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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

Vol. LXVIII No. 1 CHICAGO, JANUARY 1, 1916. Three Dollars A Year

"WHERE THE BEST IS NONE TOO GOOD"

WILLIAM PENN HOTEL PITTSBURGH, PENN.

JANSSEN & ABBOTT
ARCHITECTS

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EDITORIALS

THE ANNUAL REVIEW NUMBER.

We are pleased to present to our readers the first issue of the New Year in an entirely new dress. As the art preservative of arts has advanced it has been our aim to continually improve the physical appearance of the publication, and we offer now to our subscribers the most recent advances in type design, in paper-making and in printing and binding facilities.

As is customary at this time of year, a considerable portion of this issue is devoted to a review of the outstanding developments which have transpired during the year just ended. There has been a steady growth in every direction, and a wider utilization of electrical energy and electrical apparatus in the performance of industrial and domestic work of every description. The spanning of the continent with long-distance through telephonic communication over wires and the pitching of the human voice from Washington, D. C., to the Eiffel Tower at Paris, and across the United States and the Pacific ocean to the radio station at Honolulu, Hawaii, mark the year as establishing an inspiring epoch in the electrical communication of human intelligence.

Many good friends, the leaders in all of these developments, have contributed of their knowledge and from the suggestions which they have made this review is largely prepared. To all of these we voice our sincere appreciation.

In wishing our friends a most prosperous New Year we again assure them of the completion of plans to adequately represent the industry. The editorial staff has been augmented and each department of effort will be in charge of men especially trained to discover and prepare that character of information which, because of its practical nature, will be of the greatest assistance in keeping abreast of every development.

Never before did the future appear so full of real opportunities. Scarcely any form of industrial or domestic service may be thought of for which there is not available some application of electrical energy and some adaptation of electrical apparatus. The world is keen to use this service, and it remains only for the representatives of our organizations producing electrical energy and the manufacturers of electrical material to bring the demand and supply in contact to achieve the greatest industrial conquest the world has ever known.

HIGH-TENSION EXPERIMENTS.

An article on other pages of this issue describes some experiments with extremely high voltages which were carried out at the Panama-Pacific International Exposition by Mr. C. H. Thordarson, by virtue of appropriations made by the Exposition officials for this purpose. These experiments were not unusual for the half-million volts developed, since such voltages have been attained heretofore; but the use made of this voltage and the construction of the transformer which supplied it are worthy of mention.

An electrostatic field of large dimensions was created by applying the high voltage to a network or screen of wires suspended in a horizontal plane over the ground and supported at the four corners by means of hempen ropes which had been soaked in tar. To prevent the destruction of these ropes where they made contact with the highly charged conductor they were inclosed in a wire cage which protected the point of contact from the electrostatic field. This method of suspension suggests itself as a cheap substitute for the present more expensive transmission line construction.

Innumerable facts are said to have been secured from this electrostatic field covering an unusually large space. It is to be hoped that further experiment along this line will be made possible by the erection of the same apparatus in the near future in Chicago.

The construction of the transformer presents some interesting features which will probably find useful application in commercial power transformers. The coils being flat, the disks have the form for maximum strength. Since oil rather than solid dielectric is being depended upon for insulation between coils having the greatest difference of potential, there is little likelihood of break-down which will incapacitate the transformer, and it has other points of interest which cannot be gone into in detail here.

The termination of the Exposition made it impossible to continue further experiments and investigation of many phenomena of high-powered discharges. However, the apparatus will be erected in Chicago, and it is expected that a great deal of valuable data will soon be secured. Mr. Thordarson is enthusiastic over the present performance of his transformer and is eager to continue his investigations.

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MAINTAINING PRICES.

The present session of Congress will undoubtedly witness a determined effort upon the part of the proponents of the idea of justice and equity in the maintenance of manufacturers' list prices to secure legislation establishing definite rules based upon a conception of fair play in business. The antagonists to the idea of price maintenance will likely make just as determined an effort to defeat the passing of any such legislation. It is to be hoped that both parties to the discussion may bring forward their arguments in such form as to make clear that the question is one of economic necessity and not merely an exposition of individualistic and selfish ideas.

The breaking down of the manufacturers' list is usually accomplished in two ways—one, through severe competition which causes the distributor to sacrifice his expenses of handling in order to secure a smaller modicum of reward and make up in increased volume of sales the return which should come from a normal and natural distribution of merchandise. In the other case, large retail interests deliberately mark down the price on standard articles in order to force sales of these and other commodities. To offset either of these contingencies it seems quite necessary that the manufacturer have at his command some means of controlling the price at which the article may be sold, and as the Government has frowned upon agreements between manufacturers and dealers, apparently the solution will be found in absolutely defining the limitations to which a manufacturer may extend control over the prices at which his goods should be sold.

There have been reams of argument upon both sides of the question and it may seem gratuitous to refer to it now. There are, however, two viewpoints which we venture to believe are worthy of consideration. The first is that a large part of the public approval of the idea that to the middleman goes too much of the carrying charges is because of an absolute misconception. This misconception is based to a great deal upon a confusion in the minds of the public of the difference between compensation and profit. In discussing the question too often has a margin of expense for handling been considered in the form of profit. In any debate one will hear manufacturers and distributors talking about the profit they must have when compensation only is referred to. The public has the idea that it is largely profit which the middleman gets, and rarely considers that the difference between the manufacturers' prices to the distributor and the dealers' prices to the consumer is used up in expense of handling. If a distributor sells an article at that price which nets him only what he has paid to the manufacturer, plus his cost of handling, no profit has attended his efforts, and in few cases are the returns so great as to constitute a reward in excess of that legitimately the portion of anyone doing a similar amount of work for the benefit of the community in general.

The other point we wish to make at this time is that the price-cut on a standard article is not justified by the specious explanation that because of increased volume of sales, or because of great efficiency in handling, a standard price may be sacrificed. It is only those articles which have a standard of value in the minds of those who buy greater than that at which the article is offered that prove attractive as a bargain. Unless this value had been established through the efforts of the manufacturer, the idea of a bargain when the price is cut could not exist. Therefore, the price-cutter could offer no incentive to the buyer and could not make use of his vaunted efficiency of distribution. On the other hand, if because of reduction in overhead charges and because of superior business management it is possible to sacrifice a price on any article, the cut should logically be made on all articles handled by this price-cutting organization. This should be in the form of a general premium or rebate covering like a blanket the activities of every department. In this way the more efficient merchant could legitimately take a dvantage of his opportunities and he would not be affecting disadvantageously the standard of value established by the manufacturer who makes possible his greatest opportunity for successful merchandising.

ELECTRICITY AND THE RISING GENERATION.

In connection with Electrical Prosperity Week the Commonwealth Edison Company conducted an essay-writing contest among the high school students of the city of Chicago. The composition was entitled "The Manifold Uses of Electricity in the Home." Announcement was made in the daily newspapers and in the monthly publication of the company, and the response was extremely gratifying. Over 500 manuscripts were submitted, and the judges had difficulty in awarding the capital prizes. The amount of knowledge of the uses of electricity in the home was complete beyond the expectation of the most sanguine. To find boys and girls enumerating in the most logical and coherent fashion 50 and 60 uses of electricity in the home, and weaving these into a composition of high story interest, was indeed surprising and particularly satisfying.

The prizes originally stipulated cash rewards of $50.00, $30.00 and $20.00 respectively, and 10 prizes of electrical devices for the home, each averaging approximately $7.00 in value. So well satisfied was the company in the interest aroused and in the excellence of all of the compositions contributed that in making the awards it was considerately decided to show appreciation by making a gift to every one of the contributors of a certificate of the value of $1.00, which could be turned in as part payment upon any device purchased in the electric shops of the company.

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POINTS IN ELECTRIC-VEHICLE SALES.

One of the most important problems in connection with the development of the electric commercial-vehicle market today is the avoidance of too much technicality in dealing with the prospective customer. This is true in all electrical service propaganda, but in the case of the electric vehicle, the elimination of an ultra-learned attitude on the part of the vehicle or central-station representative is especially important because of the non-technical methods usually followed by salesmen of gasoline trucks. Nothing tends more to discourage a prompt sale than dissensions among competitive dealers in the hearing of the prospect over the technical merits of their equipment, and simple, direct statements about the number of miles per day a given truck will run at a given approximate cost, or corresponding estimates of the cost of transportation per ton or per package handled are what most situations require.

Speaking of these methods, one of the most successful electric-vehicle salesmen in America recently called attention to the fact that the representative of the gasoline-truck maker approaches the prospect with a tale of the number of miles a truck of a given rating or engine horsepower will run on a gallon of gasoline. If the prospect pushes the inquiry, and wants to hear something about the repair sheet to be expected, the dealer is pretty apt to call attention to the best available records of such machines rather than average performances, but on the whole he confines himself chiefly to service capabilities. There is too much of a tendency for the electric-truck salesman to go needlessly into such matters as differences in battery voltage, the specific gravity of electrolytes, capacities in ampere-hours, central-station kilowatt-hour rates, the fine points of motor and control design, and even into voltage drops in leads and the layout of wiring. Differences of a radical nature for example, have their engineering importance, but between the make-up of alkali and lead batteries, unless it is called for, the salesman who confides his arguments chiefly to performance and talks only in terms that the customer understands, does the best work in popularizing the electric vehicle. A little less "tech" and a little more "pep" should be the slogan, according to this salesman's code, although nothing should stand in the way of an adequate engineering investigation of the service requirements and fitness of stated equipment for a given work.

In taking up an electric-truck problem, it is sometimes very difficult for the salesman to get the prospect to disclose his figures of cost in connection with horse operation. In some cases a complete discussion of such data has resulted from the presentation of an estimate of between $400 and $500 per year as the maintenance expense per horse, multiplying this unit, of course, by the number of horses owned. Labor costs come extra. The salesman gives the prospect an approximate figure as to horse maintenance, which usually leads to the production of such expense sheets as are kept in the establishment, and their thorough analysis. If the costs are less than estimated, the prospect is naturally delighted, if greater, the chance for improvement is open for discussion, and in either case, the production of the cost sheets gives a fair opportunity to go into the transportation problem in a sensible way.

One more point may be mentioned. An increasing demand on the part of prospects for actual demonstrations is an important factor in winning over some contracts, particularly where competition with gasoline machines is a feature. One recent purchaser of an electric fleet for city service did not know what acceleration meant when the dealer mentioned the ability of his product in this direction compared with gasoline equipment. Actual tests showed that although the maximum speed of the electric vehicles was from 20 to 25 miles per hour against 25 to 30 miles per hour for the gasoline outfits under consideration, the former could start, get under way, and reach a given point about town more quickly than the latter, while for the service in mind, the reliability of the electric was far superior. Even in hill-climbing, the old discredited ghost that the electric vehicle is incompetent was dissipated by tests. The bugaboo of hills exacts a heavy toll in horse depreciation and where grades are steep, even as in San Francisco, where they reach 8 and 20 per cent, the transmissions of the gasoline cars wear out rapidly on account of repeated gear shifts.

CULTIVATING PUBLIC GOOD WILL.

One method of securing the co-operation of the public in extending its business which may be utilized by a central-station company, while at the same time cultivating the good will of its customers is illustrated in the action in the Union Electric Light & Power Company in St. Louis. Last summer this company announced that when the number of customers reached 65,000, which is a gain of 5,000 over the number then existing, a reduction in rates would be made. This at once offers an incentive to customers to boost the service among their neighbors and at the same time shows them that the company has a definite policy in reducing rates as the business grows. As told in an article in last week's issue the company was able to announce on December 1 that the requisite number of customers has been secured and consequently the new rate was put into effect last month.

The matter does not end with this reduction, however. A further reduction of one-half cent per kilowatt-hour is to be made when 5,000 additional customers are secured, then upon the acquisition of an additional 5,000 another similar reduction will be made. Definite prospective reductions in rate of this kind give customers something to look forward to and tend naturally to induce a more friendly attitude upon their part.

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Flood Lighting Used for Municipal Christmas Tree in Chicago.

A spectacular lighting effect patterned from the illumination of the Tower of Jewels at the San Francisco Exposition was achieved in lighting the Chicago Municipal Christmas tree which was installed at the lake front at Grant Park and dedicated to the public on the evening of December 24. The Chicago *Examiner*, a local daily, under whose auspices the tree was installed, engaged W. D'A. Ryan, who was responsible for the Exposition lighting, to take charge of the illumination of the Chicago tree. With a realization of the success achieved in the Exposition lighting, Mr. Ryan made a radical departure from the usual custom in Christmas tree lighting and relied entirely upon flood lighting.

As shown in the accompanying illustration the central feature of the Chicago display is a monster fir tree, 80 feet high surmounted by a jeweled star and decorated with 4,000 Novagem jewels obtained from San Francisco. Forming a semi-circle around this central tree are six 30-foot trees similarly decorated and an outer arcade comprising hedges of evergreen complete the effect.

The lighting of the main tree is accomplished by the

Chicago Christmas Tree Flood Lighted.

means of five arc search lights, one of 12,000 candlepower, one of 9,000 candlepower, two of 7,500 candlepower and one of 5,000 candlepower. Two of these search lights are installed in the balconies of buildings on Michigan Avenue, several hundred feet distant. There are also 25 "Sunlight" projectors, manufactured by the American Lighting Company, each equipped with a 1,000-watt nitrogen-filled Mazda lamp arranged to direct beams of light to all portions of the display. At the base of the main tree there are five 500-watt lamps, 24 250-watt lamps, 20 150-watt lamps and 28 60-watt lamps all equipped with X-Ray reflectors and directing the light up through the tree. Colored screens on some of the lights produced a pleasing and spectacular effect. The smaller trees are similarly lighted from the base by Mazda lamps of various sizes equipped with reflectors which direct the light rays up through the trees. The hedges of evergreen forming the outer circle are lighted by festoons of 10-watt colored incandescent lamps.

To the rear of the main tree is a 500-foot stockade of evergreens about 4 feet high tied together at 6 points by groups of 4 trees rising from the background.

Energy is supplied by the Commonwealth Edison Company. A temporary transformer installation of 60 kilowatts capacity was installed for the occasion.

Associated Manufacturers of Electrical Supplies Make Progress.

In response to a call issued by the General Secretary of the Associated Manufacturers of Electrical Supplies to the manufacturers of enclosed fuses and accessories, a meeting was held on Thursday, December 2 at the Hotel Biltmore, to consider the formation of a section in the association to cover this branch of the industry. The meeting was well attended, and the vote was unanimous for the formation of a section to be known as the "Fuse Section."

H. R. Sargent, of the General Electric Company, was appointed permanent chairman of the section; R. C. Buell, of the Johns-Pratt Company, secretary, and F. V. Burton, of the Bryant Electric Company, treasurer. The following standing committees were appointed: 1, cartridge fuses; 2, plug and open fuses; 3, cut-outs and accessories.

Rules for the section were considered and adopted. Membership in this section is confined to members of the Associated Manufacturers of Electrical Supplies engaged in the manufacture of fuses for electric light and power circuits and accessories for such fuses.

At the meeting held on December 8 at the Biltmore, when the Moulded or Formed Insulations Section of the Associated Manufacturers of Electrical Supplies was formed, the following officers were elected: E. B. Hatch, of the Johns-Pratt Company, was elected permanent chairman; R. W. Seabury, of the Boonton Rubber Manufacturing Company, secretary, and Joseph Steinberger, of the General Insulate Company, treasurer. After consideration rules were adopted covering the section, and the following sub-committees were appointed: 1, moulded rubber insulation; 2, fiber insulation; 3, suspension and third rail insulation; 4, high heat moulded insulation; 5, moulded composition insulation; 6, miscellaneous insulation.

The interests of the manufacturers of the various kinds of insulating materials will be classified under the above sub-committees, each sub-committee choosing its own chairman, who with the chairman of the section and the treasurer will constitute the executive committee of the section.

Members of the Associated Manufacturers of Electrical Supplies who manufacture moulded or formed insulation for electrical purposes are eligible for membership in this section.

On December 14, at 10 a. m. at the Biltmore, a meeting of the manufacturers of switchboards and panelboards was held for the purpose of organizing a section in the Associated Manufacturers of Electrical Supplies to be known as the "Panelboard and Switchboard Section." Fred B. Adam, of the Frank Adam Electric Company, was the temporary chairman of the meeting. D. K. Chadbourne, of the George Cutter Company, was elected permanent secretary of the section, and William T. Pringle, of the Pringle Electrical Manufacturing Company, was elected permanent treasurer.

The following standing sub-committees were appointed: 1, panelboards; 2, switchboards; 3, knife switches; 4, cabinets.

Membership in this section is confined to members of the association engaged in the manufacture of panelboards and switchboards.

New England Section N. E. L. A. to Hold Question Box Convention.

A Question Box Convention will be held at Boston, Mass., March 8 and 9, 1916, under the auspices of the New England Section, N. E. L. A. The convention will be conducted along about the same lines as the very successful convention of last spring.

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The Year In The Electrical Industry

Some Notes on Where We Stand at the End of the Year—Steady Growth, Rather Than Extraordinary Development Marks the Twelve - Month Period—Transcontinental Telephony Accomplished on Practical Working Basis—Radio-Telephony over Extreme Long-Distances Successfully Achieved

Telephone and Telegraph

By far the overshadowing development of the year in wire telephony was the triumph of the American Telephone and Telegraph Company's engineers in establishing trans-continental telephone communication. On January 25, Prof. Alexander Graham Bell, in New York City, called across the continent of North America to his friend and former associate, Thomas A. Watson, in San Francisco, Cal., thus completing the longest stretch of voice communication over wires ever achieved. Two years were required in the work of constructing the trans-continental line. The length of the line is 3,400 miles, and the route from west to east is from San Francisco through Salt Lake City, Denver, Omaha, Chicago and Pittsburgh to New York. Another branch goes from Chicago to Buffalo, and then down to New York. There is a continuation of the line from Buffalo to Boston. From Pittsburgh there is a continuation extending to Baltimore and Washington, and Philadelphia is reached by a branch from the line extending from Pittsburgh to New York. The total weight of one circuit, consisting of two hard-drawn copper wires 0.165-inch in diameter, is 1,480 tons. There are 130,000 poles in the line, and in the two physical circuits, each circuit having two wires, there are 13,600 miles of copper wire.

In a general way there have been the usual improvements and refinements in apparatus, and specialties have received considerable attention. A more flexible interphone system for apartment-house service is available, and switchboards have been developed with ring-off and recall signals to prevent hang-up troubles and increase operating efficiency.

An all-metal switchboard for use on board ships of the navy has been designed and put in successful operation.

Further development work has been undertaken and brought to a successful conclusion with the loud-speaking telephone for railway train dispatching.

Both manufacturing companies and operators have combined most successfully to develop the idea of "service first" and to maintain a more efficient talking facility. Both automatic and semi-automatic features for speeding up the service have found considerable favor.

A noteworthy development of the year was witnessed in the joint meeting of the National Independent Telephone Association and the Independent Telephone Association of America at Chicago on December 8, 9 and 10, 1915. As a result of this meeting a reunion of the two organizations followed in which each gave up its existence to form a new association called the United States Independent Telephone Association. The meeting was attended by nearly 1,000 delegates, and was said to be the largest gathering of independent telephone men ever held in this country.

In cable telegraphy there have been no new developments of any great importance, the developments being generally along the line of refinement of various systems of magnification of signals. This has resulted in increased legibility and speed.

Wireless Telegraphy and Telephony

The increased use of continuous oscillation apparatus has been the most marked tendency in radio telegraphy. The Telefunken station at Sayville, Long Island, which formerly made use of the quenched spark, has now been equipped with a Telefunken high-frequency machine, giving good communication with the German station at Nauen.

In the navy a large portion of the land stations where distances of more than two or three hundred miles have to be covered, have been equipped with arcs of medium power. The second of the high-power arc stations has been completed at Darien, Canal Zone, giving excellent communication with Arlington and several other stations in the United States.

The Marconi Company has equipped a considerable portion of the American merchant marine with thoroughly modern and up-to-date wireless apparatus. This system has also established communication between the United States and Hawaii, the United States and Japan, and the United States and Alaska.

On Wednesday, September 29, Theodore N. Vail, president of the American Telephone and Telegraph Company, spoke into a Bell telephone connected by wires of the Bell system with the radio station at Arlington, Va., and from that point the message was sent by wireless telephone to Mare Island, Cal., where it was caught at the radio station there and heard by John J. Carty, chief engineer of the telephone company. On the same day and subsequently a series of remarkable records was made, wireless telephone messages being sent from Arlington and heard at the radio stations at San Diego, Cal., Darien, Panama, and Pearl Harbor, near Honolulu, Hawaii.

On October 21, wireless telephone messages sent out by Bell telephone engineers at the wireless station at Arlington, were received at the Eiffel Tower in Paris. This satisfactory wireless telephone communication was carried on by means of apparatus developed under the direction of John J. Carty, chief engineer of the American Telephone and Telegraph Company.

The ultra-audion type of receiver-detector has been adopted for long-distance wireless telegraphy. It is claimed by de Forest that these extreme long distances would be a practical impossibility without this development of the audion. De Forest also claims that the phenomenal results recently achieved have been done by means of gigantic oscillating audion-amplifier systems at the transmitter with audion-detector and amplifier at the several receiving stations.

Reference to the wireless would be incomplete without giving credit to the great service performed between ships at sea and ships and shore stations. The year has witnessed over a dozen positive demonstrations of where wireless signals have summoned assistance and have been the means of saving upwards of a thousand lives. Its utility in both army and navy service is evidenced today in every war zone abroad.

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Electrochemistry and Electric Furnaces

Electrochemical investigation and research continues steadily on, but the discoveries made in this field are not always susceptible of immediate application and it is rather hard to assign development to any particular year.

The electroplating of bronze upon other metals has been successfully demonstrated, and the idea that was formerly held that there are some metals that cannot be successfully plated seems to be entirely overthrown. Copper is now electroplated upon the backs of mirrors of large size, this process having been worked out upon a commercial scale in France. The work carried on by the Canadian Department of Mines has demonstrated fully the commercial and technical feasibility of electroplating cobalt upon a large number of other metals, and it appears that articles thus plated have advantages over nickel-plated articles. The process also can be carried on at a more rapid rate, so that its commercial application would seem to be assured. Further investigations of lead and nickel-plating have added to the available data along these lines.

Among other papers presented before the American Electrochemical Society was one by Frances R. Pyne showing how solution stratification may be utilized in the purification of electrolytes such as occur in the refining of copper; one by E. Weintraub describing a new product designated "fibrox," which is an oxycarbide of silicon. This material is not only very refractory, but displays the remarkable quality of being a relatively good electrical conductor and at the same time an excellent insulator for heat. It should find important applications.

The announcement has been made in France that electrolytic iron is being successfully produced there upon a commercial scale. The most important work along this line in this country has been done at the University of Illinois, where T. D. Yensen has shown that electrolytic iron may be given desirable working qualities by subsequent fusion in a vacuum. Alloys which have been made by the use of this pure iron have shown properties hitherto unknown, especially with respect to their magnetic quality. An alloy of iron and cobalt shows a higher value for magnetic saturation than any other material yet discovered. An alloy of iron with silicon displayed, after proper annealing, magnetic permeabilities which were remarkably high and in one instance exceeded a value of 50,000.

There has been but little to record in the field of primary batteries. Dry batteries have been very extensively used with high-efficiency tungsten incandescent lamps as portable lighting units. Quite a variety of such combinations, usually provided with a reflector for concentrating the light, have been placed upon the market. A form of dry cell which was heralded as supplying three volts turns out to consist of two separate cells in series mounted in a case having the size of the common No. 6 single cell.

It has been shown that a magnetic field has no direct action upon chemical affinity.

Several publications have appeared during the year dealing with the mitigation of electrolysis of underground structures by electric current. They consist mainly in summing up information already known and applying principles in particular cases. Several electrolysis surveys upon an extensive scale have been made during the year.

Electrolysis of overhead structures in locations subject to moist salty atmospherical conditions has been recognized as a condition with which the electrical engineer must deal. The importance of this subject was emphasized in a paper by S. L. Foster before the American Institute of Electrical Engineers.

The precipitation of fumes, smoke and other forms of solid particles floating in the air by electrical means has received an increased impetus and a number of installations of this character have been made. This method has been demonstrated to be a practical one which may be applied wherever the expense is justified for securing the desired results.

Progress in the application of electric furnaces has been steady. Melting furnaces continue to be installed in increasing numbers. Furnace capacities exceeding a total of one million horsepower are now in use. Improvements have been made in design and furnaces have been adapted to various uses. Probably the single-phase type of furnace has proved the most popular. Electric steel furnaces have been demonstrated to give a high quality of product at less expense than by the earlier methods. The output of electric steel, however, is probably not over 100,000 tons per annum in this country.

At Tinfos, in Norway, the smelting of iron ore in electric furnaces, using coke, has been demonstrated to be feasible and an output of 27 tons per day of pig iron of excellent quality is recorded. Large furnace projects are reported from Norway, including one installation of 40,000 horsepower which is to be devoted to the production of calcium carbide, ferro-alloys, etc.

Electric Traction in 1915

By A. M. Buck

The year 1915 has been a comparatively successful one in the electric railway industry. The period of depression which was prevalent during the previous year has gradually been dissipated, so that today a majority of the electric roads are in better financial condition than for some time past. A hopeful sign is that the various regulative bodies have to a certain extent abandoned their attitude of regulating the railroads to the point of starvation, and have in some cases allowed much needed increases in fares. Although small, these tendencies give promise of a better understanding between the electric railways and the public of the conditions to be met and the needs of the industry.

Competition of Jitney Buses.

In the field of city railways, the principal event of the year has been the rise and fall of the "Jitney" bus. Born in the closing months of 1914, this new means of urban transportation flourished for the first half of the past year, but finally reached a maximum, and since then has had a rapid decline, so that today it cannot be considered a serious factor to be reckoned with. It appears now, in reprospect, that the principal underlying cause for the beginning of the craze was the existence of a considerable amount of unemployment and a slow market for used cars. With the return of better business conditions all over the country, as well as a shortage of suitable secondhand automobiles, the jitney operators have been forced to the conclusion that it is not possible to carry passengers in ordinary automobiles for a five-cent fare and make a profit, unless the routes are exceedingly short, the traffic dense, and none of the incidental duties of a transportation system are assumed. These conditions exist only in cities where there are already adequate street-car facilities, and in these cases the municipalities have in general come to the aid of the rail-

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way companies by passing restrictive ordinances which render the jitneys amenable to the same sort of regulation as the street cars. When this has been done the buses have been forced, through economic pressure, to cease operation.

The advent of the jitneys has had a certain good effect on the street railroad owners in waking them up to a better knowledge of what the public demands of its transportation facilities. For a good many years the tendency has been toward the operation of long, heavy cars at rather infrequet intervals. While this is ideal from the standpoint of the operating department, sending a given number of seats past a point at the least cost, it does not give as good service as the public wants. The large number of passengers carried by the jitneys in the first months of operation indicates that the public desires a service more rapid and more frequent than what has been provided by most of the city roads. The managers have not been slow to see this, as evidenced by the orders for small, light cars, often for one-man operation, which have been placed recently. Even though this frequent service may be somewhat more expensive than the present standard, it would appear that the greater volume of traffic which can be developed may well result in increased net earnings. This was shown by the great increase in total travel during the height of the jitney operation. Many persons who would not wait ten or more minutes for a street car, would be attracted by the two- or three-minute service of the buses; and, granted that many persons rode in the latter out of curiosity, there was still a considerable increase in traffic of a more permanent character.

The various center-entrance and low-floor cars have been gaining in popularity both for city and for interurban service, and their use seems to be spreading rapidly. They are driving the old-style end-entrance cars out of existence in places where rapid service with frequent stops is a prime necessity, and are aiding the roads in their fight against jitney competition.

Field of Heavy Traction.

Technically, the year has been more one of fulfilment than of great technical advance. In the heavy railway field, the items of greatest interest are the opening to traffic of the Norfolk & Western and the Pennsylvania electrifications, and the practical completion of the first portion of the Chicago, Milwaukee & St. Paul's 440-mile electrification on the continental divide. These installations were begun in the previous year, but are now fully incorporated as practical operating features of the roads in question.

It is worth noting the wide differences in conditions which impelled the electrification of these three properties. The Norfolk & Western found itself limited by the heavy grades on the section of its line lying in the Blue Ridge between Virginia and West Virginia, and electrification, by increasing the capacity of the track, postponed indefinitely the need for an increase in investment for additional right-of-way and expensive construction.

The problem of the Pennsylvania electrification is somewhat the same, although the service is entirely different in character. Here the capacity of the Philadelphia Broad Street terminal had been reached, the problem of extension being exceedingly acute on account of the practical impossibility of adding to the present facilities. Electrification of only a small portion of the traffic entering this terminal has so increased the number of trains that can be handled that provision is made for several years' normal growth in traffic. Complete electrification of the Broad Street station will make it ample for many years to come if the present rate of increase in traffic is not exceeded.

The electrification of the Chicago, Milwaukee & St. Paul is of a quite different character. In this the entire service is to be handled electrically over a long division. The object sought is a direct reduction in operating cost, and, although the volume of traffic carried is not so large as that of the other two roads mentioned, it is confidently expected that there will be a material saving.

The most notable feature of the three electrifications is the diversity of systems used, and the fact that each one makes use of hitherto untried types of equipment. The St. Paul is to operate at a trolley pressure of 3,000 volts direct current. The difference from the 2,400-volt system, as used on the adjoining Butte, Anaconda & Pacific, is, however, comparatively slight, and there is no reason to anticipate any operating difficulty. The Pennsylvania operates on 11,000-volt, single-phase, alternating current, which is a similar circuit to that of the New York, New Haven & Hartford, which has been in service for several years; but the motors are of the doubly-fed type, starting as repulsion motors and running as series motors. This makes it possible to omit the resistance leads to the commutator which have been a feature of the straight series motors heretofore used in this country on single-phase circuits. The Norfolk & Western also uses the 11,000-volt single-phase contact line, but the motors are of the familiar three-phase induction type, being fed through the medium of a rotating phase converter on the locomotive.

It may thus be seen that the standardization in electric supply and motors which was confidently looked for a number of years ago has failed to materialize; in fact, the different systems are today farther apart than they were some time since. While this may lead to a longer period of development before any extensive electrification of the more important trunk lines is attempted, it should be advantageous on account of giving a greater chance for eliminating unsuitable types of equipment.

The most striking development of the year is the operation of an experimental 5,000-volt direct-current railway. The reports are very favorable, and it would appear that it may give a further chance for the extension of the high-tension, direct-current system. In fact, the motors in use on this installation have already been operated at 7,000 volts. The source of the current is a set of three mercury-vapor converters, one in each phase of a three-phase circuit, the direct-current terminals being connected in series. In this way the difficulty of operating rotary converter or motor-generator substations at high potentials is obviated. This may be another means of furthering the development of the high-tension direct-current railway system.

Chicago Electrification Report.

Any review of the year in electric traction would be incomplete without reference to the report of the Chicago Association of Commerce committee on smoke abatement and electrification. While this report is disappointing to those persons who were looking for complete electrification of the Chicago steam railroads, it is encouraging in that it incidentally points a way to the partial electrification at once of some of the passenger roads. In the committee's estimates of cost, the construction and equipment are of the very best and most expensive types. The experience of other roads which have already electrified proves that successful service can be maintained with a considerably cheaper construction. With such a change, the estimated deficit in operation cannot be eliminated, but it can be reduced to a point where it is not nearly so formidable as the $14,600,000 per year quoted. It is interesting to note that the city council has already voted to require the immediate electrification of two of the railroads having large suburban service—the Illinois Central and the Chicago & North Western. By doing the work in sections, the city may secure the complete electrification of its terminals many years sooner than if the project were to be rushed through as one complete unit.

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Electric Lighting and Illuminating Engineering

By C. E. Clewell

In probably no other branch of electrical activity are there evidences of such widespread changes and developments during the past few years as in that of lighting and illumination. The developments of the past year, therefore, form a part of this remarkable evolution in artificial lighting, and to appreciate fully the bearing of these developments on the lighting industry as a whole, those things which have preceded the present year should be kept in mind, along with the review of the particular features which have fallen within the past twelvemonth period.

Standing out with prominence has been the introduction of the new gas-filled tungsten lamps in the smaller sizes. A little more than a year elapsed after the first announcement of this new lamp in the larger sizes, before the 100-watt size was finally placed on the market, early in 1915. Recent reports indicate that the use of the carbon filament has decreased from about 85 per cent of the total incandescent electric lamps in use, to about 8 per cent, up to the beginning of 1915, this change covering a period of six years. In the same interval the Gem lamp has increased from about 2.5 per cent of the total to about 22 per cent; and the vacuum tungsten lamp from about 2.5 per cent to about 70 per cent.

Gas-Filled Lamp Reduces Cost.

These changes in the use of lamps have probably been the basis for remarks made in May, 1915, by Holton H. Scott, president of the National Electric Light Association, in which he says:

"The public does not realize that the cost of electric illumination—that is, the cost per candle-hour—is now only 15 per cent of what it was a few years ago. Some of this enormous decrease is due to the decrease in rates charged for current; but the greater part of it is due to the improvements in the electric incandescent lamps.

"Before these improvements came into general use there were many unprofitable consumers carried by every central-station company and the lamp improvements have added largely to the number."

Mr. Scott thus advances the idea that the new lamps have imposed a serious problem upon the central stations, and, further, that the latter should receive at least a proportion of the benefits of the improvements in the efficiencies of lamps and other appliances.

Turning now to the effect of these new lamps on street lighting, reports indicate that a great many of the smaller towns and cities have changed over entirely from arc to gas-filled tungsten units. Chicago and New York are representative of the larger cities which have been affected. In each of these cities large numbers of gas-filled units have been installed in place of arc lamps, and it has been reported on good authority that on January 1, 1916, there will not be a single arc lamp in municipal street-lighting service on any street in Greater New York.

The chief engineer on light and power in charge of the Bureau of Gas and Electricity in New York City states that in Queens and the Bronx Boroughs, about 5,000 small gas-filled units have been installed in place of the gas street lamps, and 1,800 arc lamps in public buildings and on bridges have been replaced (reported in May, 1915). Changes of this nature have been taking place very generally throughout the country, thus marking a notable departure in the type of units employed for such service.

Exposition Lighting Notable.

One of the most interesting features of the year has been the successful illumination at the Panama-Pacific International Exposition. The projection of light in large quantities from concealed sources in the flood lighting of the exposition buildings has been the subject of comment both in the technical and popular press, and the popular expression may be taken as an indication of a growing appreciation on the part of the public of the place held by illumination in the modern ideas of decoration. The great success of this exposition has been due in no small measure to this single feature.

Research and improvements have also been carried out in the field of photometry and light measurement. The compensated test plate for illumination photometers may be mentioned as one of the results in this direction, and through its use greater accuracy may be expected in the measurement of certain illuminations. The results of studies into physical photometry, colored-light photometry, methods of correcting abnormal color vision and the efficiency of the eye under different conditions of lighting have also been reported during the year. The proposals relative to definitions, standards and photometric methods made by Dr. H. E. Ives have also been of interest.

The relation of illumination to safety has received additional attention. The engineering department of one of the large accident-insurance companies has reported the results of an extended investigation by stating that about 25 per cent of industrial accidents may be traced either directly or indirectly to improper lighting. At the fourth annual safety congress of the National Safety Council, held in Philadelphia in October, 1915, one of the most prominent exhibits covered the subject of factory lighting in its relation to industrial accident prevention.

Illuminating Engineering.

Turning to the activities of the Illuminating Engineering Society, it is of special interest to note the publication of the new Code of Lighting for Factories, Mills and Other Work Places, which made its appearance in September. This code stands for a systematic effort to make available authoritative information for the use of industrial commissions and factory departments in general. Its preparation is due to two committees composed of men with wide experience in the lighting field, and its circulation may be expected to raise the standards of factory lighting in many cases where the ideas of modern lighting have not as yet been put into practice.

It is also significant that Dr. Charles P. Steinmetz has been elected to the presidency of this society and has undertaken the work of the new year with his characteristic enthusiasm for the advancement of the principles of good lighting. Plans of a far-reaching nature have already been formulated by Dr. Steinmetz, which will undoubtedly be felt very generally throughout the country to the advantage of the lighting field.

The efforts which have been under way for some time past to interest the technical schools and universities in giving definite instruction to undergraduate students in the principles of light and illumination have met with some success. A complete report has been made during the past year of the work along this line at the University of Pennsylvania and at the Sheffield Scientific School of Yale University, and this report has been distributed throughout the schools of the country in an effort to show what may be accomplished in this direction. At least one institution now has under consideration the plan of giving a course leading to the degree of Illuminating Engineer. Furthermore, a committee of the Illuminating Engineering Society has prepared and distributed an outline of a course in illumination which has been placed before the proper au-

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thorities in the various schools in the nature of a suggestion as to the possibilities for instruction in this field.

Under date of August, 1915, the Departmental Committee on Lighting in Factories and Workshops, appointed about two years ago by the Home Department of the British Parliament has issued a memorandum accompanying its first report. The original letter of appointment for this committee by the Hon. R. McKenna, then Secretary of State for the Home Department, dated January 17, 1913, read as follows:

"I hereby appoint * * * a committee to inquire and report as to the conditions necessary for the adequate and suitable lighting (natural and artificial) of factories and workshops, having regard to the nature of the work carried on, the protection of the eyesight of the persons employed, and the various forms of illumination. * * * "

It is particularly significant that the first report of this British committee appeared almost simultaneously with that of our Illuminating Engineering Society's Code of Lighting. A study into the work of these two committees shows that the present state of industrial lighting in the two countries is essentially the same. The British report covers nearly 90 pages, including a section on recommendations for the purpose of bringing all factories up to at least a minimum standard basis. One clause from this report is of particular importance and summarizes the present attitude toward the question of proper lighting by authorities who have made a study into the situation. It follows:

"Complaints of eyestrain, headache and the like, attributed to insufficient lighting, are common, and while an exhaustive medical inquiry would be necessary to establish the connection between these defects and inadequate lighting, there is a general impression that unsatisfactory lighting is, in various ways, prejudicial to health. It is also recognized that insufficient light adds to the difficulty of the proper supervision of work, and of the maintenance of cleanliness and sanitary conditions generally. Witnesses gave specific instances of the effect of improved lighting in increasing the output and improving the quality of work turned out."

The general celebration throughout the country of "Electrical Prosperity Week," from November 29 to December 4, marked an interesting phase of the commercial side of electric lighting. Reports of this event indicate unusual success in the effort to concentrate attention for several days of the year towards the uses of electricity in its many modern channels of service. The event was made the basis of campaigns in many cities for widening the use of electric current. Thus in Philadelphia an allowance of one dollar per energy-consuming outlet on the cost of wiring any already built house or store along existing lines was made. This resulted in about 1,160 contracts, or at least $100,000 worth of business, for the wiring houses, of which about 930 contracts were accredited to the effort resulting from this particular celebration.

Future of Electric Lighting.

A liberal review of the past year's activities and developments thus shows both a hopeful as well as something of a depressing attitude to the future of the electric lighting industry in regard to the commercial side of the work. The introduction of high-efficiency lamps with their corresponding reduction of current consumption for the same light production, has been largely responsible for the pessimistic viewpoint outlined in an earlier paragraph of this review. As a matter of fact, however, the present status of illumination from the purely engineering point of view is still far below a satisfactory standard, and hence there is today, even after a year of effort, a wide field for improvement in the quality and quantity of illumination. As long as this situation exists the newer lamps need not cause as marked a reduction in energy consumption as has been feared by some writers, since the improvement of illumination by high-efficiency lamps may actually and often does result in a net increase in energy consumption in given cases.

In conclusion, the experiences of the past year indicate a greater appreciation than ever before on the part of the central stations of the fundamental advantages of good light and the benefits to be derived through an education of their customers to this same understanding. On the other hand, these same experiences, dating back to the introduction of the gas-filled lamp, also show that there is extreme abuse on every hand through the use of lamps of very high brilliancy without the proper diffusing glass shades or globes. The effort to lower this abuse does not seem to have kept pace during the past twelve months with the widening of the use of these new lamps as individual units separate and distinct from the proper glassware. One of the greatest lessons to be learned from the immediate past, therefore, is that a new lamp, possessing the great advantage of high efficiency, may also have an equal disadvantage, almost, if not entirely, offsetting the advantage. A great opportunity awaits the lighting profession in the elimination of the abuse of the eyes which has come about through an evolution in lamps, and the development of sufficiently dense glass globes and reflectors and their general adoption is a problem confronting the field.

Central-Station Activities in 1915

The activities of central-station organizations during the past year can best be measured by the financial statements now being prepared by a number of companies, all of which indicate greater prosperity than ever before in the history of electric lighting and power companies. Early in the year it was thought by executives of many companies that business conditions would make it necessary to reduce the number of employees in the commercial department and to retrench in appropriations for advertising and sales campaigns. Those who had carefully followed the destinies of the central station, however, saw in the apparent business depression opportunity for making this very depression the basis upon which to increase business. Manufacturing companies which previously had been too busy and prosperous to give much consideration to such details as power and operating costs were forced to economize. In many such instances comprehensive power surveys previously submitted by central-station representatives were brought to light and the improvements adopted.

Commercial lighting was improved and extended on somewhat the same basis, it being forcibly brought to the attention of the manufacturer that increased efficiency results from proper lighting, and to the merchant that light draws trade.

The general improvement which later was felt in practically all branches of industry naturally was reflected very strongly in central-station affairs. The year has been characterized by a greater number of intensive business campaigns than is true of any other year in the history of the industry. One of the noteworthy achievements in this connection was a campaign inaugurated by the Boston Edison Company to determine just what use is made of electricity by every one of its customers in its entire territory and to collect information upon which to base future sales campaigns. Other similar policies have been carried out by other companies.

One of the significant developments of the year has been the increased activity in the field of industrial electric heating. As a result of much experimentation and research work the

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Willys-Overland Company, a large automobile manufacturer, contracted during the year with the Toledo Railways & Light Company for over 60,000 horsepower of energy for enameling oven installations in its plant. Additional business of this character obtained during the year aggregated over 100,000 horsepower. An industrial heating association composed of men interested in this branch of work was formed and held an important convention in which some of the possibilities in this direction were brought out. Statistics were quoted which showed that a much greater load might be expected from this business than from the motor business. It was stated that the industrial electric heating business already on circuits amounts to the total power output of the three largest central stations in America.

Electric cooking and baking received great impetus during the year, the most important activity in this direction being a comprehensive report on the subject presented before the convention of the Northwest Electric Light and Power Association at Seattle. As a result of the information which was brought out at this meeting, the manufacturers of ranges as well as central-station companies took renewed interest in extending the use of electricity for cooking and as a result many notable installations were made in many localities. Particularly in the west, where low rates for this service are in force, architects and builders are specifying electric ranges for apartments in place of the usual gas equipment.

The culminating feature of the year's activities in central-station commercial department work was the noteworthy business campaign incident to Electrical Prosperity Week and continued in many instances up to Christmas. While it is too early to announce actual returns from the sales made, reports from every source indicate that the business increases are without parallel. Domestic electric appliances, of course, were given great prominence in the pre-Christmas campaigns, still all branches were benefited. In a great many localities, December, although not usually considered a good month for house-wiring business, will greatly exceed any month of the year in point of actual contracts signed.

One of the most encouraging features of Electrical Prosperity Week has been the real co-operation which was in evidence between all branches of the industry. In many instances the foundation was laid for future co-operative work which will mean much in the extension of business in the future.

In reviewing central-station activities mention must also be made of the gratifying extension of welfare work on the part of utility companies. Savings funds, pensions, sick and death benefits, etc., are now considered as much a part of central-station work as manufacturing electricity and the industry as a whole is benefiting. The trend in this direction is further evidenced by the establishment during the year of more employees' clubs, libraries, recreation rooms, etc.

Electric Vehicles and Storage Batteries

The past year has seen many changes and improvements in the electric-vehicle industry, all of which point to an unusually bright future both for the electric in the commercial field and as a passenger car. There has been no sudden, illusory spurts of popularity in the progress of the electric vehicle, rather it has been a gradual, steady growth, forming a good strong foundation upon which to build up its ever-increasing business. Ever since the transportation world has recognized the value of the motor truck in the larger cities where there are opportunities of testing the various forms of trucks, that while the gasoline motor truck is especially adapted for long, uninterrupted hauls, the electric vehicle is the desirable and economical vehicle for city and suburban work.

The Boston Institute of Technology, employing the best authorities in an unbiased study of transportation problems, bears out this statement of the electric's adaptability to city traffic after four years of observation and statistical study. Indeed, all we need do is to observe the large fleets of electrics in our city streets which have been adopted by our largest and most conservative business houses. The American Express Company has been a consistent buyer of all forms of electric trucks for the past seven years. It has now about 300 electrics in use in two cities alone, and the additions to its various fleets during the fall and winter of 1915-16 are practically all of the electric type. The Adams Express Company operates 326 electrics in two large cities, and has just received the final shipment of an increase in one fleet of 42 electrics. The Ward Baking Company is now using 610 electric delivery wagons. The Jacob Ruppert Brewing Company has 145 electrics, many of which are 5-ton capacity units; the George Ehret Brewery, 136; the New York Edison Company, 130. A number of large fleets of electric coal trucks varying from the light two-ton capacity to five and six-ton trucks, are used in and around Boston, where they are operated 18 hours a day, hauling coal to the business houses and office buildings at night, thus avoiding the difficulty and delay of operating in the sections where traffic is more congested during the day. In the lighter class of delivery wagons, the department stores have shown a strong preference for the electric. Gimbel Brothers operate 119; Lord & Taylor, B. Altman & Company, R. H. Macy & Company, Bonwit-Teller Company, Stern Brothers, the Tiffany Company, the Franklin Simon Company, all of New York, have adopted electric delivery service. In Chicago Marshall Field & Company operates no less than 230; Woodward & Lathrop of Washington, Houghton & Dutton Company of Boston, and the Bullock Company of Los Angeles, are also representative department stores all using large fleets of electric vehicles. It is significant that in nearly every case where a concern has adopted the electric, large repeat orders have been the result, evincing a certain confidence in the substantial solidity of the electric vehicle for city and suburban transportation service.

That the horse and wagon is gradually being displaced by the light electric delivery wagon has been demonstrated by the very successful campaign recently carried on by a well known manufacturer of vehicles of that type. Within its capacity rating the small 750-pound electric delivery wagon costs less to operate than a single horse wagon and can perform a far greater amount of work. Where conditions are such as to demand mileage ranges of 30, 40 or 50 miles per day, the saving obtained by the use of this car may actually cover its cost in less than two years, and this after all other running expenses have been paid for. It costs less to keep this car in tires than it does to keep a single horse in shoes for the same work done. For equal service the cost of current at five cents per kilowatt-hour amounts to but half the cost of hay and oats alone. In New York City more than 50 livery stables have expressed a willingness to store and wash this car for $10 a month. These same stables get from $27 to $30 a month for stabling and otherwise caring for a single horse and wagon, and there is profit in the former and almost inevitable loss in the latter.

Another important development of the electric vehicle during the past year in a special field is its adoption for municipal service by many of our most progressive cities in one form or another. It is with considerable interest that fire chiefs throughout the country are watching the results and performance of electrically propelled fire trucks

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and engines in the cities where they have been adopted. This should prove an especially fertile field for the exploitation of the electric because of its inherent qualities of absolute dependability, its ease of operation, immediate response to driver's touch, and great simplicity of working parts, all of which are vastly important in operating fire apparatus. Philadelphia has adopted electrically propelled fire apparatus, and especially high commendation has been given it by the fire chiefs of the following cities, all of which have adopted the electric vehicle: Springfield, Mass., Baltimore, Md., Boston, Mass., Akron, Ohio, Worcester, Mass., Uniontown, Pa., Camden, N. J., Paterson, N. J., Hartford, Conn., and several other cities too numerous to mention.

Electrics are now being used in large numbers for the collection of refuse in our cities, two of the most recent installations being in Boston, where two five-ton trucks have been purchased by the city, and in New York, where two gas-electric tractors are being used for the same purpose. Several cities of the south have adopted electrics for refuse collection, notably Miami, Fla., which has operated electric refuse vans for some time. Electric street sprinklers, snow plows, steam rollers, police patrol wagons, and ambulances are all being gradually adopted by progressive municipalities which recognize the economy of operating cost and efficiency of the modern electric commercial vehicle.

The very latest development and one which will play an important part in further popularizing the passenger electric, is the electrically driven taxicab. The present gasoline taxicab service in many of our larger cities, and especially in New York, is inefficient, in many instances unsafe and costly to operate. An electric taxicab has been developed by a company in Detroit, where there is now a fleet of 47 in operation, which has all the exclusive refinement of a privately owned limousine in appearance, and is operated with far greater ease and safety than the very best of the gasoline taxicabs. Plans are now under way whereby a company will be formed to introduce electric taxicab service in New York and other large cities in this country.

The battery-rental plan for commercial vehicles, which has been in existence for a number of years in Hartford, Conn., is just beginning to force recognition in other cities, and will, without doubt, become extensively employed throughout the country during the coming year. The aim of the battery-rental system is to widen the scope of the electric truck, increase its mileage, and reduce the initial cost. The truck user buys a truck with chassis and body adapted to his particular requirements without the battery. The electricity supply companies or charging stations of the various cities where this system is used keep him supplied with charged batteries to run his truck. In other words, he buys from the electricity supply company not energy at so much per kilowatt-hour, but transportation service. He pays a flat charge for garaging and battery maintenance depending on the size of his truck. In addition he pays so much per mile for the total mileage traveled as indicated by the odometer on the truck. When one set of batteries are nearly exhausted he receives a freshly charged set from the nearest charging station, taking from two to four minutes for the exchange, less time than it takes to refill a gasoline tank. This system is already in practical use in Hartford, Conn., Boston, Worcester, Baltimore, Salt Lake City, Fall River, Spokane and San Francisco, and as its success becomes recognized by other electricity supply companies, it will within a comparatively short time become practically universal, thus increasing the mileage radius of the electric truck and extending its usefulness to fields not always considered practical for the electric.

The battery rental and exchange system is also being developed successfully for the passenger car type. Coupled with this project will be a very substantial reduction in the price of electric vehicles. Already one large manufacturer of passenger electrics in Chicago is selling a vehicle minus batteries for nearly $1,000 less than last year, the purchaser renting the batteries from the various service stations throughout the city. In this way the user can estimate his maintenance costs without difficulty and he will know beforehand exactly what his operating expenses will be. In some figures recently compiled by this company it is shown that in the comparative costs of operating an electric and a gasoline car of the same valuation, the difference in upkeep expenses mounts as high as 185 per cent in favor of the electric in cases where the owner employs a chauffeur to run his gas car. In instances where no chauffeur is employed the electric shows a saving of from 26 to 55 per per cent in operating costs over the gasoline type.

Other phenomenal price reductions in electric passenger vehicles have been due to quantity production and an unprecedented increase in sales. A decrease of $875 was announced by one company which has been carrying on an extensive sales campaign, and other manufacturers have offered reductions of from $300 to $800. All of this augurs well for future popularity of the electric and already its recognition as the most satisfactory car for city and suburban use is evidenced in the greatly increased numbers which we see daily in the streets. The past year has been marked by a number of successful long runs organized by several of the leading manufacturers.

Manufacturers of electrics have begun to realize during the past year that there is a growing demand for electrics built along more masculine lines. This type of automobile has so long been recognized as the ideal car for a woman that they have lost sight of the fact that certain features of the electric have an especial appeal to business and professional men with whom destination on time is of vital importance. An electric is absolutely dependable, and in traffic congested streets it winds its way in and out more easily than any other type of car, saving time by stopping and starting in immediate response to the driver's touch. There are no blow-outs, no stalling of the engine, and no changing of gears to be reckoned with when every minute counts. Sturdy appearing roadsters, built on more masculine lines, have therefore been developed to meet popular demand and the electric is fast establishing itself as a favorite with men for city and suburban use.

During the summer the new co-operative electric garage of the New York Electric Vehicle Association, located at Central Park West and 62nd street, was thrown open to the public, and is housing its full quota of 100 electric passenger cars. The charging equipment of this electric garage, which is the largest in New York, is unusually complete, having facilities to charge from 100 to 200 cars per day and to care for the various sizes of batteries. Finely equipped electric garages are springing up in greater numbers all over the country, offering excellent facilities, and in some instances, giving a unique parking service free of charge. The electric garages of Chicago offer a parking service in the loop district which has proven a boon to shoppers and theater patrons. Owing to the strict enforcement of the "half-hour law" for motor vehicles, which prohibits a car from standing in any one place for more than a half hour, the owners of electrics, who rarely employ a chauffer, were especially inconvenienced. Recognizing this, the electric garages organized the free parking service and the cars are brought to a centrally located garage by the owner and parked by a reliable and competent chauffeur, who returns the car when needed again.

This is but one instance of the excellent service offered to users of electric vehicles, both commercial and passenger. Manufacturers, electricity supply companies, and electric garages are all co-operating to further electric vehicle development.

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Estimated Value of Materials Used in Electrical Industry.

ARTICLES.	FOR THE YEAR 1912.	1913.	1914.	1915.
Arc lamps and appurtenances	$ 3,000,000	$ 2,000,000	$ 1,500,000	$ 1,250,000
Auxiliaries, steam, for electrical installations, such as pumps, condensers, separators, feed-water heaters, injectors, piping, etc.	3,500,000	3,250,000	2,500,000	2,500,000
Bells, buzzers, push-buttons, call-boxes, annunciators	2,000,000	2,500,000	2,500,000	2,000,000
Boilers for electrical plants (water-tube)	5,000,000	4,500,000	3,600,000	3,000,000
Boilers for electrical plants (other than water-tube)	3,500,000	3,000,000	3,000,000	2,500,000
Cables, underground, aerial and submarine	16,000,000	15,000,000	12,000,000	10,000,000
Carbons for lamps, batteries, brushes or other electrical purposes	5,500,000	8,000,000	8,000,000	7,500,000
Circuit-breakers	2,500,000	3,000,000	2,100,000	2,000,000
Conduits (underground) and similar material	1,500,000	1,000,000	750,000	500,000
Dynamos and motors, including parts of machines, boosters, balancers, rotary converters, motor-generators, etc., and all motor applications, such as in automobiles	100,000,000	110,000,000	80,000,000	90,000,000
Electroplating and other electrolytic apparatus not elsewhere specified	1,200,000	1,400,000	1,400,000	1,500,000
Electrostatic machines, induction coils, medical sets	800,000	500,000	500,000	600,000
Elevators, electric (mechanism only)	3,500,000	4,000,000	3,500,000	3,000,000
Engines, gas or gasoline or oil, used to drive electrical machinery	14,000,000	8,000,000	8,000,000	8,000,000
Engines, steam (reciprocating), used to drive electrical machinery	11,000,000	6,000,000	6,000,000	6,000,000
Fans, electrically operated and direct-connected	2,000,000	1,700,000	2,000,000	2,000,000
Fire-alarm apparatus, also burglar alarms, crossing indicators, etc.	1,000,000	1,250,000	900,000	1,000,000
Fixtures for electric lighting	20,000,000	15,000,000	15,000,000	15,000,000
Fuses	1,000,000	1,500,000	1,100,000	1,250,000
Glassware, electrical	6,000,000	6,000,000	5,750,000	5,000,000
Heating and cooking apparatus, electrical	4,000,000	6,000,000	7,000,000	8,000,000
Incandescent lamps (carbon or metal filaments)	22,000,000	23,000,000	23,000,000	23,500,000
Instruments for measurement and meters, of all kinds; also ground detectors, scientific and laboratory apparatus, photometers, Leyden jars, X-ray outfits, etc.	7,000,000	6,500,000	5,000,000	7,000,000
Insulating material, fibre, tape, etc.	5,000,000	6,500,000	5,000,000	5,500,000
Insulators (glass and porcelain)	3,500,000	3,500,000	3,000,000	3,000,000
Interior wiring supplies, as tubing, interior conduit, molding, junction boxes, rosettes, outlet boxes, etc.	5,500,000	5,000,000	4,000,000	6,000,000
Lightning arresters	600,000	650,000	500,000	500,000
Mercury-vapor lamps	900,000	900,000	900,000	900,000
Poles and wire towers, cross-arms, brackets and pins	5,500,000	6,500,000	5,000,000	4,000,000
Primary batteries	3,000,000	3,250,000	3,500,000	5,000,000
Railway supplies, electric, such as trolleys and other contact devices, strain insulators, cross-overs, rail-bonds, etc.	7,200,000	7,000,000	7,000,000	6,000,000
Rheostats, car controllers, motor starters, etc.	6,500,000	6,000,000	5,500,000	5,000,000
Shafting, pulleys, clutches, etc., used in electrical generating plants	1,200,000	1,000,000	1,000,000	1,000,000
Signs, electric	4,000,000	3,200,000	3,500,000	4,000,000
Sockets, switches, cut-outs	7,500,000	7,000,000	7,000,000	7,000,000
Steam turbines, used to drive electrical machinery	14,000,000	14,000,000	10,000,000	10,000,000
Storage batteries, including used in automobiles	12,000,000	15,000,000	14,500,000	16,000,000
Telegraph instruments and apparatus	650,000	600,000	500,000	300,000
Telephones, telephone switchboards and distinctively telephonic apparatus	16,000,000	18,500,000	16,000,000	20,000,000
Transformers, stationary	10,000,000	10,000,000	9,000,000	9,000,000
Water-wheels, used to drive electrical machinery	5,000,000	4,000,000	3,000,000	2,000,000
Welding apparatus, electric	400,000	500,000	600,000	500,000
Wire, bare	33,000,000	30,000,000	25,000,000	25,000,000
Wire, rubber-covered	18,000,000	21,000,000	18,000,000	17,000,000
Wire, weather-proof	15,000,000	15,000,000	10,000,000	9,000,000
Wire, all other electrical	7,000,000	10,750,000	10,000,000	11,000,000
Wireless apparatus	500,000	500,000	500,000	800,000

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General Survey

As a general proposition there have been few startling developments in electrical apparatus, the improvement consisting in a normal growth of betterments in construction and refinements in design. The continued use of electrical equipment of every description has greatly increased efficiency of construction, and it is along these lines where it appears possible to make the greatest conquests for electrical service in the immediate future.

One of the notable things of the year is the extensive electrification of the Chicago, Milwaukee & Puget Sound Railroad. Hydroelectric power is supplied over a long distance at high voltage and distributed and collected by the locomotives at 3,000 volts direct current. Due to extensive and successful research into the effects of transient voltages on dielectrics many lightning phenomena have been explained. This has resulted in protective apparatus to better take care of actual conditions, improvement in transformers to better withstand impulses, surges, etc., a design of bushing with high lightning and voltage flashover characteristics.

Improvements have been made in single-phase rotary converters allowing the converter to be started from the alternating-current side with a large torque per ampere, the machine commutating perfectly in normal operation and having a good efficiency and high power factor. This main distinctive feature is the arrangement of the damping winding. In one connection this can be used for starting the machine from the alternating-current side; in another for improving the commutation and efficiency and high power-factor. This main distinctive feature signed mainly for the purpose of converting single phase into unidirectional current, it can be used for the converse process, and is sometimes used as a synchronous single-phase motor.

In generating apparatus there has been a surprising demand for large units. Turbo-generator equipment of 20,000 kilowatts have been installed and the tendency is to increase the volume of energy available from a single machine. Thirty thousand to thirty-five thousand kilovolt-ampere machines are under construction, and it would appear that the demand for 50,000 kilovolt-amperes in one machine will be realized in the construction of a machine of this rating.

The beginning of the year witnessed the introduction of a single-phase motor requiring less starting current than the split-phase motor, making it possible to maintain good voltage regulation on secondary circuits without the installation of an abnormal amount of copper.

The Panama-Pacific Exposition, referred to elsewhere, brought out, of course, some remarkable features in illumination, and gave to the world on this side of the water an opportunity to become familiar with many phases of electrical development.

Developments in electric lighting and illuminating engineering are reviewed so comprehensively in the article by Mr. Clewell on other pages of this issue that it will suffice to point out only a few additional features. Among new types of lamps is the unique gas-filled tungsten arc lamp just introduced in England; it is especially suited for projection and searchlight work; it was described in our last issue. A new form of Moore color-matching tube has also been brought out. The number of sizes and types of gas-filled and of vacuum coiled-filament tungsten lamps has been increased, especially in the smaller sizes. An important development in lighting standardization is the movement for reducing lighting voltages to between 110 to 120 volts, formally inaugurated by a committee of the Ohio Electric Light Association. In the more technical work of illuminating engineering it is to be noted that a great deal more stress is being placed on brightness than on light flux.

Early in the year considerable impetus was given to the discussion of the securing of a cheaper method of wiring, and the concentric system in vogue for some time abroad was much discussed. The revision of the National Electrical Code in March failed to recognize this system of wiring and out of the study of the subject there was formed the Associated Manufacturers of Electrical Supplies, various committees of which having studied systems of cheaper wiring and wiring devices of other descriptions.

Export statistics indicate a considerable increase in shipment abroad of electrical material, and a very great decrease in imports. The early months of 1916 will undoubtedly show a continuation of this condition.

Electrical Prosperity Week was celebrated from November 29 to December 4. The columns of this publication have contained many references to the great success achieved by the Society for Electrical Development in its handling of this propaganda.

Electrical Affairs in Great Britain in 1915

By Albert H. Bridge

With bloodshed and carnage proceeding on a colossal scale, with plans developing for matters to become far worse before they become permanently better, with practically all energies turned in one direction, a review of electrical affairs upon the accustomed matter-of-fact lines is impossible for the year 1915. The leaders of the British nation have ordered that nation to divide its attentions thus: fight or prepare to fight; produce weapons of war and other munitions; maintain export trade—to assist the financial situation for both those purposes.

Electrical science and electrical industry are concerned directly with all of these three classes of activity. Scientific and efficient organization has become recognized as a main essential for them all.

In the early months of the war it was decided that electrical undertakings must not proceed with extension works involving the raising of new capital unless it was found by the government authorities that the conditions rendered such outlay necessary. A number of important undertakings for which preparations had been made, including supplementary power stations for existing light and power systems, were affected by this decision. As, however, the national organization of hundreds and thousands of industrial works was got into shape under the ministry of munitions the importance of electric power assisted rather than hindered the development of electrical undertakings in many places. When the effect of the war upon electrical industry in all European countries can be studied retrospectively, it will be seen that, as in the case of the English coal miners' strike of several years ago, electricity was afforded a most favorable opportunity for demonstrating its value in time of national emergency and was thereby enabled to make rapid permanent advance such as could only have been secured in normal times either by a period of unprecedented industrial prosperity or by a highly organized educative publicity effort. One noteworthy factor has been the growth of the co-operative spirit between electricity supply authorities who after-talking for years about schemes for mutual assistance have derived technical and commercial benefit from the carry-

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ing of those ideas into effect. The higher cost of fuel and practically all materials and labor have affected the finances of all systems, and to counteract such effect charges for energy for all purposes have been fairly generally advanced by 10 or 12.5 per cent. In some cases the output for power has leaped up, while restricted public lighting and consumers' economical habits have had an adverse effect. The Government in its war taxation schemes has imposed an "excess profit" tax which will be felt by a few electric supply undertakings which have made profits in war time in excess of those of certain other years. In the case of municipally owned undertakings, if the authority owns the tramways, electric supply, gas and any other profit-earning works, the profits and losses on these will be calculated as though the whole of the systems were one undertaking, a tramway loss, for example, and an electricity profit may in conceivable circumstances leave the authority without any "excess profits" tax burden. As a general rule companies which own electricity undertakings own nothing else, so they will not have this relief.

The controversy respecting municipal competition with private contracting firms for installation work, and the other matters involved in connection with this discussion which has extended over so many years, have received less attention of late. Perhaps the most hopeful feature of the situation and one auguring for a happy issue ultimately is the opening of a co-operative showroom at Glasgow where the electricity department and the Scottish electrical contractors have made an excellent attempt to work amicably together. Elaborate conditions were drawn up governing the running of the premises which consist of a large four-flat building in one of the best shopping thoroughfares of the city. The showroom exists primarily for the exhibition of electrical appliances. Electrical contractors and their customers are afforded all possible facilities for inspecting the stock of appliances kept in the central showroom. Any electrical contractor who requests the corporation to sell from the stock in the central showroom any fittings, accessories, lamps or apparatus, is entitled to receive out of the purchase price one-half of the discount which he would have received from the makers, had the contractor sold such apparatus to his customer direct. All fittings, accessories, lamps and apparatus sold from the showroom are at the usual retail selling prices current in the trade. All wiring work resulting from inquiries at the showroom is to be done direct by a contractor, and no undue preference is to be shown to any electrical contractor. At present the hiring of apparatus is not being undertaken from the showroom, but the management is free to lend apparatus for a short period to possible customers under exceptional circumstances, and may make a charge, if it thinks fit, for the loan of such apparatus. All charges made to consumers by the showroom management are separately stated on the relative demand notes sent to consumers, and all sums paid to and obtained by the corporation as a result of business done in the showroom is to be separately set out in the annual accounts of the corporation electricity department, these accounts being audited by a separate auditor. It will be extremely interesting to hear how this arrangement works out, but I learn from Mr. Lackie, the city electrical engineer, that in less than ten days from the opening quite a number of transactions resulted from electrical contractors taking their clients to see apparatus which they themselves did not stock. Another matter of installation interest recorded during the past year has been the adoption, after two years' discussion, of the guaranteed wiring scheme of the Electrical Contractors' Association, under which the association guaranteed the wiring work of each of its members up to a certain specified amount. The scheme came into force on October 1 but the result thereof has been already recorded in the Electrical Review and Western Electrician. At the time of writing an innovation is announced from Liverpool—women workers are to be admitted to the electrical installation world and according to report their instruction in wiring work is about to begin.

The Electric Vehicle Committee has continued to show its accustomed enterprise in pushing the merits of electrics. It has been particularly active in its efforts to induce municipal authorities to make use of such vehicles for the various departments of the public services. Some headway has been made in consequence, notwithstanding the difficulty which stands in the way of all new departures involving capital outlay.

Telephone work which promised to be so extensive under the Government schemes before the war has had to be to a very large extent suspended—indeed it may be said that in practically every department of electrical activity which we have come to regard as a normal part of the electrical industry there will be big arrears of work to be taken in hand when pre-possession with military and naval operation is less of a necessity. All sorts of schemes are being prepared and discussed for cultivating more intimate trading relations between those who are now allies in war. This is so in England, France, Russia, Italy and Belgium, as it is also the case between the Central and Balkan nations of Europe. What these efforts will lead to it were folly to attempt to predict, but apart from them one thing that appears to stand out very clearly is the improved opportunity that has been opened out for American suppliers who wish to do business in the British Empire, in Russia and in other allied markets where such a vast amount of electrical and other engineering work and trade must inevitably await those who have adequate manufacturing, financial and distributing facilities for tackling it.

It is common knowledge that British electrical and engineering firms have been and still are so actively engaged with the production of all kinds of war requirements that they are unable to avail themselves to the full of the absence of German and Austrian manufacturers from the world markets. But when the war is over, though they may have a shortage of some kinds of skilled labor, they will have larger works manufacturing capacity than before the war and unskilled labor is being trained and thousands of women workers are learning parts of the skilled trades. I give a few of the official figures to show some of the effects of the war upon British electrical import and export trade. A big increase of machinery imports will be observed, and a big decrease of machinery exports—a natural consequence of the situation if all the factors are taken into account. In regard to the import trade the value figures for the eleven months ended November, 1915, in comparison with those for the corresponding period of 1914 were as follows:

Electrical goods and apparatus, excluding machinery and uninsulated wire, $4,921,155 in 1915, and $5,760,085 in 1914, showing a decrease of $838,930.

Machinery, which includes usually a considerable quantity of electrical plant, etc., $40,735,180 in 1915, and $30,800,765 in 1914, showing an increase of $9,934,415.

The figures for exports from the United Kingdom in the same classes for the same periods, have been:

Electrical goods, etc., as above, $14,610,085 in 1915, and $14,166,650 in 1914, showing an increase of $434,435.

Machinery exported was $88,589,485 in 1915, and $149,394,685 in 1914, a decrease of $60,805,200.

The foregoing figures are, of course, for values which at any time are naturally subject to variation, and particularly so under the conditions obtaining in war time. The 1914 figures include only four war months, whereas all the 1915 returns are for war-time trade.

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Electric-Vehicle Practice of Large Brewery

Growing Electric-Truck Fleet and Model Electric Garage of The Stroh Brewery Company, of Detroit

Instructive points of value to central-station men and others interested in the greater use and proper care of commercial electric trucks are obtainable from the past experiences and the present practice with electric vehicles of The Stroh Brewery Company. This is a progressive and enterprising Detroit firm which, through the excellence of its beers and its approved business methods, has built up a splendid reputation. The general policy of the company has steadily been, first, to produce the highest possible quality of product and, second, to secure maximum efficiency of production through the use of the most scientific processes and the most modern labor-saving machinery consistent with maintained quality.

As examples of how this policy has been carried out may be cited the company's new brew house and its electric-truck fleet and garage. The brew house is a massive and highly finished eight-story reinforced-concrete structure, completely equipped with electrically-driven machinery the whole arranged so that every step of the brewing process is conducted with scientific accuracy and scrupulous cleanliness. Likewise the new electric garage, which is described more at length in the following, is a model of perfected equipment for the care of the electric trucks.

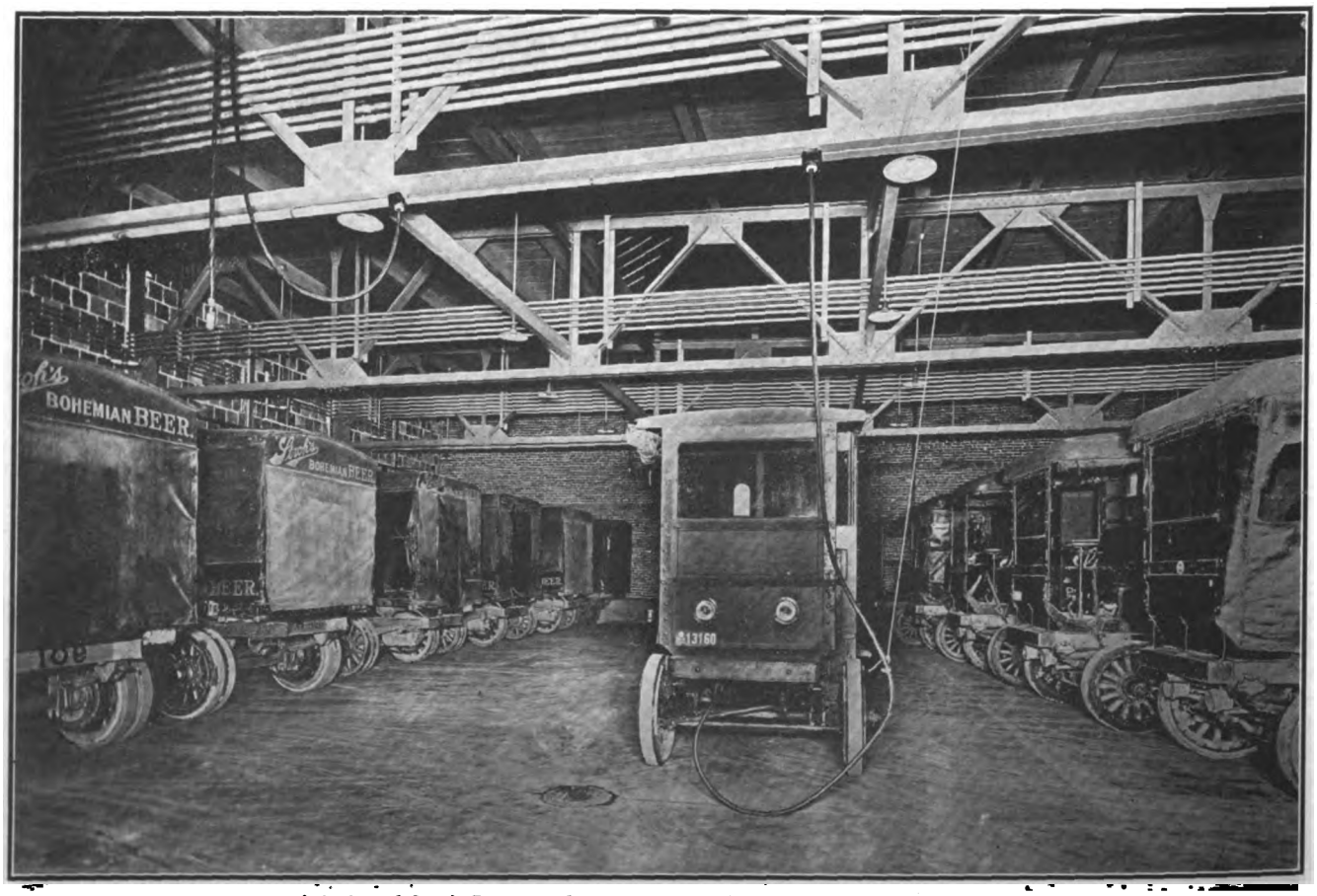
The Stroh Brewery produces both keg and bottle beer and has a capacity for brewing annually 500,000 barrels. The bottling department has been developing very rapidly for the past ten years and now constitutes a large part of the business. This has imposed new conditions on the delivery problem of the company, which consists of both keg and bottle delivery to local and suburban dealers and private consumers, and of bottle delivery to the various depots for shipment to other cities.

Experience with Horse-Drawn Wagons.

For bottle delivery it was formerly the custom to use one-horse and two-horse closed wagons, the former carrying about 50 cases, with a maximum load of nearly one ton, and the latter about 90 cases. When two trips were made in one day the teams were changed at noon; with one trip a day the teams were changed on successive days, one team resting while the other worked. This was found absolutely necessary in order to keep the horses in proper condition. With the horses the usual troubles were experienced. At all times their feed and care were costly. During the very hot summer days they required exceptional care and could make only low speed. The icy pavements in winter also retarded delivery through much slipping and many falls, these resulting occasionally in serious or fatal injury to the animals.

The First Electric Truck.

As a result of a study of these conditions it was decided to do some experimenting with automobile trucking. In 1903 the company bought a five-ton electric truck for keg delivery. In the light of present practice in truck design and construction the old truck was crude and comparatively inefficient, taking considerably more current for its operation than modern trucks do. It was built by the old Vehicle Equipment Company (to which the present General Vehicle Company is the successor) and it was so ruggedly



Interior of Stroh Brewery Company's New Electric Garage, at Detroit.

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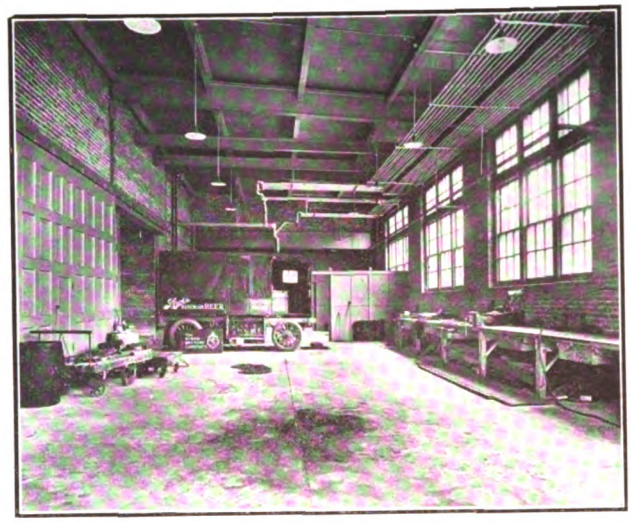
Front of Stroh Garage Showing Architectural Features.



Corner of the Repair Shop Which Is Part of Garage.

built that it is still in use, after nearly 13 years of continuous service, showing that it is almost impossible to predict the life of an electric truck. The batteries for this truck have been overhauled or renewed about every two years and the truck maintained in good condition, the upkeep necessarily being higher than with present trucks. This truck was charged at the brewery from a 110-volt direct-current circuit and the batteries taken care of by the brewery's electrician. Although slower than the modern trucks and incapable of equaling their mileage, it still gives satisfactory service and is used for keg deliveries near the brewery.

Experience with Gasoline Trucks.

About the year 1908 it was decided to try out some gasoline trucks, and several of these of different makes were purchased. Nearly half of them were out of commission for repairs at all times. Nine gas trucks were tried out in all at about this time. Most of them fell apart and were beyond hope of repair after two years of service. The rest were gradually disposed of after their unhappy experience.

More Electrics.

In 1911 the company purchased three General Vehicle electric trucks; two were two-ton trucks and the third a five-ton truck. They all have closed bodies and are used for bottle delivery, giving regular and satisfactory service. From time to time since then other electric trucks have been added to the fleet.

It has been the policy of the company to use its former horse-wagon drivers, all of whom have been in the employ of the company for many years, to operate its trucks; although these men are neither mechanics nor electricians, the scheme has worked very well with the electric trucks, although it was found entirely unsatisfactory with the gasoline trucks.

The Present Fleet.

With the additions that have been made in recent years, the company's electric fleet at present numbers 20 vehicles of several makes. Two of these are five-ton trucks; sixteen are two-ton, three-ton and three and one-half-ton trucks; two are 750-pound open wagons used for pick-up and miscellaneous light service. All the 20 electrics are used for service in the city involving a great many stops with comparatively short runs between successive stops. Two of these trucks have Edison alkaline batteries the others have lead batteries of various makes, chiefly Ironclad-Exide, which type is being made the standard battery equipment.

The company also has two gasoline trucks of three-ton capacity and modern design that are used in the outskirts and suburbs of Detroit where pavements are poor and the hauls between stops relatively long. These two trucks are operated by experienced chauffeurs.

Of the original horse and wagon equipment there are still in service about 25 wagons of various types, mostly for keg delivery, shipping and depot work. For hauling these wagons there are now kept 88 horses.

From the fact that it has built its new garage to accom-

General Interior View Indicating Size of New Garage.

Charging Outlets Along the Wall, Stroh Garage.

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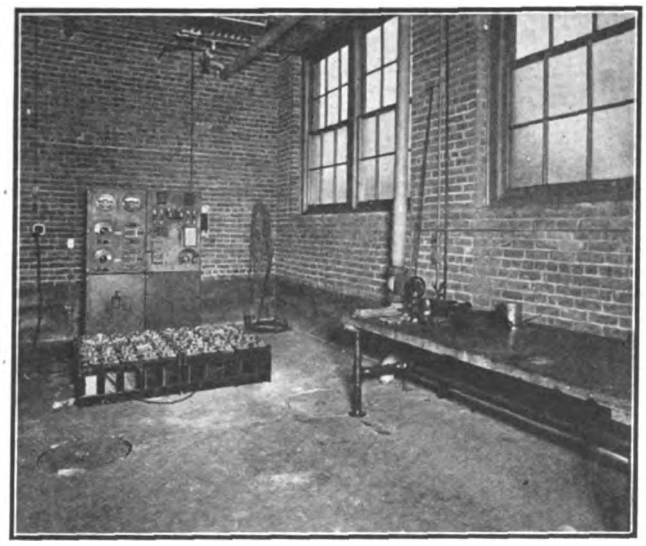
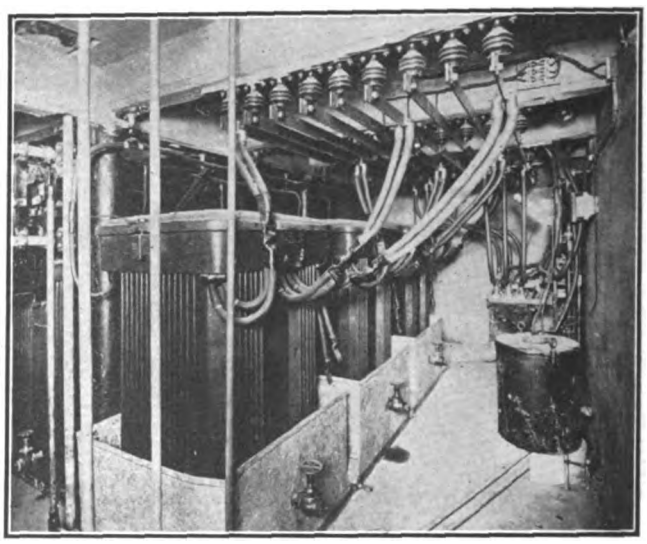


Battery Test and Repair Room.



Transformer Installation at Garage Substation.

modate 50 electric trucks, or two and one-half times the number now in use, it may be taken for granted that the company plans to continue, from time to time when it can be done to advantage, to retire its horse-drawn equipent and replace it with additional electric trucks, thus making this one of the larger electric fleets in Detroit.

General Features of Electric Garage.

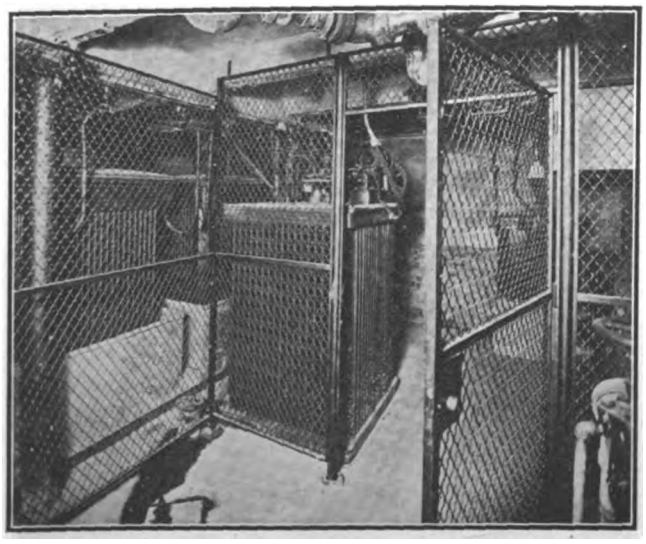
After it was determined that electric trucks were well adapted to take care of the bulk of the company's delivery problem, and as soon as the number of these trucks began to increase, it was realized that the proper care of these vehicles could be best assured in a private garage in charge of competent employees of the firm. In order to keep the maintenance at a minimum, it was decided to equip the garage with the most efficient and complete facilities for charging, inspecting and overhauling the truck batteries and for cleaning, oiling and repairing the trucks. Consequently, in building the garage, no expense was spared to provide these facilities on a liberal scale, since reasonable expenditures of this kind insure the best operating conditions and performance of the trucks on the lowest upkeep costs.

The garage is a brick structure about 167 by 95 feet, located on the corner of Hastings and Elizabeth Streets about one-half block west of the main brewery buildings. The main part of the garage is divided by a fireproof wall into two separate truck sections, each of which has a large independent doorway leading in from the street and a similar door directly opposite leading to the alley in the rear. The eastern section, which is now actively in use, accommodates 20 trucks; the western section accommodates 24 trucks. The substation and charging apparatus is in one corner of this section. The building is well ventilated and exceptionally well lighted, both by day and night.

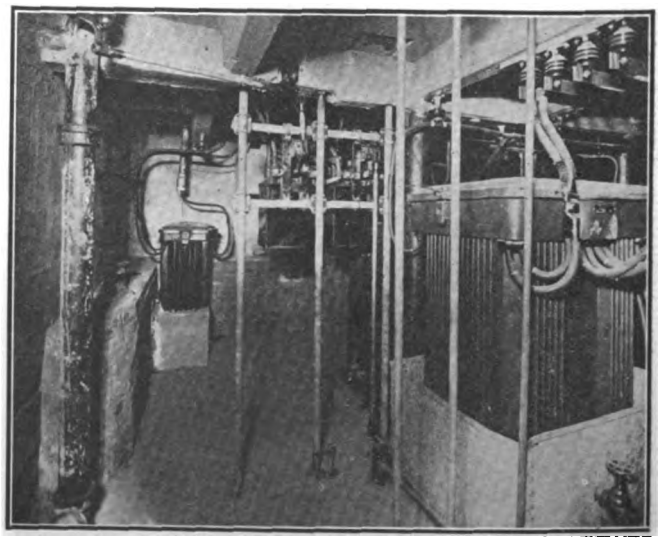
At the east end of the building is a large repair shop that can easily accommodate four trucks; it is separated from the adjoining truck section by means of large sliding doors giving access to any part of this shop. In the northeast corner of the building is a room especially equipped for the care of storage batteries. Along the Elizabeth Street front are two rooms entirely separated from the truck sections of the garage; these constitute private garages for the pleasure cars of officers of the company. Seven cars can be accommodated here, and for each of them there is a separate roller curtain opening to the street. On the second floor along this front are well-equipped locker, wash and rest rooms for the truck drivers and garage attendants.

Truck Facilities.

The accompanying illustrations give a good general idea of the arrangement and appointments of the garage. It will be noticed that the truck sections are very spacious. The stations for the individual trucks are for the most part along the walls, each station having allotted to it a space 10 feet wide. This permits abundant room not only to walk entirely around each truck, but also to pull out any battery tray for inspection, testing or filling of the cells.



Potential Regulation in Garage Substation.



Special Transformer Equipment.

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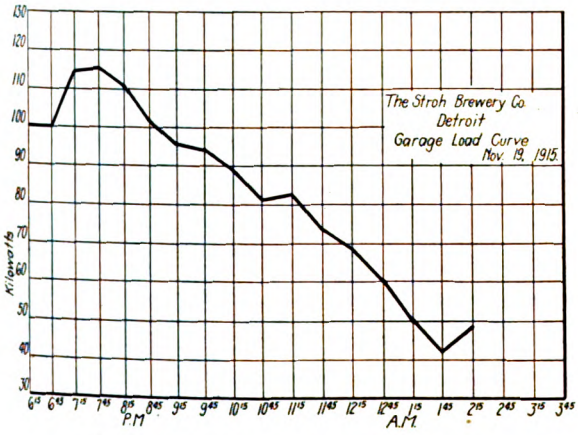
The charging outlets along the wall are ruggedly mounted between two three-inch pipes, one of which carries the charging cable from the conduit beneath the floor. In order to utilize the clear space in the middle of each truck section, a number of charging outlets are also provided at properly spaced points over this area, these outlets being secured to the roof truss with one end of the connecting cable permanently attached and the cable arranged so it may be pulled up out of the way, as shown in one of the views.

For washing the trucks there are provided a number of floor boxes (six in the east truck section) for hose connection to either cold or hot water pipes. The latter permit washing without discomfort during cold weather. The steam for heating the garage and water is piped from one of the main brewery buildings nearly a block away. These floor connections are so placed that from each one it is possible easily to reach three or four trucks without pulling a long section of hose. Numerous floor drains carry off the wash water.

General Repair and Battery Upkeep.

In the main repair shop there are work benches and tools to facilitate making repairs to any part of the truck except the battery. An inspection pit similar to the type used in street-car houses permits examining and working on the motor and running gear with comfort and dispatch. Separated from the repair shop by sheet-iron and wire-screen partitions is a storeroom for spare parts, general supplies and special tools.

The battery repair room is provided for any special treatment required by any of the batteries, such as cleaning and flushing, renewal of part of the element, special boosting and bringing-up charges, etc. A water still heated by means of gas supplies distilled water for replacing water evaporated from the electrolyte. A special charging panel with a 7.5-kilowatt single-phase Wagner rotary converter is provided in this room. This panel can be fed from two sources, the small rotary just mentioned or the large one in the converter room. This small rotary is supplied directly from the lighting transformer in the garage substation,



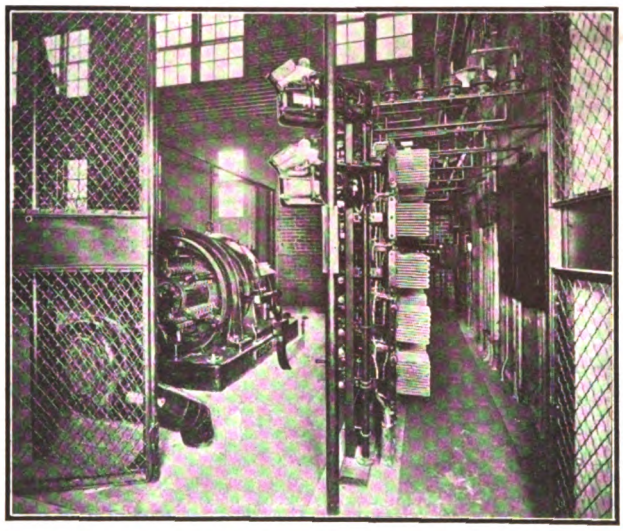
Garage Load Curve of Stroh Brewery.

which transformer is energized at all times. This rotary can supply direct current to two places, either to the battery repair room where it is located, or, in the day only, to the main charging panels in the garage, so as to supply a boosting charge to any truck located at any of the 48 truck stations. This varied operation of the rotary is obtained by a properly interlocked arrangement of throw-over switches.

Garage Substation.

The garage, like the entire Stroh Brewery, receives its electrical supply from the Edison Illuminating Company of Detroit as three-phase, 60-cycle current at 4,600 volts. In the brewery there are two substations, one for the new brew house and the other for the bottling, refrigerating and miscellaneous motors. A third and entirely separate substation is located in the garage; this is not operated until the bulk of the brewery motor load is thrown off and the trucks have come back after their day's run.

High-tension energy for the garage substation is supplied



Rotary Converters and Side View of Switchboard.

through underground cables to the switching, regulating and transformer equipment located in the basement directly below the converter room. No circuits carrying over 220 volts are brought above the floor of the garage. The Edison service cables run first into disconnecting switches, then pass through current transformers for the polyphase supply meter and load into two oil switches, which are operated from the control panel directly above by means of bell cranks and rods. One of these oil switches is a double-pole switch connecting to a 20-kilowatt single-phase Westinghouse transformer that steps down the voltage for the three-wire lighting circuit to 220 volts between outers. The other oil switch is triple-pole and connects the three-phase supply to a motor-operated Westinghouse potential regulator. This is in series with the primary side of the main transformers and serves to adjust the alternating-current voltage supplied to the main rotary converter so that the direct-current voltage may be regulated between 175 and 230 volts between outers. From this regulator the cables lead to the three main step-down transformers for the charging converters.

These transformers are energized only during the charging period. They are single-phase, 110-kilowatt Westinghouse transformers connected in delta on the primary side. Their secondaries connect with six busbars so as to supply six-phase current to the converters. From the middle point of each transformer a tap connects with a corresponding auxiliary starting bus adjoining the main secondary buses. Each of these nine buses is 2 inch by one-fourth inch and all of them are mounted on the ceiling above the main transformers, as shown in one of the views.

Since the large transformers are of standard oil-insulated pole type and they are installed in a confined space, special means are provided for cooling them, if necessary, while heavily loaded. Each transformer is mounted on four concrete pedestals and is surrounded by a low galvanized-iron sleeve; into this leads from below a blast pipe from the motor-driven blower seen at the right of the large converter. The sleeve turns the air blast against the outside of the transformer case, reproducing the action of the wind on regular pole-type transformers.

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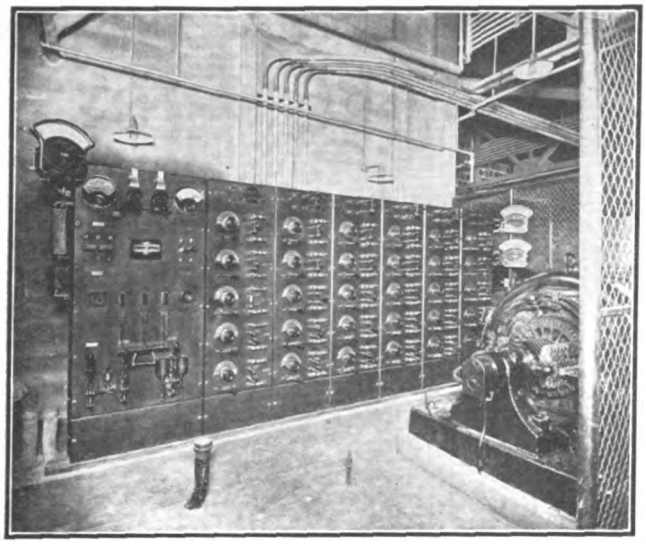
Main Charging Equipment.

The charging current is rectified by means of a 200-kilowatt, six-phase Allis-Chalmers rotary converter arranged for 230 volts, three wire, on the direct-current side; it is installed directly in front of the control panels for the charging circuits. Within a month a second converter, a duplicate of the one now in service, will be installed next to it. The conduit is already in place, as shown in the illustration. The alternating-current switches for the second rotary will be connected to the other end of the nine buses referred to above.



Main Charging Board With Unit Control Panels.

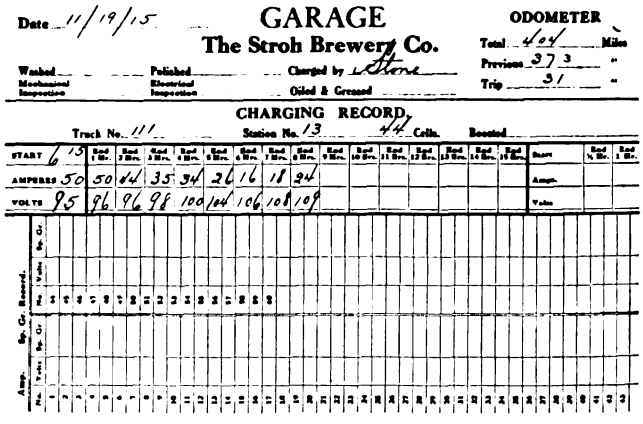
Starting of the converter is from the alternating-current side, and for this purpose a three-pole double-throw oil switch is provided at the lower left corner of the converter panel, which is the left-end panel on the switchboard. This switch is so interlocked with the six-hole running switch as to connect the rotary first at reduced voltage and when up to speed it is thrown over to full voltage. A special star-connected balancer coil is tapped in on the large transformers and from its neutral point is derived the neutral for the direct-current charging buses. The voltage of these buses is raised or lowered through the primary potential regulator already alluded to; a double-throw three-pole switch near the upper left corner of the converter panel controls the motor of this regulator so that it boosts or depresses the alternating-current voltage supply to the converter. The main direct-current switch is the three-pole switch in the middle of the panel; it is rated at 1,000 amperes and connects with the two-pole circuit-breaker at the top, the middle pole of the switch connecting solidly with the neutral bus.

In the view showing the back of the switchboard as seen from the right end it will be observed that there are mounted on top five busbars. Two of these are for the converter now in service, two are for the converter to be installed, and the fifth is the neutral bus to be used in common by both converters. At the present time there are in place six panels, each containing five superposed charging sections. When the second rotary is put in, another tier of five charging panels each with four units may be mounted on a balcony to be built directly over the present panels, thus providing a total of 50 charging units and circuits. Each of the six charging panels now in has a horizontal double-throw, two-pole switch at the top to permit connecting its group of units to the buses of either rotary. On the panels to be placed on the proposed balcony these double-throw switches will be at the bottom of the panels. From this it is evident that the design was carefully laid out to minimize the amount of heavy copper buses and cables needed; this was also achieved by the mounting of the converter directly over the step-down transformers in the basement.

The charging panels, as well as the entire switchboard, were supplied by the Fort Wayne Works of General Electric Company. The unit charging control sections are of very simple design. Each of them includes double-pole 100-ampere, knife-blade cartridge fuses and a double-pole, 100-ampere switch for opening and closing the charging circuit. An eight-point grid rheostat is provided for regulating the charging current, if necessary. Directly below the rheostat handle is an ammeter and voltmeter switch. This connects in the ammeter at the right end of the board, the connection being made to the instrument before the gap in the charging circuit is opened; likewise the charging circuit is again closed before the instrument is disconnected.

Charging Procedure and Records.

The charging load comes at such a time as not to overlap the power load of the brewery. Operations in the brewery are usually practically completed for the day by six o'clock in the afternoon. The trucks likewise return after their day's work between 4:00 and 5:30 p. m. At about six o'clock they are put on charge, one after another, so that practically all of them are charging before 8:00 p. m. From this it will be observed that the charging load is practically distinct from the brewery load and does not increase the maximum demand of the entire establishment; on the contrary, it increases the load-factor and thereby gives very favorable conditions as regards rates and nature of supply, both to the brewery company and to the central station.



Date 11/19/15 GARAGE The Stroh Brewery Co. ODOMETER Total 404 Miles Previous 373 " Trip 31 "

Washed — Mechanical Inspection — Polished — Electrical Inspection — Charged by Stone — Oiled & Greased —

CHARGING RECORD

Truck No. 111 Station No. 13 44 Cells. Boosted

START	6 13	End 1 Br.	End 2 Br.	End 3 Br.	End 4 Br.	End 5 Br.	End 6 Br.	End 7 Br.	End 8 Br.	End 9 Br.	End 10 Br.	End 11 Br.	End 12 Br.	End 13 Br.	End 14 Br.	End 15 Br.	Start	End 1/2 Br.	End 1 Br.
AMPERES	50	50	44	35	34	26	16	18	24								Amps.		
VOLTS	95	96	96	98	100	104	106	108	109								Volts		

Type of Charging Record Used by Stroh Company.

The charging is done by a modified constant-potential system. The provision of the potential regulator and rheostat enables the charging voltage of the entire garage to be raised by a number of steps as the charging process has advanced, or, in special cases, the charging current of each individual circuit to be regulated, according to requirements.

The performance of the electric trucks now in service, particularly since the garage was completed, has been very satisfactory to the company. It is believed that with the improved facilities afforded by the new garage the performance of the electric trucks will be on a par with the best obtainable in similar service. As an evidence of the faith the company has in electric trucking it may be cited that the cost of the garage has been considerable, but it was felt that the investment involved was well warranted by the results obtained.

The photographs and data on which this article is based were kindly provided by The Stroh Brewery Company, and by Fred. J. Postel, of Fred J. Postel & Company, of Chicago, who designed the electrical equipment of the garage. The architect of the garage was G. L. Lehle, of Chicago.

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Experiments with High-Voltage Transformer

Interesting Results Achieved by Use of Aluminum Coil, Paper-Insulated Transformer Demonstrated at Panama-Pacific International Exposition

By C. H. Thordarson

Mention has already been made of the high-potential transformer[1] which was exhibited and demonstrated at the Panama-Pacific International Exposition held last year at San Francisco, and some data given regarding the construction.

The coils are wound of aluminum ribbon with paper insulation. The primary consists of 122 coils in multiple series, taking 2,200 volts from a 60-cycle supply. The secondary winding consists of 190 coils in series, with a rated voltage of 5,000 volts each. The rated capacity of the transformer is 1,000 kilovolt-amperes.

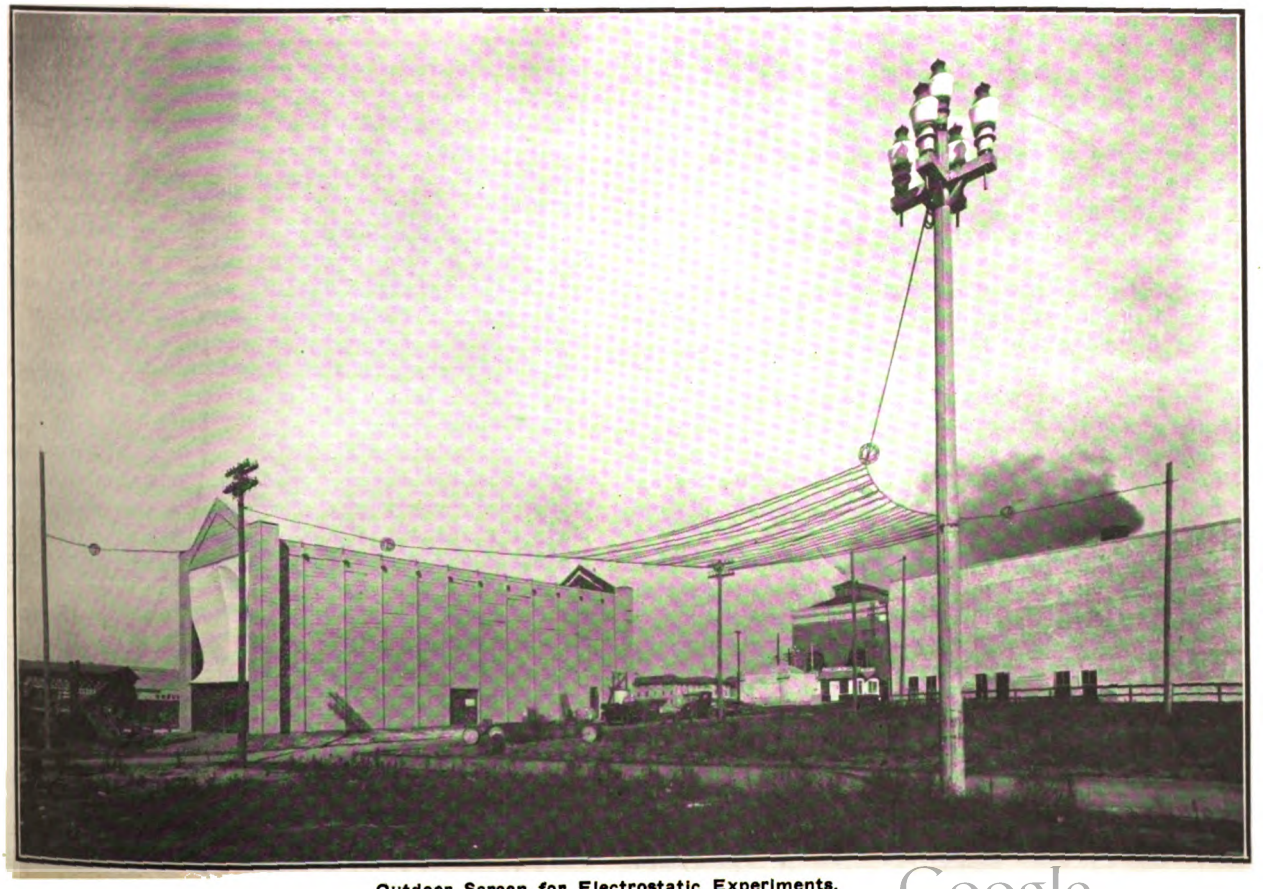
Although only 31 days were required to build this transformer, over a year and a half was spent in building the machinery necessary for its construction. Special machinery was required for making paper strips or ribbons and for winding several of them together between flat and bare conductors in such a way that they overlap 0.007 inch beyond the edges of the conductors. That required some accuracy on coils over four feet in diameter. The greatest difficulty, however, in the building of this transformer was the insulating tube between the primary and secondary windings. We found it necessary to have it 6 inches in thickness, which would bring its weight to 2,000 pounds. One of the largest electric manufacturing companies in this country positively refused to build an insulation tube of this dimension, although we promised to pay a portion of the expense of the special machinery necessary for its construction, and the largest tube it was willing to undertake to build was one-third of that size. I was, therefore, obliged to design a machine to do this work. It unwound 100-inch paper through hot liquid insulation kept at 360 degrees Fahrenheit and wound it in a form with compression rollers. The machinery was placed in a circular steel tank made of one-half-inch steel that had several heavy plate-glass windows, and the entire machine with its motor, heating apparatus and electric lights was operated in a vacuum. The vacuum pump removed all vapor as it was formed, and the action of the machine could be observed through the windows.

The object of the vacuum process is to eliminate the presence of imbedded air between the paper layers in the tube. We have found that with the same process and material, the dielectric strength is nearly twice as high, when made in vacuum, as in air; 0.045 inch of this tube invariably tested over 45,000 volts in oil between 11/16-inch spheres, one-minute test.

The tube, primary and secondary were shipped as three units and arrived in splendid shape.

Power was supplied from a substation at 2,200 volts over a line whose circuit-breaker was set at 300 amperes. For the sake of protection to the substation, this voltage was stepped down to 440 volts and then stepped up again to 2,200 volts, two 200-kilowatt transformers being used for this purpose. The available power was thus limited to an amount less than the capacity of the experimental transformer. The primary of the latter was supplied with 2,200

1 Electrical Review and Western Electrician, Vol. 67, p. 945 (November 20, 1915).



Outdoor Screen for Electrostatic Experiments.

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volts through a water rheostat which served to control and limit both voltage and power.

The high-tension building transformer pit and high-tension wiring were all built according to my sketches and specifications.

No nails were used in the high-tension building. Iron bolts were used, however, on the outside of the walls for holding the frame together. They were placed horizontally and parallel with the high-tension line suspended within the building. When the walls of the building were dry, people could receive heavy sparks from these bolts, due to electrostatic induction from the high-tension line 18 to 20 feet within. Both ends of the building were open, and covered with canvas curtains, that were rolled up during demonstrations. A railway track was laid into one end of the building for a railway crane to enter to lift the transformer out of the pit. This was found necessary on two occasions to replace leaks in the metal linings of the pit, but it never became necessary to remove the transformer, or take it apart for repairs.

I may say here that figured on a basis of 1,000 kilowatts, the core loss as measured with a wattmeter at full potential was 1.5 per cent, or 15 kilowatts; primary loss 0.3 per cent and secondary loss 0.9 per cent; total reactance, 25 per cent (in terms of voltage).

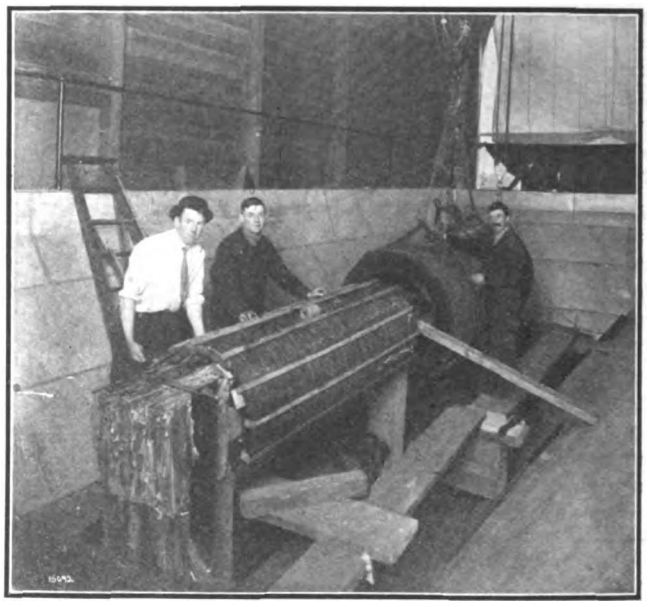
A number of engineers examined the primary and secondary windings as the transformer was being erected and they invariably admired their appearance and workmanship.

After we had installed the transformer in the pit we waited a week for oil. During this period we showed the transformer in operation to a number of electrical engineers. With one end of the secondary grounded we were able to run the transformer up to 250,000 volts without oil. Some were willing to go with me into the pit and stand close to the transformer core and observe its operation. A dense corona was produced between the secondary coils and the tube with a heavy spray that would occasionally flash over the tube a distance of 36 inches. The corona between the high-potential tube and the primary windings appeared to be more dense, the tube being separated from the primary a distance of nearly two inches. I may mention here that the limit of capacity of the transformer was not the maximum carrying capacity of its primary or secondary conductors, but the dimensions of this oil space or its capacity for conveying the heated oil from the primary windings. To increase this oil flow, the transformer was not resting horizontally, but had a dip of four inches.

Two hundred and twenty-five barrels of mineral seal oil were used to immerse the transformer. This oil was not dried or filtered before using, and tested as we received it 18,000 to 20,000 volts for a 0.2-inch gap between 11/16-inch spheres. After operating under electrostatic stress from the secondary for several hours, its dielectric strength rose to 40,000 volts and so remained to the end of the Exposition. A motor-driven rotary pump was connected and always ready for service; it could remove all oil from the pit in one hour and thirty minutes.

The surface of the oil in the pit measured 16 by 17 feet. The high-tension terminal, a three-inch metal tube, came through the center of this oil surface and was secured to the high-tension line; the other end of the high-tension winding was permanently grounded. No choke coils or resistances were used on the line from the high-tension terminal, nor were any resistances or spark gaps used on any of the high-tension coils, nor was any provision made to eliminate corona on the high-tension line. Had precautions been taken several burns and short-circuits would have been avoided, but the places and the way they appeared became in itself an interesting study. These burns were always repaired in a few hours without taking the transformer apart and for that reason the transformer came to be known as the "indestructible." Occasionally we had to cut out a coil, but as we had 190 secondary coils, a few more or less made little difference in the demonstrations.

Demonstrations were shown to the public on an open space between the Machinery Palace and the Automobile Building. These demonstrations consisted chiefly of the electrostatic display in the open air, generally at night between 8 and 10 o'clock. A wire screen 50 feet square was suspended about 35 feet above the ground by means of specially prepared insulated ropes. These ropes were prevented from burning where they were tied to the high-tension circuit by means of electrostatic baskets. This construction proved wonderfully effective under the different weather conditions found in San Francisco. This screen was connected by means of a steel wire to the



Swinging Transformer Into Position.

high-tension terminal of the transformer. The operating potentials that were used for these demonstrations varied generally from 400,000 to 500,000 volts. The primary circuit was supplied with 2,200 volts at 60 cycles and the power that we used was limited only by the capacity of the intermediate transformers.

At the beginning of the experiments we tried to establish heavy arcs to ground without resistance or reactance in the circuit. This always failed; we were never able to establish an arc but received intense discharges and terriffic surges, and dense corona along the high-tension wire that appeared from 8 to 10 inches in diameter. Judging from the destructive effect of these surges, they must have been equal to at least 2,250,000 volts.

The circuit-breaker on the primary circuit at the substation was set at 300 amperes, 2,200 volts. It repeatedly opened during these experiments. These surges were quit uncomfortable; anyone standing on the ground within forty feet from the high-tension wires would feel his knees bend with every surge. Although we had several repairs we never lost a night for demonstration, with the exception of Monday, November 29, when we were obliged to shut down after a short operation, due to a burn, from a puncture of the high-tension tube between the primary and secondary, that had been caused by a heavy surge; four hours' work the following day brought the transformer into operating condition as usual.

It is worthy of mention here that we never had the slightest trouble in the primary circuit of this transformer, nor the underground cable, nor the two General Electric transformers that supplied the power to the circuit, although they were frequently operating at 330 per cent overload, measured in volt-

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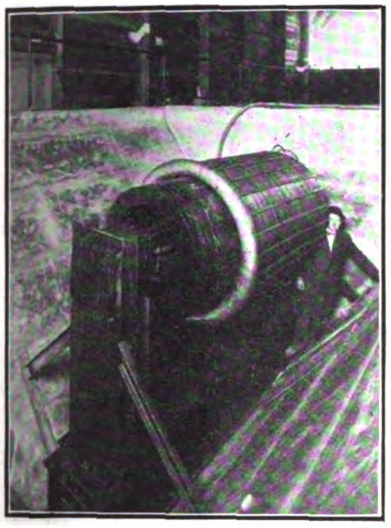
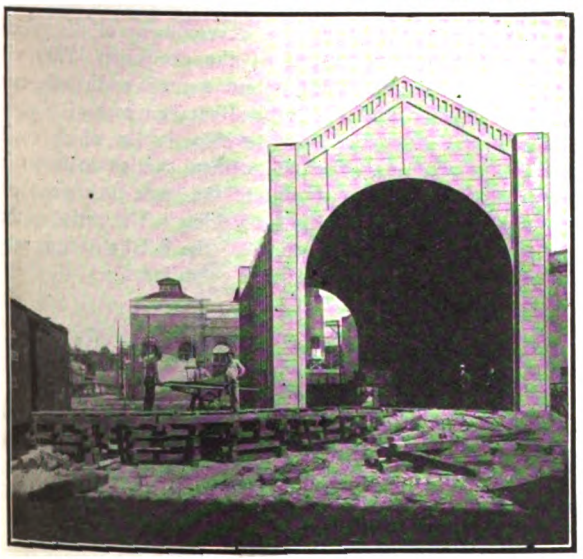
amperes. This was entirely due to the construction of the primary circuit, which was built up of 60 multiple circuits with their centers connected to a common ground and so connected that every primary turn was electrostatically shielded from any disturbance of the secondary circuit. The effective-



Transformer In Pit.

ness of this construction is proven by the fact that the heavy surge that broke through the high-tension tube and the arc that immediately followed did not cause any short-circuit on the primary winding. Before we understood the nature of this break we tried several times to operate the transformer by raising its secondary potential slowly until it flashed through the tube, producing volumes of smoke that rose through the oil from the inside and outside of the tube. These arcs did not injure the primary winding. To power-transmission men especially, these are phenomena worthy of serious consideration. Here we were dealing with several hundred kilowatts and potentials so great that the electrostatic stress becomes uncomfortable to people walking 40 feet away, and when we



Special Building for Housing Transformer.

consider this energy striking like a flash of lightning to the low-potential circuit, without damaging it or in any way injuring voltmeters, ammeters, and other transformers connected to that line, we feel that we know at least a method of safeguarding the low-potential winding of a transformer from any lightning disturbances on the high-potential side.

Every night brought new excitements, new experiences and new observations that would be too long to enumerate here, but I wish to mention that on the night of December 2 we operated for two hours during a continuous rainstorm, at potentials of 500,000 volts to ground. Our insulators showed no signs of weakening. The electrostatic stress in the air made the umbrellas tremble with the alternations 40 to 60 feet away from the high-tension wires, and the falling raindrops appeared like silver threads one inch in length in the intermittent light of 120 alternations per second.

The electrical engineer generally has a good conception of the energy that can be stored in the magnetic circuit, but the different sensations and observations during these demonstrations were revelations that gave conceptions of the amount of energy that can be dissipated in the electrostatic field. Raising the hand in air, the finger tips glowed and the air beat against the hand with each alternation and felt as if the hand were held against a loosely clamped transformer core; in operation, the electrostatic field produced a loud hum in the air—the familiar note of the 60-cycle alternator.

All this work would have been an impossibility, had it not been for the co-operation and good will of the management of the Exposition, that not only appropriated funds for the erection of the high-tension building, the transformer pit, underground cables to the power house, and high-tension demonstration structure, but also paid operating expenses.

It is expected that the transformer will be erected in Chicago and experiments continued. The author will be pleased to hear from any observer of the San Francisco experiments who noticed any unusual effects which should be verified.

Changes in the Staff of Society for Electrical Development.

A number of changes have been made in the staff of the Society for Electrical Development. George B. Muldaur, who had charge of the field co-operative work severed his connection with the Society December 15. H. W. Alexander, who is in charge of the editorial and advertising departments, will undertake part of the work formerly done by Mr. Muldaur, assisted by G. W. Hill.

The publicity work of the Society has been handled by J. T. Kelly, who will remain with the Society, and will, in addition to his former duties, undertake some of the work formerly handled by Mr. Alexander.

W. W. Ayres and J. J. Reardon, who joined the staff for the Electrical Prosperity Week campaign, have left the Society, as has also C. Ridderhof, whose work consisted of the preparation of advertising copy, booklets, etc., and whose successor is C. H. Griffith, formerly with the McJunkin Advertising Agency, in Chicago. Mr. Griffith has been preparing this company's electrical advertising matter for the past three years and is equipped, by this experience to render the service undertaken by this Society.

In this connection, the Society points out the fact that it is constantly preparing copy for use in newspaper advertising, booklets, solicitation letters, follow-up letters, mailing cards, etc., for such members as request this special service. The Society for Electrical Development is continuing its regular work and has special plans for 1916.

Northern White Cedar Association Arranges Important Program for Annual Meeting.

Publicity for Northern white cedar products, in line with similar action by allied lumber interests, will be one of the leading features for discussion at the twentieth annual meeting of the Northern White Cedar Association, which will be held at the Hotel Radisson, Minneapolis, January 13 and 14, 1916. Plans will also take form for educating the trade to advantages of dealing with its members who sell only to recognized dealers, affording the greatest possible protection on purchases, with a practical guarantee of quality. The usual order of business will include the presentation of reports from several standing committees will be included.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Christmas Candle Campaign Results in 700 Sales.

Preceding the Christmas season, the Commonwealth Edison Company, Chicago, conducted a campaign to revive the old custom of placing candles in the windows of homes on Christmas eve. Newspaper advertisements calling the attention to this custom were run in all of the local daily papers on three occasions and attention was called to the fact that after the candles had served their purpose on Christmas eve they would be suitable for use for decorative lighting in the home. The candles featured in this campaign comprise a brushed-brass base of a design similar to the antique candle stick, equipped with a 30-watt frosted, round-bulb lamp. During the campaign 700 pairs of these lamps were sold.

Vincennes Inaugurates White Way Lighting.

A new "White Way," covering the business section of Vincennes, Ind., was a conspicuous feature of the celebration of the centennial of that city as an incorporated municipality. The new lighting system covers eight city blocks, seven of them on the principal business street. It consists of 57 ornamental iron standards, each carrying one 300-watt Type C Mazda lamp inclosed in Austrian opalescent glass globes. The lights are 14.5 feet from the surface of the sidewalk. The posts are cast iron, colonial style. The system is operated from a new 150-kilowatt generator, which delivers current at 2,300 volts, three-phase. There is a new single-panel double-circuit switchboard equipped with standard oil and cut-out switches and indicating wattmeters. It was installed under the direction of Felix L. Cadou, general manager of the Barstow properties in the city.

The turning on of the new lights marked the beginning of a civic celebration commemorating the one hundredth anniversary of the city's corporate existence and the completion of 13 miles of street paving. There were three days of celebration, on the first of which Governor Ralston of Indiana delivered the principal address. Historic and industrial pageants of exceptional merit were the features of the succeeding days.

Manufacturer Aids Central Station in Selling Electric Vehicles.

One of the hardest worked, most abused, least understood words in the English language is "co-operation." Co-operation has a thousand different shades of meaning to suit the advantage of proposers. Ofttimes co-operation does not advance far beyond the conversational stage. On the other hand, co-operation is successfully practiced extensively, but does suffer greatly from the selfish or negative attitude of pseudo-practitioners.

Fortunately, in the electric-vehicle industry, and especially recently, co-operation is being practically applied, perhaps not so extensively as we all would like, but nevertheless, there are definite active co-operative movements made possible largely through the Electric Vehicle Association of America, which give promise of an irresistible, concerted movement which will establish for the electric vehicle merited supremacy.

F. S. Komp, general manager of the Lansden Company, Brooklyn, N. Y., was recently interviewed regarding the "Lansden Selling Plan." Mr. Komp's outline of the means being employed by his company to really co-operate with central stations is extremely interesting. He says, in part:

"The 'Lansden Selling Plan' consists of our placing a demonstrating car with a central station and co-operating with them, both in the demonstration and the closing of any business which they may develop, and accepting deferred payments where necessary, running over a period of one year, the notes being given by the customer, to the central station, who will turn them over to us, the central station, however, assuming the responsibility of the collection. The battery is to be handled in like manner, or on a rental basis, as agreed. If ten cars are sold during the period of the campaign the central station is made a present of the demonstrating car. In addition thereto, a cash commission of $50 is paid to the individual salesman who secures the order for the vehicle.

"The central station's part is to work up a volume of prospects preceding the demonstration; which is supplemented by advertising in the local papers, coupled with a series of letters sent out at intervals of a few days each. The cuts and the copy, also folders will be supplied by us. The central station of course would be expected to enter into this matter enthusiastically and put all of their force to work energetically in the development of the vehicle business during the period of the campaign. They will also co-operate with a competent garage, so that the cars will be properly and economically taken care of.

"We have endeavored to develop a plan which would make it unnecessary for the central station to invest in demonstrating equipment, but at the same time give them the benefits of the sale of the vehicle. The period of the campaign, together with many of the details of it, is subject to change to suit the local conditions."

Springfield Municipal Buildings to Be Flood-Lighted.

Plans for the spectacular flood-lighting of the municipal buildings at Springfield, Mass., have been formulated by J. W. Gosling, who was responsible for the flood-lighting of the Panama-Pacific Exposition buildings at San Francisco. A large painting of the Springfield group, showing how the buildings would appear under the lighting system, was exhibited at the Lynn Prosperity Week Exposition.

The project is to install projectors on nearby buildings, with colored screens, which will give an orange effect to the tower illumination, while a steam curtain issuing from the flambeaux in front of the group will be given a glowing red effect by means of incandescent lamps placed in the torches.

The new system will be employed only on occasions such as conventions, civic observances, etc. The idea originated with William E. Hodge, deputy superintendent of street lighting, and has the hearty support of Mayor Stacy.

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Human Interest in a Central-Station Window Display.

In arranging the window display shown herewith no attempt was made by the Topeka (Kan.) Edison Company to beautify or to make the beauty of this window the paramount feature, the opinion of the designer being that electricity is, to a certain degree, advertised over the heads of the multitudes. Electrical advertising should reach all, but up to date it has been so closely associated with luxury that the ordinary wage earner is still afraid to discard his obsolete form of illumination and put in electricity, for fear he will be burdened with a large electric bill.

The window was designed to demonstrate the practical application of electricity for all purposes in the home. Semi-partitions divided it into three sections, the first section representing the laundry room, in which was installed a Thor washer. At the bottom of same were the two signs, "We Wash by Electricity," and, "The Thor Washer for Sale on the Installment Plan." In this section the

Show Window of Topeka Company In Which Visitors Were Entertained.

floor was covered with oil cloth having a design which gave the appearance of a tiled floor.

On the newell post of the semi-partition was placed an electric laundry iron with a sign, "We Iron by Electricity." At the rear of this semi-partition was a vacuum cleaner. The back of the partition being higher than the front raised the cleaner high enough that it was well displayed from the front of the window.

In the center portion of the window and directly in front of the opening into same, affording easy access for people to get in and out, was a small table wired for electrical connections and on it were placed various cooking devices, such as an electric toaster, disk stove, tea kettle, egg boiler, percolator of the urn type, and various other electric cooking devices to suit the occasion, it having been arranged that cooking by electricity could be done right in the window.

At the time the accompanying view was taken, coffee was being served to Robert B. Basham, general contract agent of the Topeka Edison Company, and Mrs. Basham. This feature of the display attracted considerable attention and many visitors to the company's store were entertained in this manner. Music furnished by an electric piano player added to the enjoyment. Sewing-machine motors, portable lamps, etc., were attractively displayed in sections of the window which portrayed sewing room, parlor, etc.

From November 20 to December 19 the Topeka Edison Company made a net gain in customers of 252, the highest in the history of the company for a like period.

Some Interesting Features of Boston Edison Service.

Interesting statistics have been compiled by the Edison Electric Illuminating Company of Boston showing what disposition was made of the 200,000,000 kilowatt-hours of electricity generated last year. It is interesting to note that 27 per cent of the total output, or 54,000,000 kilowatt-hours, was used in station apparatus, feeders and mains, and in distribution. Approximately 4.5 per cent was used by the company for lighting and power service in its many buildings and stores, and for advertising purposes.

Approximately 20,000,000 units were sold for street lighting in 42 cities and towns served by the company and to several so-called municipal plants. The balance of 116,000,000 kilowatt-hours was utilized by the company's 73,000 customers.

Residence customers in the district served by the company used approximately 11,000,000 kilowatt-hours during the fiscal year covered by the statistics.

Big Increase in Power Business.

The power business of the company is increasing at an encouraging rate. The company at present has a total motor load of 100,000 horsepower.

The largest department store in New England is on Edison service, and in fact every large department store but two in the territory. The big hotels—Touraine, Young's, Parker's, Adams House, Bellevue, Vendome, Thorndike and dozens of others less prominent—utilize Edison current for almost every light and power need.

Practically every theater throughout the territory, both for drama and for moving pictures, is connected in the Edison network. Every Boston newspaper but the *Evening Record* is printed by Edison service, and that one is probably content to depend on another source of power because of a feeling of security in maintaining an auxiliary connection with the company.

It furnishes all light and power requirements for the largest furniture store in the world—the Paine Company; for the largest bakery in New England, which turns out 50,000 loaves of bread, 8,000 pies and 72,000 doughnuts daily for a hungry public—the General Baking Company; for the largest manufacturer of plumbers' supplies in New England—the Walworth Company, and the largest warehouses in New England—the Carnegie Steel Company, in Allston Approximately one-half million kilowatt-hours were used last year in the operation of shoe shops.

The largest banks are likewise customers, and in most of them electrical brains are used to add, subtract, multiply and divide, and to count and sort hundreds of thousands of coins.

That the routine of commercial life is rapidly being electrified is demonstrated in Edison Company's own offices. In the mailing division four thousand bills per hour are folded electrically, six times as fast as by hand, or twenty-five hundred per hour when two, three or four fold work is done.

How Much Dirt Does a Vacuum Cleaner Remove?

During Electrical Prosperity Week the New Bedford Gas & Edison Light Company awarded the prize of a $40 suction sweeper to the woman who most correctly estimated the amount of dirt taken from a rug during the week. The actual weight was 5 pounds, 0.75 ounce, the estimate being 5 pounds, 1 ounce.

Free house wiring was awarded as a prize to the man who guessed most accurately the number of holes in a map of the city. The total number was 1,600, and the estimated number 1,565.

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Electric Heating Equipment for Domestic Science Students at Salt Lake City.

The Board of Education of Salt Lake City, Utah, has placed an order with the Utah Power and Light Company for electrical equipment for the domestic science departments of three of the city's graded public schools. The equipment of these departments will be exclusively electrical and will consist of 24 Hughes No. 10 hot-plates provided with three-heat control and 1,100-watt units, and two No. 74 General Electric Company electric ovens for each school. The order includes a special ten-gallon soup boiler, the walls of which are insulated and which is heated by a four-and-one-half-kilowatt immersion-type heater. This kettle will be used in preparing soup for the light lunch which is served to pupils wishing it and for which a nominal charge is made. If this kettle proves to be entirely successful it is expected by the company that many more will be used in the schools for the same purpose.

A Timely Electric Sign Idea.

George Williams, new-business manager of the Henry L. Doherty Company, is responsible for a commercial idea which seems to have unlimited possibilities. Because of the prominence of "America First" and other patriotic slogans it was believed that the time was opportune for selling small electric signs picturing the American flag, the colors being brought out with red, clear and blue lamps.

The electric sign manufacturers when approached on the subject entered into the idea enthusiastically and now have available a supply of such signs in 4-foot, 6-foot, 8-foot and 10-foot sizes, equipped respectively with 94, 110, 130 and 160 lamps for a single-face sign and 170, 220, 260 and 320 lamps for a double-face sign.

In a campaign conducted in Toledo by the Toledo Railways & Light Company, 42 of these signs measuring 4 feet by 5 feet, were sold in three weeks.

Central Station Insures Employees and Adopts Extensive Welfare Policy.

A most acceptable holiday gift has been made by The Nevada-California Power Company in the form of a life insurance policy upon the life of each of its several hundred employees,—each policy being for the sum of $1,000. These policies are issued by one of the oldest and strongest of the Eastern companies, and the premium upon each policy will be paid and the policies kept in force at the sole expense of the power company and without cost to the employee.

Coincident with the announcement of this generous gift, The Nevada-California Power Company and its associate companies operating in Nevada and California, have established a plan by which the employees of these companies will, from the beginning of the new year, maintain a hospital or sick benefit fund for the care and treatment of employees who from time to time shall suffer illness or personal injury not sustained by accident arising out of and in the course of their employment. This means that the benefits to be had by employees from the use of this fund are entirely separate from the benefits conferred by the Nevada Industrial Insurance Act and by the Workman's Insurance and Safety Act of California. To maintain this fund a nominal monthly contribution is made by each employee (depending upon the amount of monthly salary and in no case exceeding one dollar), and this contribution entitles each regular employee to receive medical and surgical treatment, and hospital care if necessary, including medicines, in case of sickness or injury; the amount in each case being limited to $250. The creation of this fund is for the sole use and benefit of the company's employees.

SUCCESSFUL COMMERCIAL MANAGERS.

Douglas Burnett.

Douglas Burnett, who for many years has been a leading figure in central-station affairs, was born in Brooklyn, N. Y., April 6, 1872. He was educated at Juvenile High School and Brooklyn Collegiate and Polytechnic Institute, now the Polytechnic Institute of Brooklyn, graduating from the Chemical Course, with degree of B. S., in 1890. He took the post-graduate course in Electrical Engineering under Dr. Samuel Sheldon. After graduation he held positions as instructor in physics and instructor in chemistry in Brooklyn Polytechnic, and also for several years instructor in applied physics at Pratt Institute, Brooklyn, and instructor in natural sciences at Brooklyn Manual Training School.

Mr. Burnett was employed by the Edison Electric Illuminating Company of New York (now The New York Edison Company) in 1893 in inspection department, being later promoted to assistant general agent, wholesale, in charge of relations with new buildings and isolated plants. He was vice-president of the New York Electrical Society and member New York Academy of Sciences. In 1904 he was transferred to the United Electric Light & Power Company, Baltimore, now the Consolidated Gas Electric Light & Power Company of Baltimore, of which company he is manager of the commercial department.

Douglas Burnett,
Manager Commercial Department, Consolidated Gas, Electric Light & Power Company, Baltimore.

Mr. Burnett is No. 1637 in the Jovian Order, member of the American Institute of Electrical Engineers, charter member Illuminating Engineering Society, founder Baltimore Consolidated Section of the National Electric Light Association. He has served as chairman of the Finance and Publications Committee of the Commercial Section of the National Electric Light Association, as vice-chairman of the Commercial Section and chairman of the Section in 1915. He was also Maryland State chairman of Membership Committee of National Electric Light Association.

Boston State House Exterior Illumination to Be Made Permanent.—A bill has been introduced in the Massachusetts Legislature, on petition of the Secretary of State, which provides for permanent exterior illumination of the State House at Boston, either by the installation of a rim of incandescent lights below the cornices, or else by searchlight.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

THE ELECTRIC FURNACE AS A CENTRAL-STATION LOAD.

Desirable Class of Business Available Where Sufficiently Low Rate Can Be Offered.

By T. R. Hay.

Within recent years the practical design and application of the electric furnace has proceeded rapidly, and on account of its operating characteristics forms an admirable load for the central station. Furnaces are designed for operation at low, moderate and high temperatures and are used for a variety of purposes, the principal of which is the melting of steel, the reduction of alloys for industrial uses and also commercial annealing and heat treating.

The principal advantages the electric furnace offers over other methods of making steel are:

(1) It produces the highest temperature obtainable.

(2) It offers a ready and easy means of temperature control.

(3) Any temperature is possible without contamination of the charge.

Essentially the electric furnace is a refining medium and is not intended and probably never will compete with the blast furnace. Without exception, it is perhaps the best means of producing high quality steel, that is both fine and homogeneous. Furnaces from about 250 pounds up to 15 and 20-ton are in successful operation for refining steel and are found to be satisfactory.

Electric furnaces may be classed as resistance, induction and arc furnaces, and may be designed to use single, two or three-phase current. Direct-current furnaces may be of the resistance, arc or electrolytic type. The type of furnace and control best adapted for it depends on the class of work for which it is to be used. The arc furnace is best suited to the melting of steel, but should be replaced by the resistance furnace for melting brass or other alloys which contain as one of their constituents a volatile metal or one which has a tendency to take up carbon in objectionable quantities.

Furnace Characteristics.

Substantially all furnaces are at present operating on alternating current, the voltage of the furnace varying from 75 to 110 volts. The use of alternating current permits of the transmission of the power at a high voltage, step-down transformers taking power from this high-tension supply and furnishing the necessary voltage to the furnace. As a rule, the load-factor will be high, from 60 to 90 per cent, with a power-factor varying from 90 to 98 per cent. This combination of high power-factor and high load-factor is extremely advantageous, and when in operation on a 24-hour, or equivalent, basis presents an extremely desirable load. For resistance and arc-type furnaces, satisfactory operation is possible on 25 to 60-cycle circuits, but the induction furnace requires a frequency as low as 5 to 10 cycles. One prominent manufacturer markets a single-phase furnace which is entirely satisfactory, while others manufacture the two or three-phase type, mostly the latter. Each type has its specific advantages, which will not be discussed here, but from the central-station viewpoint it would seem that the two or three-phase type is preferable to the single phase. The latter, to prevent objectionable and excessive unbalancing, necessitates the use of special transformers to counteract this unbalancing and consequently increases the readiness to serve investment on the part of the central station, and unless the power application is properly made will detrimentally affect other equipment operating on the same circuit.

When making extensions and making connections to serve an electric furnace installation, great care should be exercised on the part of the central station to be sure that the facilities are adequate to take care of the extreme conditions sometimes occurring, so that no other consumers may be affected by outages or extreme voltage variations due to surges prevalent in the operation of the furnace when the heat is being begun. Unless a high-tension supply circuit is available, it is usually advisable to build a separate line to the power house or to the nearest high-tension circuit available, the operation of the furnace being made entirely independent of any other power or lighting load. These objectionable surges will vary from 50 to 200 per cent of the normal rating of the furnace, depending, primarily, on the care exercised in feeding the raw material to the furnace, and also, to some extent, on the charge used. Essentially these violent surges are due to the fact that, as the furnace is charged, pieces of unmelted material momentarily impinge against the electrodes, thus decreasing the resistance of the immediate path, due to the fact that this unmelted charge is colder than the surrounding material. In proportion as care is exercised in charging, these fluctuations can be reduced in quantity and kept to a minimum in value.

Details of Operation.

As the resistance furnaces depend for their heating power on the contact resistance between the carbon plates of which the resistor is composed, an increase of pressure on the plate increases the current, but decreases the voltage, and vice versa. This is due to the fact that, when a resistor is used which permits of external adjustment of its resistance, the tendency of the furnace is to act as a rheostat for its own control. With an arc furnace the voltage does not increase considerably with the current, but as in the resistance furnace, as stated above, the current often increases with decreasing voltage. The voltage of the arc is dependent not only on the current, but also upon the length of the arc and upon the kind of vapor in the furnace. As a rule, resistance furnaces require a lower voltage than arc furnaces of the same size. It is these variations of current and voltage, as previously stated, which are due to conditions peculiar to electric-furnace operations, which may be and are excessive, that recommend the use of a separate service to satisfactorily and economically supply furnace installations. Some furnaces have two movable electrodes at the top and one stationary electrode at the bottom. Others have the three electrodes at the top. In either case the spacing is such that they compose, as nearly as possible, an equilateral triangle. In the single-phase furnace there is one movable top electrode and a bottom stationary electrode inclosed in a water-cooled jacket. The roof of the furnace is of acid brick and the lining of the furnace of dolomite or

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UNIVERSITY OF CALIFORNIA

magnesite. The electrodes are of carbon and when suspended from the top are raised and lowered by means of vertical manually operated steel screws manipulated by the operator from outside the furnace. The charge may be fed in through the top or at the side. In pouring, the furnace may remain stationary or may be tilted. To start the furnace the upper electrodes are lowered to the floor and some granular graphite or plumbage is sprinkled in. When this glows the slag making material is added. This material varies with the material to be melted, but ordinary window glass or limestone may be used, in most cases, as it is neutral to the majority of the metals to be melted. Besides acting to produce slag, this material also tends to prevent oxidation of the material worked. As the slag making material melts, the electrodes are slowly raised until the proper height is reached and the alloy is then charged, by hand, through a small opening in the top or side of the furnace. Being heavier than the slag making material it sinks to the bottom and is melted from the heat of the bath and not from the direct heat. When the metal alloy has been completely reduced to a homogeneous molten state it can be poured into a ladle or the furnace can be picked up by an auxiliary hoist and poured as if it were a ladle. The slag remains in the furnace to be ready for the next heat and as it retains its molten conditon for a considerable length of time the furnace can be quickly prepared for another heat.

Good Revenue Producer.

An electric furnace is a good revenue producer and, in the case of the majority of installations, represents a proper user of central-station service, not only account of the long hours of operation but also because of the great expense that the user would be put to in installing a plant of adequate and sufficient capacity to meet all conditions. To be economically profitable to the user the cost for power should not exceed one one cent per kilowatt-hour, and in many cases, depending on the size and hours of usage of the furnace and on the geographical location, the cost may be as low as 0.25 cent to 0.5 cent per kilowatt-hour.

It is claimed for the electric furnace that it is more economical in cost of operation, as compared to the work done, than any other type of furnace; that a more uniform product results; that devolitization is decreased; that there is an actual saving in material and an improvement in the steel due to decreased segregation as a result of more thorough and uniform distribution. The deoxidation is quick and rephosphorization impossible. It is further claimed that the quality of the steel is not only improved but that the capacity of the converter plant can be increased, as the time required for the resting of the metal to permit the ferro-manganese to dissolve, is saved.

Extensive tests have been made in melting various alloys and the results indicate that the electric furnace is at least a potential success, if not an absolute one.

PERTINENT POWER-SALES PROBLEMS.

By H. J. Kunz.

In selling power there is no one mechanical problem that stands out, but one of the greatest problems and one that brings a lot of the others to an easier solution when it is once solved, is the gaining of the confidence of the man to whom you are trying to sell electric power.

The majority of power salesmen are too prone to talk kilowatts, demands, connected loads, load-factors, power-factors, etc. Terms the uninitiated are afraid of.

Another thing that most salesmen have encountered is the tendency of prospects to be sort of secretive about details, which if known, would be a great aid in working out his problems.

In this connection, when talking to the prospect it will be found that the number of cars of coal shrinks, the average gas bill is little more than nothing, the water bill is very low, the cost of handling ashes is next to nothing, and the oil, grease, waste and repairs are never heard of or that repairs are made in the shop and cost nothing. The engineer's and firemen's wages are not to be considered. The endless line shafts, belts, couplings and hangers are essential to the good looks of the plant and further than that, these belts, shafts, couplings and hangers do not require any extra power.

Now we all realize that the items mentioned are all necessary with steam and gas-operated prime movers, and that they cost money, but the question we have to answer is "will electric power cut the cost?"

To get at the heart of a power problem you must start somewhere and generally it is with the owner of a plant. You may tell him that he should use electric power and you can give him a lot of reasons why he should, and he will probably say that your statements sound good and ask you to give him proof.

If you have succeeded in gaining his confidence he may give you the amount of coal used or the gas costs; engineer's and firemen's wages, water cost, waste, oil, grease, some repairs, cost of flues, grates, reboring and a few other items, and then it is up to you to find out the time lost through shut downs; the production lost, sales lost, wages paid during shut downs and the temporary disorganization along with other local wastes. I know of one case where 21 men relayed for 7 hours endeavoring to start a 70-horsepower engine, and held up 48 other men. This engine as usual never gave any trouble when the question of purchasing central-station power was being discussed by the salesman.

Where a prospect is found who is not willing to give these figures, sometimes because he thinks they will be used to base rates on, it is a greater task and requires more time in the engine room watching the amount of coal used, and some judicious questioning to discover wages and the other items which must be known, not to base rates on, but to show to the owner his actual cost per month for power used.

In a number of cases it will be necessary to indicate his engine under friction load and then under average operating conditions. Or you may be able to get it at no load and then friction load to show him what he is paying for friction. Probably you will meet the man who can turn the pulley with one finger. Ask him to turn it 300 times per minute.

I believe that more business will be secured by the application of a rate which will carry a minimum or guaranty charge which is close to the average monthly bill estimated. In other words, balance the rate with the demand charge. This may mean a little less revenue and you may have to work to convince your prospect that he should pay a higher minimum, but if you do not do it at first, you probably will have to later and encounter considerable trouble.

Another point to be considered in converting an old plant to electric drive is the percentage saving on the investment. It is quite frequently a good paying proposition to junk a few thousand dollars worth of machinery to make the change and you can generally show enough yearly saving to warrant the new investment for a modern equipment.

The vacuum system in steam heating is rapidly doing away with the high-pressure steam idea. Put a small motor driven suction pump on the end of the steam line instead of pressure in the boiler. There is very little increased heating value in 50 pounds over 10 pounds of steam, only 18 British thermal units, but you must get it through the radiators.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

TRANSFORMER WIRING PRACTICE.

By Terrell Croft.

In locating transformers within buildings it should be remembered that a large transformer contains considerable combustible material. It is possible for an insulation breakdown, due possibly to a lightning discharge or a surge, to result in a fire within the transformer. The insulation burns

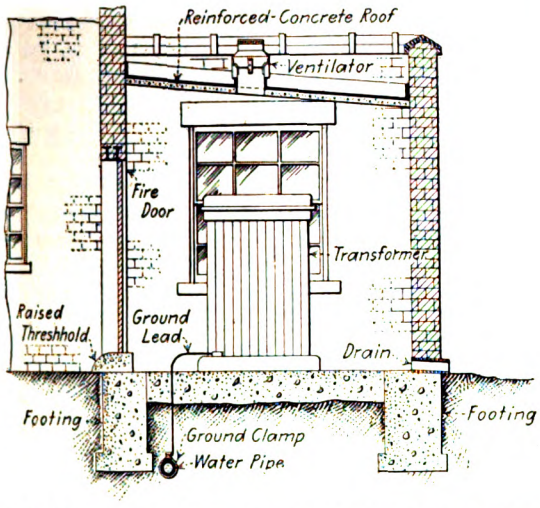

Fig. 1.—Transformer House of Non-Combustible Materials.

with a heavy, dense smoke and produces the effect of a very serious fire. The result may be that streams of water will be thrown on the apparatus in the building, incurring considerable damage thereto. Furthermore, the oil in the transformer case may become ignited and boil over. Such a fire, in addition to the damage to property, is very difficult to handle.

A safe indoor transformer installation is shown in Fig. 1. The walls of the inclosing room or addition should be of brick, hollow tile, or stone. A fire door of approved construction separates the transformer room from the building which adjoins it. The roof is a concrete slab reinforced with steel lath. A ventilator is provided to carry off fumes, should they exist, and to keep the room cool. The floor should slope toward the drain, so that if the oil leaks from the tank or boils over from it, it will flow out of the building. The drain should empty into a stream or be arranged some way so that the transformer oil, if it does flow through it, cannot accumulate. Frequently transformer houses are arranged with grating floors having a space underneath them so that if the transformer oil leaks, it will drip down through the grating and not collect on the floor near the transformer.

Where the casing of a transformer is thoroughly grounded, as shown in Fig. 1, the fire hazard is decreased. Furthermore, it will be impossible for an attendant standing on the ground and touching the transformer case to receive a shock, even if the transformer case has, because of some accident or breakdown, become charged from accidental contact with the conductors it contains. Where a transformer case of any character is grounded, all of the adjacent metal work should be grounded also to prevent accidents.

Grounding of instrument transformer cases, while not mandatory, is considered desirable because it decreases the possibility of shock to attendants as suggested above. The power associated with an instrument-transformer circuit is seldom great enough to involve any considerable fire hazard. Where the transformer casings are grounded, the metal switchboard frames, the instrument cases, conductor supports and all other adjacent conducting members that do not contitute portions of the electrical circuits should also be grounded.

Transformers carrying pressures in excess of 550 volts should not be supported on buildings for the reason that they are likely to materially interfere with the fighting of a fire in the building and that they introduce the possibility of voltages, greater than those for which interior conducting systems are ordinarily designed, being impressed upon the circuits within the building. The preferable arrangement is always to have the transformers mounted directly on poles, on platforms built between poles, or in underground transformer vaults. In all cases the transformer should be located a reasonable distance (20 to 25 feet, if possible) away from the building. This will insure that the high-tension conductors to the transformer will not be nearer the building than 20 or 25 feet. Where it is absolutely imperative that transformers operating at pressures exceeding 550 volts be attached to buildings, they should be supported thereon by a method similar to one of those suggested below.

In arranging the supports for a transformer on a building wall, it should be remembered that the transformer imposes not only a vertical stress on the wall and its sup-

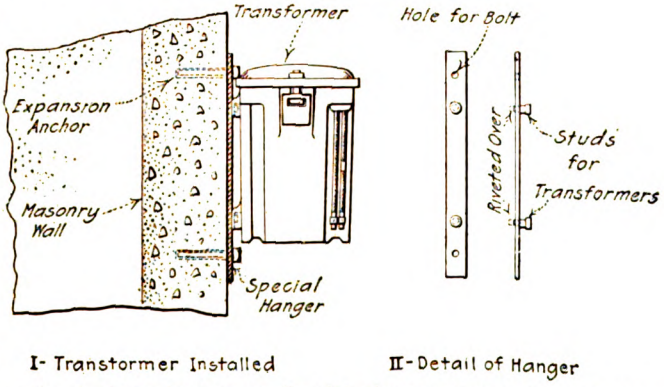

Fig. 2.—Transformer on Special Hanger Mounted on Masonry Wall.

ports, but also an outward stress tending to pull the upper supporting bolts out of the wall, or to pull the upper timbers away from it. It is this "tipping" stress that must be considered most carefully, because almost any reasonable arrangement will support the vertical stress. With an old masonry wall or a weak frame (wood) one, the only method of effectually supporting this tipping stress is to use bolts extending clear through the wall for holding the transformer or the frame that supports it.

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Methods of supporting transformers on buildings are shown in Figs. 2 and 3. Where the transformers operate at pressures not exceeding 550 volts there is no particular objection to mounting them on buildings as shown, but where the pressure on the transformer does exceed 550 volts, the practice is, as above suggested, objectionable, and special permission from the local underwriters' inspector should be secured before the transformers are thus mounted. In any case, the transformer cases should not rest directly against the building wall, but should be separated there-

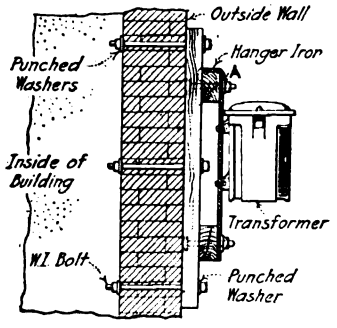

Fig. 3.—Transformer Mounted on Brick Wall on Wooden Rack.

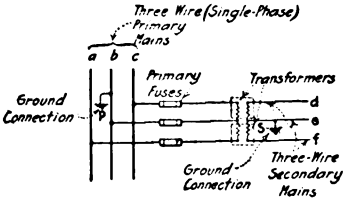

Fig. 4.—Ground Connections on Primary and Secondary Side.

from in some way so that an air space will be provided between the transformer and the wall.

The method of supporting a transformer on a special wall hanger is shown in Fig. 2. With this arrangement, a specal iron hanger, detailed in *II*, is used. If the building walls are of masonry, the hanger irons may be secured thereto with expansion bolts, or preferably with machine bolts passing entirely through the wall. If the wall is of wooden construction, the hanger may be fastened to the wall with lag screws or preferably with through bolts.

The method of supporting a transformer on a timber frame is shown in Fig. 3. The frame should be of substantial construction and thoroughly painted to prevent the absorption of moisture. The cross timber *A* may be made of the same proportions as a standard cross-arm so that it will accommodate the cross-arm hanger iron ordinarily furnished with transformers. Through bolts should be used where possible for fastening the timbers to the wall, but lag screws or expansion bolts can be utilized where the application of through bolts is not feasible and where the wall material is strong enough to sustain the lag screws or expansion bolts.

The ground connection to a transformer secondary winding may be, and usually is, in practice made to one of the secondary conductors outside of the transformer case. Fig. 5 shows the usual methods of making such connections. There does not appear to be any particular advantage in making any special provision for the grounding of a secondary circuit of a standard single-phase distributing transformer when the transformer is built, inasmuch as such a connection can always be readily made. However, when two-phase or three-phase transformers are constructed, it may be advisable to then have a special tap brought out from the neutral or some other point of the secondary windings.

The arrangement of the primary and secondary windings within a distributing transformer is indicated in *I*, Fig. 5. There ar usually two primary and two secondary coils. The transformer may be adapted for different primary and secondary voltages by connecting these coils either in series or in parallel. The series or parallel connections of the secondary coils are usually made by suitably joining the secondary conductors outside of the transformer. The primary coils may be connected in series or parallel by means of a connection block and straps provided within the transformer.

The ground connection on a transformer three-wire secondary operating at 110 and 220 volts is made as show in *II*, Fig. 5. The ground is connected to the neutral point of the secondary and to the neutral wire.

The ground connection on a transformer two-wire secondary operating at 110 volts is made as indicated at *III*, Fig. 5. Inasmuch as it would not be feasible to join to the neutral point of a secondary transformer winding connected as at *III*, the earth connection is made with one side of the circuit. To connect to the true neutral in this case it would be necessary to tap a lead to points *N* and *N* of the two secondary coils as indicated at *I* and then to carry this lead to ground. Obviously, this could not be done with transformers of ordinary construction without dismantling and rewinding the transformer.

The ground connection of a transformer two-wire secondary operating at 220 volts may be made as diagrammed at *IV*. In this case the ground wire joins the secondary winding at its neutral point. Three-phase transformer secondaries may be grounded as shown at *V* and *VI*. With the delta-connected secondary of *V*, the ground is not at the neutral point of the secondaries of the group and it is impossible to connect the ground wire to the true neutral point of a three-phase delta-connected group, unless an artificial neutral point be established through the insulation of three resistors or similar devices connected in star. The star-connected secondaries of *VI* are grounded at the true neutral point on the secondary system.

Why it is desirable to ground transformer secondaries may be explained thus. If the primary and secondary coils of a transformer become, through accident, electrically connected, the high-tension primary voltage is then impressed upon the normally low-tension secondary circuit. Any person then touching any conducting component of the secondary system would have impressed on him to ground the primary voltage. Furthermore, if the primary and secondary are in electrical contact, the fire hazard is greatly increased,because then the high-tension voltage (possibly

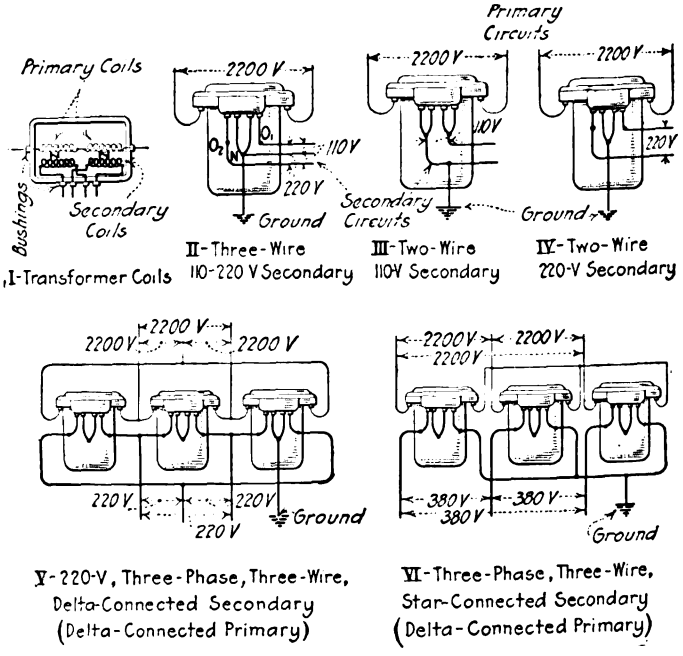

Fig. 5.—Methods of Making Ground Connections to Secondaries of Standard Distributing Transformers.

2,200 volts) is impressed between the secondary system and ground.

Now, the secondary system, its conductors, fittings and appliances are ordinarily insulated for a voltage of 110 or 220 volts. It follows that the 2,200-volt pressure is likely to break down this 110 or 220-volt insulation, impelling a current through the insulation to ground and possibly producing a fire, caused by arcs between the conductors and the interior water or gas piping or other

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grounded metal, or by arcs in the low-voltage fittings. If the secondary of the transformer is grounded, a voltage between the secondary system and ground that would be dangerous to life cannot, except under unusual conditions, exist.

Example: Consider the diagram of Fig. 6, which shows a generator feeding a secondary distribution system through a transformer. Note that there is normally no electrical

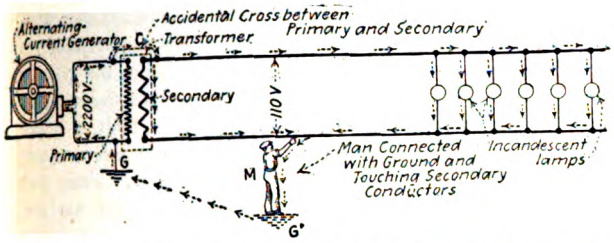

Fig. 6.—Graphic Illustration of How Person May Receive Shock by Touching Ungrounded Secondary Crossed with Primary Circuit.

connection between the primary and secondary circuits. The connection *C* shown is an accidental cross between the high and low-tension circuits which might be within the transformer case, or at some point out on the line, as shown at *C* in Fig. 7. The primary voltage is asumed t be 2,200, and the secondary voltage 110. Now assume further that there is no ground on the low-tension or secondary circuit but that there is a ground at *G* on one of the primary or high-tension conductors. This ground *G*, Figs. 6 and 7, might be an accidental ground, such as a tree ground, or it might be a permanent ground placed for some reason or other on the primary circuit.

Now, with conditions as above defined, a man, *M*, Fig. 6, standing on the earth and touching any live current-carrying part of the secondary circuit, would have impressed across him, between the part of his body that touched the circuit and ground, 2,200 volts. This pressure would, probably, force through the man's body, as shown by the full arrows, a sufficiently great current to kill the man.

But now if the secondary circuit be grounded, as shown by connecting it to the permanent ground *PG*, Figs. 8 and 9, the maximum voltage that could then exist (except under very unusual conditions) between the secondary circuit and ground is 55 volts. For example: An accidental cross occurs between the primary and secondary circuits either out on the pole line, as shown in Fig. 8, or within the transformer case (Fig. 9). A current of considerable intensity will be forced through the cross and the permanent ground, as shown in Fig. 9 by the arrows. In other words, the permanent ground provides a short-circuit path for the current, and an excessive current will flow. This will cause a fuse or a circuit-breaker, located in the high-tension or primary circuit at the station or distribution center, to open, whereby the primary circuit will be disconnected from its source of energy.

The automatic cutout just referred to may be either the primary fuses at the transformer, inserted between the primary main and the transformer, the fuses at the distribution center, or the fuses or circuit-breaker protecting the high-tension circuit at the central station.

Furthermore, the permanent ground placed on a secondary circuit tends to form a short-circuit or shunt path of very low resistance between the secondary circuit and ground. Then, in case the high-tension circuit does accidentally contact with the low-tension circuit and a person now touches the low-tension circuit, the secondary ground connection constitutes a short-circuit path around the person and thereby prevents him from being shocked.

For maximum protection the primary circuit must be provided with automatic cutouts, so that in case of a cross between the primary and secondary, like that just referred to, there will be every assurance that the excessive current flowing through the secondary circuit ground connection will cause the automatic cutout (fuses or circuit-breaker) to open and disconnect the transformer primary or the primary circuit from its source of energy.

The reason for connecting the ground wire to the middle or neutral point of a transformer secondary is that where this is done the difference of potential then possible between any part of the secondary circuit and ground is a minimum. For example, if the ground connection is made at the middle point of a transformer secondary connected for 220 volts, as shown in Fig. 5, *II*, then the maximum possible difference of potential between any part of the secondary circuit and ground is, except under very unusual conditions, 110 volts. If, instead of the ground wire having been connected at *N*, it were connected to either of the outside wires at O_1 or O_2, then the maximum possible difference of potential between parts of the circuit and ground would be 220 volts.

A cross between a high-tension primary circuit and a low-tension secondary circuit may be dangerous, even if there is no ground on the primary circuit. It is sometimes supposed that there is no danger in touching one side of a high-tension circuit if the other side of the circuit is free from grounds. This view is erroneous and it is quite possible for a person standing on or in electrical connection with ground to be killed by touching at one point a high-tension circuit upon which there are no other grounds, or by touching a low-tension circuit which is in accidental contact with such a high-tension circuit. If the high-tension circuit connects with a network of considerable extent, this network will then have considerable electrostatic capacity against ground. The impedance of the short-circuit path, comprising in series the condenser thus provided and the person, in many cases may be so low that it will permit a charging current to flow which is sufficient, if it passes through a person's body to ground, to kill the person. Grounding the low-tension circuit will eliminate the life hazard above described that may be present because of the electrostatic capacity of an ungrounded primary circuit which is in contact with a secondary circuit.

The objections to grounding a low-tension secondary system are: (1) A single accidental ground upon one of the secondary conductors, if the secondary conductor of opposite polarity is permanently grounded, may, and prob-

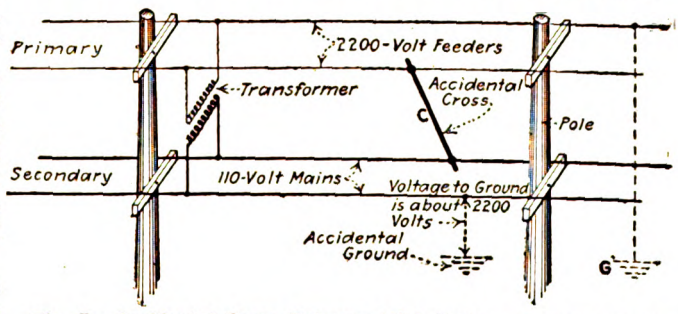

Fig. 7.—Accidental Cross Between High-Voltage Primary Feeder and Low-Voltage Secondary Mains.

ably will, interfere with the service. (2) With a permanent ground on a secondary circuit, if the ground wire connects to one of the outside wires of the secondary circuit, there then exists between the other wire of the circuit, that is, the conductor of opposite polarity, and ground the full difference of potential of the secondary circuit. (3) Permanent grounds on secondary circuits may cause difficulties when tests are being made. (4) Permanent grounds increase the expense of installation.

It is apparent then that there are certain disadvantages to secondary grounding. It is generally conceded that secondary grounding tends to increase rather than decrease

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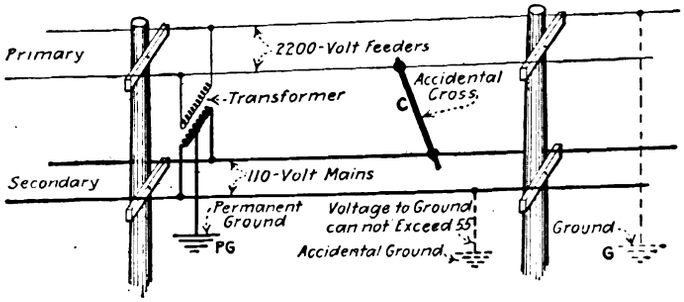

Fig. 8.—Transformer Secondary Permanently Grounded.

the fire hazard. For example: With one side of the secondary permanently grounded, one accidental ground or breakdown of insulation on the other side of the circuit will involve a short-circuit and possibly a fire, if the overload protection of the circuit does not act promptly. Obviously, when a secondary system is entirely free from grounds, two breakdowns or accidental grounds, one on each side of the system, that is, one on the positive wire and one on the negative wire, are necessary to constitute a short-circuit. Where ground detectors are installed, the first ground will ordinarily be discovered and cleared before the second one occurs.

However, in spite of the above disadvantages, which practice has shown to be relatively unimportant, it is now considered the best practice to ground all secondary circuits so that life hazard will be a minimum. This course is recommended by practically all competent authorities.

Secondary grounds should be tested periodically—about once a year—to insure that they are effective. It is especially important that the ground connection be tested where the transformer is located a considerable distance from the buildings served by its secondaries. It sometimes occurs that a secondary ground connection is effective in

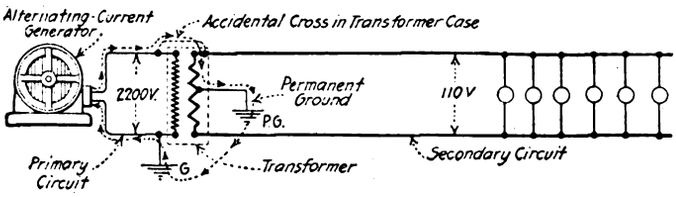

Fig. 9.—Secondary Circuit Permanently Grounded.

preventing potential rises on the secondary system only within a relatively limited area. Such conditions are attributed to the conducting properties of the earth adjacent to the ground on the secondary system.

The grounding of a neutral wire of a three-wire system not only tends to decrease life hazard, but it also tends to insure the continuity of the neutral conductor, because if the neutral is grounded at frequent intervals along its length and it breaks at some point, the neutral conducting path will be completed around the break through the two grounds on either side of it.

The general situation relative to grounding may be outlined thus: While the Code specifies no requirements one way or the other as regards the grounding of the neutral on a high-potential system (550 to 3,500 volts), it specifies that lightning arresters must be installed on circuits operating at these voltages. Grounding, it appears, is regarded as a medium of reducing the risk of shock or injury to persons, but which tends to increase fire hazard, hence in compiling the rules now in effect the Electrical Committee yielded to the life-hazard plea only for circuits operating at pressures not exceeding 150 volts. That is, grounding the transformer secondaries of circuits operating at pressures of 150 volts and below is compulsory, except where a system is supplied from private industrial power or lighting plants where the primary voltage does not exceed 550.

COST OF MOTOR REPAIRS.

By George A. Schneider.

About the first question put to the electrical man who is called upon to examine a burned-out motor or one otherwise in need of repairs, is what will be the cost of the job, and how much time will be required to complete it. This is an easy question for those who are experienced in this line of work or for the representative of a repair shop having standardized prices for the most common repairs required for the different types of motors. But the average electrical dealer or contractor, who is only occasionally called upon to handle such work, usually finds it rather difficult to give a reasonably accurate and safe estimate without communicating with a repair shop. Even then there is some likelihood of the estimate being too low, unless the motor has been carefully inspected and the repairs needed fully stated.

The number of inquiries on this subject received at the office of the company with which the writer is connected, indicates that data on the approximate cost of rewinding and repairing the most common types and sizes of motors would be useful to many of our readers. The accompanying tables contain information of this kind for certain types of alternating-current motors.

Table I is suitable for 60-cycle two or three-phase squirrel-cage motors wound for any of the standard voltages from 110 to 550, inclusive. Table II applies only to 60-cycle single-phase motors of the resistance-reactance starting type. These motors are similar in appearance to their polyphase prototypes, and are built in the same line of frames. However, a somewhat larger frame is required for a given output than for the corresponding polyphase rating. The stators have "symmetrical" three-phase windings. The rotors are of the squirrel-cage high-resistance type, but of different mechanical design than is used for polyphase machines. The design is such that the rotor, in starting, revolves freely on the shaft until a certain predetermined speed is reached. The load is then picked up by the automatic action of a centrifugal clutch, which engages an outer shell keyed directly to the motor shaft. The phase displacement required in the stator windings at starting is produced by a resistance-reactance starting box operated in much the same manner as the common direct-current starting rheostat. For certain classes of service these motors are very satisfactory and have been largely used. The standard voltages are 110 and 220.

For most of the sizes listed the costs were arrived at by taking the average cost of repairs for a given frame and then applying this cost to the various ratings built in that frame. This will be apparent by comparing the costs for the different ratings. Take, for example, frame H in Table I. The cost of rewinding the stator is $39. This figure has been applied to the following ratings, all of which are built in that frame: 1 horsepower, 600 revolutions per minute; 2 horsepower, 900 revolutions per minute; 3 horsepower, 1,200 revolutions per minute, and 5 horsepower, 1,800 revolutions per minute. Likewise in Table II this same cost is applied to 1.5 horsepower, 1,200 revolutions per minute, and 3 horsepower, 1,800, since both are built in frame H. The frame sizes specified do not apply to any particular line of motors, but were arbitrarily chosen for the purpose of this article. However, the relative output of a given frame at the different speeds will be found to agree quite closely with several lines of induction motors on the market.

These estimates may also be used equally well for motors of other frequencies by taking the figures applying to a 60-cycle rating built in the same frame. This comparison can be easily made by referring to the manufacturer's rating and dimension sheets for that particular line of motors. The tables may be further applied to slip-ring or phase-

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TABLE I.—COST OF REPAIRS FOR 60-CYCLE POLYPHASE MOTORS.

Horsepower	Synchronous Speed in Revolutions per Minute.	Frame Size	Stator Winding	Resoldering Rotor.	Bearing Linings, Two per Set	Painting	Recrating
0.5	600	G	$28.00	$4.00	$2.25	$1.50	$1.50
0.5	900	E	22.75	3.00	1.80	1.00	1.00
0.5	1200	C	21.00	2.50	1.35	1.00	1.00
0.5	1800	A	19.50	2.25	1.35	1.00	1.00
0.75	600	G	28.00	4.00	2.25	1.50	1.50
0.75	900	F	23.50	3.00	1.80	1.25	1.00
0.75	1200	E	22.75	3.00	1.80	1.00	1.00
0.75	1800	B	19.50	2.25	1.35	1.00	1.00
1	600	H	39.00	4.75	3.00	1.50	1.50
1	900	G	28.00	4.00	2.25	1.50	1.50
1	1200	F	23.50	3.00	1.80	1.25	1.00
1	1800	C	21.00	2.50	1.35	1.00	1.00
1.5	600	I	43.00	6.50	3.40	1.50	1.50
1.5	900	H	39.00	4.75	3.00	1.50	1.50
1.5	1200	G	28.00	4.00	2.25	1.50	1.50
1.5	1800	E	22.75	3.00	1.80	1.00	1.00
2	600	I	43.00	6.50	3.40	1.50	1.50
2	900	H	39.00	4.75	3.00	1.50	1.50
2	1200	G	28.00	4.00	2.25	1.50	1.50
2	1800	F	23.50	3.00	1.80	1.25	1.00
3	600	K	60.00	8.75	6.00	1.75	2.00
3	900	I	43.00	6.50	3.40	1.50	1.50
3	1200	H	39.00	4.75	3.00	1.50	1.50
3	1800	G	28.00	4.00	2.25	1.50	1.50
5	600	M	60.00	12.00	5.70	2.00	2.50
5	900	K	60.00	8.75	6.00	1.75	2.00
5	1200	I	43.00	6.50	3.40	1.50	1.50
5	1800	H	39.00	4.75	3.00	1.50	1.50
7.5	720	M	60.00	12.00	5.70	2.00	2.50
7.5	900	L	56.50	11.00	5.70	2.00	2.50
7.5	1200	J	48.00	7.00	6.00	1.75	2.00
7.5	1800	I	43.00	6.50	3.40	1.50	1.50
10	600	N	65.00	13.00	7.00	3.00	4.00
10	900	M	60.00	12.00	5.70	2.00	2.50
10	1200	L	56.50	11.00	5.70	2.00	2.50
10	1800	J	48.00	7.00	6.00	1.75	2.00
15	720	P	75.00	14.00	7.00	3.00	4.00
15	900	N	65.00	13.00	7.00	3.00	4.00
15	1200	M	60.00	12.00	5.70	2.00	2.50
15	1800	K	60.00	8.75	6.00	1.75	2.00
20	600	S	125.00	17.25	8.25	3.25	6.00
20	900	P	75.00	14.00	7.00	3.00	4.00
20	1200	N	65.00	13.00	7.00	3.00	4.00
20	1800	M	60.00	12.00	5.70	2.00	2.50
25	600	S	125.00	17.25	8.25	3.25	6.00
25	720	S	125.00	17.25	8.25	3.25	6.00
25	900	R	115.00	16.00	12.00	3.25	6.00
25	1200	P	75.00	14.00	7.00	3.00	4.00
35	600	T	150.00	18.50	15.00	3.50	6.25
35	720	S	125.00	17.25	8.25	3.25	6.00
35	900	S	125.00	17.25	8.25	3.25	6.00
35	1200	R	115.00	16.00	12.00	3.25	6.00
50	600	V	175.00	19.75	24.25	3.50	6.25
50	720	V	175.00	19.75	24.25	3.50	6.25
50	900	T	150.00	18.50	15.00	3.50	6.25
50	1200	S	125.00	17.25	8.25	3.25	6.00

wound motors, since the cost of rewinding the rotor of such a machine will not differ materially from the cost of rewinding its stator. On this basis the cost of completely rewinding a 10-horsepower, 1,200-revolutions-per-minute slipring motor built in frame L will be $113, or $56.50 for the rotor or stator separately.

The estimates for rewinding the stator or resoldering the rotor do not include any preliminary work required to put the stator structure in fit condition to receive the new winding or work required on the rotor before the actual resoldering can be started. In other words, the figures cover only the actual rewinding or resoldering, as the case may be. However, this preliminary work is frequently necessary and must always be considered in making up estimates. It is due to a number of causes.

For example, the motor bearing linings may have worn down sufficiently to allow the rotor to rub against the stator. If the motor has operated very long in this condition the laminations of either or both stator and rotor will probably be damaged, which may require considerable work to put them into their original condition. Again, a defective or broken bearing may injure the shaft. Sometimes this damage will be serious enough to require a new shaft. New bearing linings will probably be required in either case. Burned-out windings may also be accompanied by fusing of parts of the stator laminations. These fused portions must necessarily be removed before actual replacement of the coils can be commenced.

In a rotor which has been badly overheated, allowing the melted solder to be thrown out, arcing is frequently set up between the rotor bars and end rings, causing serious burning. When this occurs, new end rings are often needed, either for one or both ends of the rotor, or perhaps part of the bars will need to be replaced. With bolted end-ring construction there is also liability of trouble. The expansion of the end rings, caused by the excessive heat, tends to snap the bolts between the rotor bars and rings, producing the most favorable conditions for arcing. Burnouts of this kind, for either soldered or bolted construction, are quite common in connection with motors which have been started from time to time under loads requiring heavy starting torque with long periods of acceleration. Two or three-phase motors allowed to operate single-phase for any considerable length of time may also develop troubles of this nature. Very often the rotor will be badly damaged, while the stator has been only slightly overheated. Conversely, in some instances, the stator will be burned out, while the rotor is uninjured. Single-phase motors of the types listed in Table II may also need repairs on the rotor clutch. This work is not included in the figures for resoldering the rotor.

In connection with these points the details of two repair jobs recently handled by the writer will be helpful. In a woodworking plant a 15-horsepower three-phase motor had been mounted upon the side of the wall with the belt brought up through an opening in the floor to a machine placed almost directly over the motor. Because of the general layout, the belt was required to operate almost in a vertical position, with a rather short distance between centers of pulleys. Difficulty was experienced in keeping the belt in proper tension, so the operator devised a home-made belt tightener arranged to bring the necessary tension on the belt by means of several weights. The belt was operated under a heavy tension, and the bearings soon wore sufficiently to allow the rotor to rub against the stator. Finally, the motor would not start. Upon examination it was found that about a dozen coils on the side of the stator toward the top had been thoroughly roasted, due to the heat set up by this mechanical friction. The remaining portion of the winding had been overheated, probably due to overload, but was not badly damaged. At the point where the friction was greatest the stator slots were almost closed, requiring considerable work to fit them to receive the new coils. The rotor had also been very hot, and had to be resoldered.

The second job covered a 25-horsepower, 600-revolution motor from the same plant. This motor was of the squirrel-cage type, but was used to operate a machine demanding a large torque at starting. To make matters worse the machine was started several times each day. The continual

TABLE II.—COST OF REPAIRS FOR 60-CYCLE SINGLE-PHASE MOTORS, RESISTANCE-REACTANCE TYPE.

Horsepower	Synchronous Speed	Frame Size	Stator Winding	Resoldering Rotor.	Bearing Linings, Two per Set	Painting	Recrating
½	1200	F	$23.50	$3.00	$1.80	$1.25	$1.00
1	1200	G	28.00	4.00	2.25	1.50	1.50
1	1800	F	23.50	3.00	1.80	1.25	1.00
1½	1200	H	39.00	4.75	3.00	1.50	1.50
2	1800	G	28.00	4.00	2.25	1.50	1.50
2½	1200	I	43.00	6.50	3.40	1.50	1.50
3	1200	J	48.00	7.00	6.00	1.75	2.00
3	1800	H	39.00	4.75	3.00	1.50	1.50
5	1200	K	60.00	8.75	6.00	1.75	2.00
5	1800	I	43.00	6.50	3.40	1.50	1.50
7½	1200	Special	70.00	13.00	12.00	2.00	2.25
7½	1800	K	60.00	8.75	6.00	1.75	2.00
10	1200	Special	79.00	19.50	12.00	2.25	2.50
10	1800	Special	70.00	13.00	12.00	2.00	2.25
15	1800	Special	79.00	19.50	12.00	2.25	2.50

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overheating of the rotor, especially during the starting period, soon developed trouble. When removed the rotor gave evidence of serious arcing between the end rings and bars. It was necessary to supply new rings for both ends of the rotor. The stator winding had not been damaged.

The ordinary type of squirrel-cage motor is not well adapted for starting loads of this kind, and it would have been better to have provided a motor of the slip-ring type, giving a much higher starting torque, and at the same time taking less starting current.

It will be apparent from these cases that estimates should not be made until after the motor has been given a careful inspection, otherwise there is likely to be a large discrepancy between the estimated and actual cost of the work. If an inquiry of this kind must be handled by letter it is not possible to make an inspection, but the dealer can at least detail clearly just what his estimate covers and point out the possibility of additional work that may be needed. Our readers will appreciate that estimates of this kind can be only approximately correct at the best. However, the tables submitted have been carefully compiled from data based upon a large number of actual repair jobs handled in a city where wages are high. For this reason, it is believed these estimates will be found quite conservative for almost any locality.

Economy of a Separate Night Lighting System in a Factory.

In most cases where a manufacturer has an isolated plant, he is also equipped with central-station service, either through a special emergency switch or a double-throw main switch. This has several advantages: (1) In case of a breakdown to engine or generating equipment, the central-station service will supply light while carrying on repairs. (2) When it is necessary to run motors overtime it is not economical to run the engine for a small load. (3) At all times when the isolated plant is not operating, the service can be obtained for use in the mill for either power or lighting.

The writer has recently installed a system of separate lamps for night lighting in a textile mill with which he is connected. This has been found satisfactory and much more economical than the use of the same lamps which furnish light during working hours.

The repair men, men working overtime and others frequently turn on an unnecessary number of lamps and frequently leave them burning when they are through using them, so that power is unnecessarily consumed until the watchman comes around and turns them off. There are two disadvantages to this: (1) the extravagant use of central-station service; (2) the life of the lamps for use in production is shortened by this unnecessary use.

Some watchmen keep a light in each room so that they may see at a distance, and if the regular equipment is used an unnecessary wattage is consumed. In a recent test the writer found a total of 21 kilowatt-hours consumed in one night of 10 hours for the night lighting system alone. In addition to this, 6 kilowatt-hours was unnecessarily used in overtime work. This made a total of 27 kilowatt-hours for lighting not used for productive work.

A special night lighting system was then installed. In each room and in locations such as corners a 10-watt tungsten lamp was installed. These lamps were placed so as to illuminate alleyways and the road through the mill, so that night workers could see any obstructions in their path. This required 30 lamps. Rules were made prohibiting the use of other lamps for this purpose so that now only 3 kilowatt-hours is necessary per night.

Such lamps can be installed by using a pull socket and cut in on branch lines between cutout and switch. Special wiring is thus obviated and the cost of installation is low. These lamps can also be used as pilot lights to investigate where fuses have been blown.

The economy resulting from such an installation soon pays back the cost and it also helps to educate the employees in economy during working hours.

William T. Estlick.

Construction Costs on Substation, High-Tension Line and Street Lighting.

Interesting construction data were brought out at a hearing recently on a petition of the Edison Electric Illuminating Company of Brockton, Mass., for approval of an issue of $211,000 capital stock by the Massachusetts Electric Light Commission. One recent addition to plant was the construction of a brick transformer house. The building is of one story, 37 by 44 feet, with steel and concrete roof, concrete floor and foundation, with six transformer bays. The cost of erection was $3,846.60, and of apparatus installed, as follows:

2 12,500-volt aluminum lightning arresters	$ 524.00
6 choke coils	141.00
2 charging current indicators	12.00
Miscellaneous material	15.00
Meters, current and potential transformers	1,557.00
Switches	377.00
Cable	108.00
Copper wire	78.00
Cable taps	70.00
Pipe	67.00
Labor	501.00
Miscellaneous material	120.00
Freight, carting and incidentals	70.00

Installation of an ornamental street-lighting system in Brockton, with 75 luminous arcs on Lundin ornamental iron posts with wood shafts, involved the following costs:

19,000 feet No. 8 steel armored cable @ 20 cents	$ 3,800.00
75 posts @ $40	3,000.00
75 6.6-ampere luminous arc lamps @ $35	2,625.00
3 25-light transformers and rectifier outfits complete with switchboards @ $830	2,490.00
Labor, setting, wiring and painting poles, 75 @ $15	1,125.00
Trenching, laying cable, refilling and repairs to sidewalk, 7,500 ft. @ 25 cents	1,875.00
Contingencies	1,485.00
Total	$16,400.00

Construction of a 13,200-volt transmission line from the Brockton substation to a proposed substation in Campello, including right of way and transformer house, cost, $19,895.88, made up of the following items:

Right of way and substation lot, 65 by 125 ft	$ 4,679.84
Brick transformer house, stucco finish, concrete foundation, tile roof; space for six transformers	3,238.62
54 35-foot poles and one 40-foot pole	336.50
5,949 pounds No. 1 bare stranded copper wire @ 15 cents	893.76
Labor	727.72
Miscellaneous material	550.47
Freight	38.61
3,576 feet lead-covered underground cable @ 84.5c	3,022.43
Pipe	106.02
Miscellaneous material	79.17
Labor	192.93
Freight	36.96
Substation equipment: switchboard and control, two 550-volt feeders, switchboard, 13,200-volt feeder, two 13,500-volt lightning arresters	1,427.00
2 50-kilovolt-ampere transformers	412.29
3 300-kilovolt-ampere transformers	2,800.00
Labor, miscellaneous material and freight	1,277.46
Blue prints and supervision	76.20
Total	$19.895.88

Change to Three-Wire System to Eliminate Electrolysis.

The Springfield (Mass.) Street Railway Company has decided to change its present system to the three-wire plan, to eliminate electrolysis, following the recommendations of the Bureau of Standards, Washington, D. C. The Stone & Webster Engineering Corporation, Boston, recently made an exhaustive study of electrolysis in Springfield, reference to which was made in a previous issue.

The three-wire system, as applied to street railway installations, has been in use in Europe, particularly in Germany, for several years.

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PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

CALIFORNIA.

Pacific Gas & Electric Company. The Railroad Commission of California in the matter of the complaint of the city of San Jose to compel the Pacific Gas & Electric Company to extend its gas mains to a sparsely settled district of the city decided that though the revenue from this extension does not quite cover its pro rata of operating expense and return upon the investment, the district is rapidly growing and will soon be on a paying basis, which, taken into consideration together with the increased cost of laying this pipe after the street has been paved, as proposed by the city, warrants the company in making the extension, which is directed to do within a reasonable time.

COLORADO.

Mountain States Telephone & Telegraph Company. Two decisions, each of which is of a vital importance to public service corporations of the state, have been handed down by the Public Utilities Commission of Colorado. Both decisions effect either the rates or service of two public service companies. The first decision, made December 16, commands the Colorado Springs Light, Heat & Power Company to reduce its rates for electrical current beginning January 1. Details of this decision were given in our last issue. The second, made December 18, directs the Mountain States Telephone & Telegraph Company to increase its physical plant by extending its lines from Genoa, Colo., westward to the Kansas state line, a distance of nearly 70 miles.

In making these decisions, the Commission, for the first time since its inception, takes jurisdiction over the affairs of public service corporations. The one affecting the telephone company is one of the most important and far-reaching decisions ever made in Colorado. It is the first order ever given commanding a public service corporation to increase its physical plant and equipment.

A hearing on the telephone case was held before the Commission on December 13. The company objected to the extension of its lines on the ground that "the proposed extension would be expensive, and that the investment would not immediately earn a fair return for the company." In ruling on this, the Commission said:

"We are of the opinion that this is not the test and that the defendant corporation, having the advantages of natural monopoly within the boundaries of the state, should make every effort to serve all communities within the state, and, in this way make its service of greater value to present subscribers and the state of Colorado."

The Commission believed that the extensions can be put on a paying basis within three years. The extension will serve nine small towns, where are now located privately owned telephone systems, which, of course, leaves these towns without toll service.

Residents of all of the towns requested that the company be compelled to supply them with service, contending at the hearing that under present conditions they were cut off from the interior of the state, and thus the farming communities adjacent to all of the towns were prohibited from marketing in Denver, Pueblo and Colorado Springs. The towns are shipping points for farming and dairy products.

The text of the order commanding the company to extend its lines is as follows:

"The defendant corporation, the Mountain States Telephone & Telegraph Company, to a large extent enjoys a natural monopoly within the boundaries of the state of Colorado. The evidence in this cause convinces us that these communities are prosperous and will show a steady increase in population in future years.

"Many witnesses testified that the inhabitants of the petitioning towns and cities are unable to transact business in Denver, Colorado Springs, Pueblo and other state trade centers, due, partially, to inadequate telephone service; and that a large percentage of this business which properly belongs to these cities, is directed east and outside the state.

"We are of the opinion, therefore, that the proposed extension of telephone lines of the defendant company will be of much mutual benefit to the petitioning communities and the trade centers of Colorado.

"After a careful examination of the record in the case we find that the Commission is justified, from the evidence, in ordering the corporation to extend its telephone lines, and to adequately serve the petitioning communities at fair and reasonable charges, with equitable rules, regulations and practices surrounding the same.

"It is, therefore, ordered that the Mountain States Telephone & Telegraph Company, with all due dispatch, and under the supervision of this Commission, extended its lines to the petitioning communities, and that the said telephone lines be strung through, and serve with adequate telephone service at reasonable and just rates.

"It is further ordered that the defendant corporation file with this Commission, subject to its approval, the rates and charges and the rules, regulations and practices surrounding the same, which shall apply to the cities affected by this extension."

In the case of the Colorado Springs Light, Heat and Power case it is considered probable that an appeal will be taken from the ruling of the Commission.

In this case the Commission ordered the following rates put into effect on January 1:

For residence light, 10 cents per kilowatt-hour, with 15 cents discount for prompt payment of bills and a minimum monthly charge of $1.00. The present charge is 11 cents per kilowatt-hour, with a 10 per cent discount and a monthly minimum of $1.35.

The rate for power, as fixed by the Commission, is 6.66 per kilowatt-hour for the first thirty hours; 3 cents per kilowatt-hour for the next sixty; then 1 cent per koliwatt-hour for additional power, and a minimum monthly charge of 75 cents per horsepower.

Charges in effect at the present time, but which will be abolished January 1 under the ruling of the Commission, is 7 cents per kilowatt-hour, plus 50 cents per horsepower, with a minimum monthly charge for horsepower. In its ruling the Commission ordered the fixed charge abolished.

Commercial lighting rates, under the order, will be as follows: For the first thirty hours, 9 cents per kilowatt hour; 4 cents per kilowatt-hour for the next sixty hours, and 2 cents per kilowatt-hour thereafter. It fixed a 10 per cent discount for prompt payment of bills and reduced the mini-

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mum monthly charge from $3 to $1. Commercial lighting charges are now the same as resident lighting charges.

The Colorado Springs company also manufactures and sells gas, and the Commission in its decision held that in view of the fact that the company's earnings from the sale of gas was now only 1.16 per cent profit per annum it would entertain a request from the company for an increase in gas rates.

In arriving at its decision the Commission fixed the physical valuation of the company's plant at $2,315,453. The company contends that its property is worth $4,878,390.

The Commission was aided in its investigation by F. J. Rankin. P. B. Rice, an electrical engineer of New York City, acted for the company. Each of them made valuations of the property. Department valuations were also made to enable the Commission to reach a decision.

Investigation of the Colorado Springs Light, Heat and Power Company's charges for electric current was instituted by the Commission at the request of the city council of that place. The Commission spent five months in investigation before making its decision ordering the company to reduce its rates.

The Public Utilities Commission established a number of precedents for such inquiries as are deemed important to both the consumer and the public service corporation. These precedents, as given out in the Commission's report on the Colorado Springs matter, follow:

"That an earning of 7½ per cent is a fair return on a corporation's investment.

"That each unit or department of a corporation should be self-sustaining and its rates computed on that basis; thus the Commission ordered reductions in the rates of the Colorado Springs company, which it found was making a profit of 12.27 per cent.

"That discriminatory rates, either to consumers or persons connected with a company shall not be allowed, and that officers, stockholders and employees of a company shall be required to pay in money the same rate paid by other consumers.

"That in fixing a valuation allowance should be made for 'going concern' value.

"That the Commission will approve and fix rates for residence and commercial lighting, but that it will allow no discrimination in commercial lighting charges under contracts or agreements.

"That while a utility corporation is entitled to a fair return upon its investment only a fair and reasonable charge for service can be made.

"That under the law creating it the Commission has no power to regulate steam heating charges."

ILLINOIS.

St. Clair County Gas & Electric Company. In the decision recently made by the State Public Utilities Commission of Illinois regarding rates for electric service in the city of Belleville the stand is taken that 4.4 per cent per annum is an equitable and just allowance for depreciation on the electric property. The Commission in its decision says:

"It was argued by the respondent that the reproduction cost new (undepreciated) is a proper and equitable value to be considered for rate-making purposes. The reasons advanced are: (1) That reproduction cost is the amount of money which would necessarily be expended by a utility in duplicating its plant. (2) That, from a consumer's point of view, a well-operated utility is delivering 100 per cent service, and is hence in 100 per cent condition, irrespective of actual deterioration of the physical plant. If there is justifiable ground for such an argument, it must be based upon real reasons, and not upon a mere desire of the owners of a property to maintain its paper integrity. The advocates of the theory would hardly admit that any need of actually duplicating the property will ever arise, or, if such need were to arise, that the property would be duplicated in the same identical manner, despite modern efficiency and economy and despite scientific development in the art. The fact must be faced squarely that property does depreciate in value with age, with use, with changes in the art, and with increases in load. A very vital element in the value of equipment lies in the fact that it probably has ahead of it certain years of effectiveness in the operation for which it was intended. As this period of potential operation is increased or decreased, the value of the equipment as a portion of an operating property is correspondingly enhanced or diminished."

The Commission found that the St. Clair County Gas & Electric Company is entitled to a 7.25 per cent per annum rate of return on a fair value of its property. Such a rate of return is approximately equal to an 11 per cent rate of return upon a proper stock issue. The rates fixed by the Commission for Belleville electric service are a material reduction over the lighting rates now in effect.

NEW YORK—First District.

Rates for Gas Oil. The Public Service Commission for the First District has instructed its secretary to communicate immediately with the Attorney General of the United States, calling his attention to facts brought out in recent gas rate cases, showing what seems to be a discrimination in the price at which gas oil is sold to different gas companies in the City of New York. The Commission itself will hold a public hearing to further investigate the prices for gas oil.

One Meter to a Service. Counsel to the Public Service Commission for the First District has submitted an opinion in regard to the effect of the Commission's recent order directing electric companies to install a master meter or meters on the premises of one customer, and forbidding the installation of more than one meter to a service under each contract. At the time this order was made the New York Edison Company had contracts with several of its consumers under which it agreed to maintain more than one meter on its customers' premises, and some of these contracts have several years to run. In accordance with the general principle that no contract can be carried into effect, which, although legal when made, has become illegal by virtue of some subsequent law, counsel holds that the order of the Commission, when it becomes effective, will abrogate all outstanding contracts made by the company, which are inconsistent with the provisions of the order. The order goes into effect January 1, 1916.

Bids for Subway. The Public Service Commission for the First District has authorized the chairman and secretary to advertise for bids, to be opened January 14, for the construction of a part of the Broadway-Fourth Avenue Rapid Transit Railroad. Route No. 12 is generally known as the Eastern Parkway subway in Brooklyn, which is to be operated under the dual system contracts as an extension of the first subway by the Interborough Rapid Transit Company.

PENNSYLVANIA.

South Lebanon Electric Company.—A decision of the utmost importance to all utilities, especially those operating in Pennsylvania, has been handed down by the Pennsylvania Public Service Commission in the refusal to reopen an order denying a charter to the South Lebanon Electric Company and thus establishing a precedent for public service corporations. The commission according to the order, has not the power to limit corporate powers as suggested by the attorneys for the company. Neither will it grant rights where the community is being adequately served.

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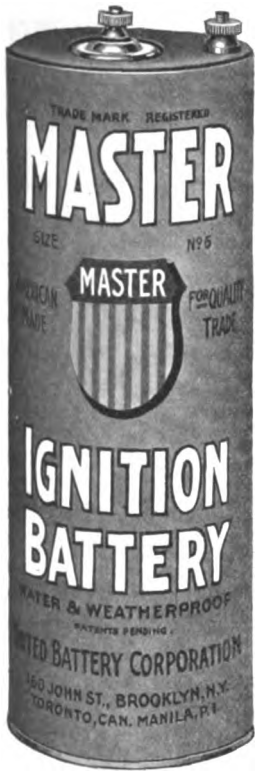
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

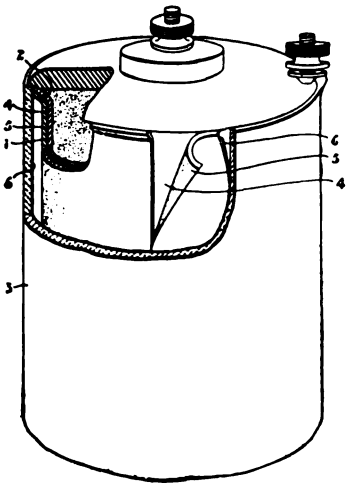
New Water and Weather-Proof Batteries

The principal objections to dry batteries are the difficulties encountered incident to atmospheric and temperature influences upon them. To overcome such difficulties the United Battery Corporation, 160 John Street, Brooklyn, N. Y., has succeeded in insulating the active part of the battery, namely, the zinc electrode, in such manner as to minimize the retarding effect upon the electrolyte, due to low temperature, and to restrain the violent chemical action caused by extremely high temperature.

It is well known that dry batteries decrease in efficiency through age and it is mostly due to the excitation caused by the transference of energy between the negative and positive poles, this being principally due to superfluous moisture in the atmosphere effecting the zinc container.



Master Dry Cell.



Sectional View.

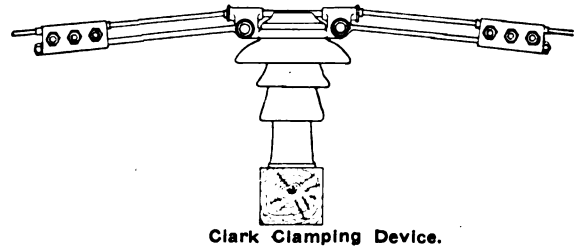
The United company, therefore, had to provide for a novel formation of the cell and to arrange for a covering thereon, whereby the cell is insulated against the effect of changes in atmospheric conditions.

It will be noted on the illustration showing a sectional perspective view of the cell, that the zinc cup is formed with an outwardly flaring upper edge. This flaring edge engages the upper edge of the outside container and as the inner member is spaced centrally within the outer container, a surrounding dead air space is provided for. The cell itself is being coated with a special adhesive varnish which is impervious to moisture, thus forming an insulating coating. A jacket formed of a sheet of asbestos or some similar heat insulating material is placed around the zinc container, while the varnish coat is still sticky, thus providing a protecting covering which is a poor conductor of heat, consequently the cell retains a comparatively uniform temperature, outside changes of temperature effecting it but slowly. The electrolytic paste and the depolarizing compound inside of the cell are also protected to a very great extent against atmospheric changes.

The outer carton is made up with a water resisting material or is lined with paraffine or coated inside with some other waterproof material. When the cell is now placed within the external cover, the top is sealed so that the sealing wax extends over the top of the flanged zinc container, effectively closing the air space surrounding the cell and consequently forming an insulating jacket very effective against changes in temperature. The seal extending beyond the top edge of the inner container effectively secures the outer carton to the cell and thus forms a unit from which the outer carton cannot be removed and replaced in a fraudulent manner.

To secure the bottom cap of the outer carton and to make such carton positively waterproof, the ordinary fiber bottom cap is being replaced by a black japanned metal bottom which, on the inside of the carton, is insulated from the zinc cup by a specially formed, paraffined, paper cap.

The company which is placing these batteries on the American market is well known in the battery field and is affiliated with battery factories in Toronto, Can., and Manila, P. I. An up-to-date, modern plant of very considerable size has been completed recently to manufacture these new cells exclusively. Having adopted the trade-mark "Master" for its product, the company states that the word will be indicative of the quality of its product.



Clark Clamping Device.

The Untied Battery Corporation will not only manufacture the standard sized batteries, known in the trade as Nos. 6, 7 and 8, specializing, of course, upon ignition and telephone batteries, but will also invade the field of the flashlight industry.

Clark Overhead Clamping Sets.

Special protection requiring efficient construction has long been recognized as necessary at points where high-tension lines cross other lines, right-of-ways, streets, etc., Prevailing specifications require that the line be "dead ended" on poles carrying double cross-arms on either side of the line to be crossed. In all cases at such crossings a construction must be approved by those whose property is to be crossed, the general idea being to make these points the safest and strongest points in the line, and it is to meet these requirements that the Clark overhead clamping sets were designed and developed.

A clamping device for single cross-arming is shown herewith. In this type, which is known as No. 25, as well as all other types of Clark overhead protective clamping sets, the flat clamps on the outrigger arms provide an approved fastening to take the place of the "dead end." They are an

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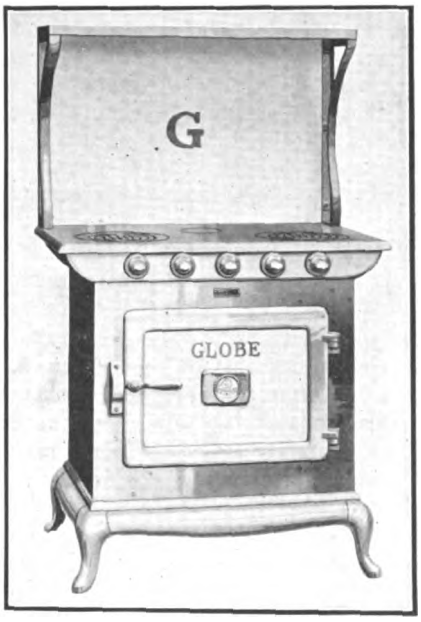
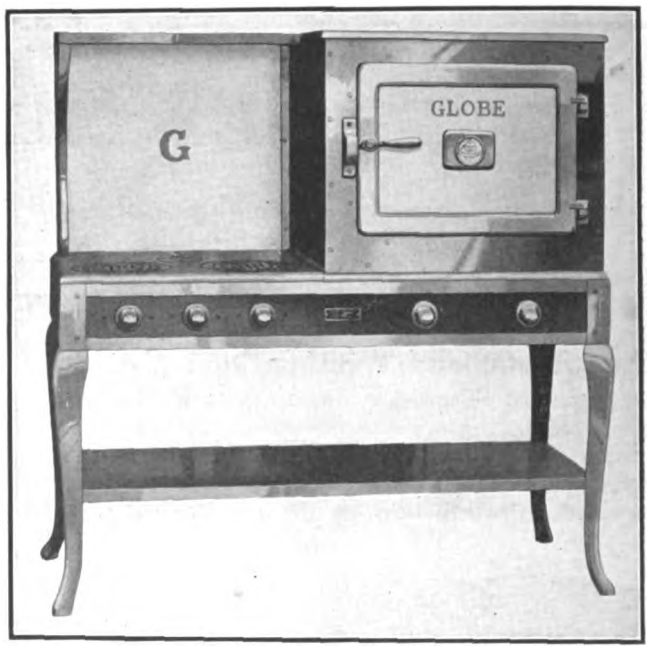


New Range Designed for Use Where Space Economy Is Essential.



New Type of Globe Range with Enlarged Oven.

improvement over the dead end in that they relieve the insulators from a side mechanical pull, balancing the strain in the line practically the same as on the ordinary insulator in ordinary line construction, that is, the only mechanical strain on the insulator is a directly down pull, which is the resultant of the strain from the span on each side. In this way the electrical efficiency of the insulator is unimpaired and while in the old form of construction it was necessary to continue the electrical path over the two dead ends by means of a jumper, with these overhead sets the conductor is continuous.

There are certain forms of construction, notably where insulators are very high in electrical efficiency in comparison with the insulators on the rest of the line, which are used in connection with strong insulator pins, steel cross-arms, etc., where single insulators and single cross-arm construction have been approved and undoubtedly will be approved considerably in the future. In such places the single cross-arm set, as shown, is used. This set is of comparatively recent development, a very large number having been used in the past summer. The same principle is employed in the set designed for use at angles. This set is also of recent development, and it makes a comparatively easy and simple crossing that otherwise might involve the setting of additional poles and rather extensive general construction.

The Clark Electric and Manufacturing Company, 149 Broadway, New York, also manufactures the well known Clark seamless copper splicing sleeve and insulator clamps.

Novel Fan Equipment for Southern Building.

The First National Bank Building, of Paris, Texas, is noteworthy among many other things for its installation of electric fans. The building is an imposing six-story structure of terra cotta, brick and imitation limestone. It is completely equipped with 132 Western Electric ceiling fans. Each fan is supplied with an electrolier attachment made up of a Holophane reflector and a 60-watt Sunbeam Mazda lamp. The fan fixture thus has a double function—ventilation and illumination, either of which can be employed independent of the other or simultaneously. The installation is causing favorable comment in southern circles.

A telephone system, with a network of lines, has been projected for the province of Biscaya, in Spain.

New Types of Globe Electric Cook Stoves.

In keeping with its strong faith in the future of electric cooking, the Globe Stove & Range Company, Kokomo, Ind., is continually adding new types to its already popular electric cook stoves and ranges, several of which have been described in previous issues of the Electrical Review and Western Electrician, thus making available sizes and types of these devices to meet almost every conceivable household requirement.

The company has just placed upon the market three new models of electric cook stoves, two of which are illustrated herewith. From the standpoint of general construction, these new ranges are similar to the medium-priced line now manufactured by the Globe company. However, several new features have been incorporated, with the intention of broadening the line and giving a diversity of models from which every housewife will be able to choose one for her particular needs.

For those who desire it, greater accessibility has been provided in the oven by making the dimension across the front 18 inches. It is quite apparent that this arrangement permits of greater freedom in the handling of utensils both into and out of the oven.

As electric ranges intended for use in families where a larger number of heating units is not required, two of the new stoves have been provided with two eight-inch units on top, together with a smaller simmering unit. This small simmerer is a type of unit found only in Globe electrics. Consuming, as it does, but a small amount of current, it finds instant favor as a means of keeping warm that food which has cooked before the remainder of the meal is ready.

The stove with its oven below the top heating surface is especially adapted for use in kitchens where floor space is very limited, thus meeting the desire of many housewives for a compact arrangement involving a minimum amount of walking while cooking.

Thermophones May Displace Magnetic Telephones.

The British Post Office Department has ordered a number of thermophones, so that life tests may be carried out by the research department. It is claimed that this instrument is a distinct improvement over the magnetic telphone for short lines.

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Electrolet Conduit Fittings.

The accompanying illustrations show two types of fittings, known as Electrolet conduit fittings, which are being widely used because of their suitability for various classes of work. Fig. 1 shows a reversible entrance fitting instantly adjustable for use in vertical pipe or as a waterproof service entrance

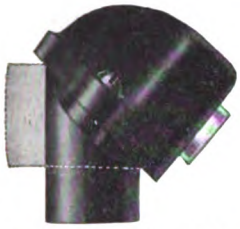

Fig. 1.—Reversible Entrance Fitting.

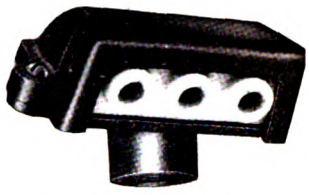

Fig. 2.—Side View.

fitting for horizontal pipe only. The slight off-set in the angle of the metal base provides for practically straight pull on the wires. The off-set in the hub prevents wires coming in contact with sharp edges on end of pipe.

The convenience of the reversible feature lies in the fact that the fitting may be taken to a job without exact previous knowledge of how the installation is to be made and there immediately adapted to whatever method of installation is decided upon. It also reduces the amount of stock necessary to carry because this one fitting takes the place of two. Fig. 2 is a side view of this fitting.

Fig. 3 is a fitting designed for combination work, particu-

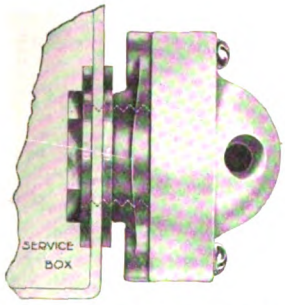

Fig. 3.—Combination Fitting.

larly for use as a box outlet on boxes having pipe knock-outs, where wiring changes from pipe to open or knob and tube construction are necessary.

These fittings are being marketed by the Killark Electric Company, St. Louis, Mo. W. D. Wooley, 30 North Michigan Avenue, is manager of the Chicago office.

Western Electric Developments in 1915.

New requirements in the various branches of electricity's commercial applications have prompted the development of new and the changing of old apparatus to conform to these new needs. The following is a résumé of the more important of the Western Electric Company's contributions to electrical progress, during 1915.

Telephone Apparatus.

Intercommunicating.—The growing need for intercommunicating telephone systems in apartment houses to replace speaking tubes has resulted in the development of a more flexible Inter-phone system than has hitherto been available for this class of service.

The system, known as the No. 20 apartment house Inter-phone system, is arranged for service between vestibule, apartments, janitor and trades people. The vestibule outfit consists of one vestibule Inter-phone and any number of letter-box units. The vestibule Inter-phone consists of a flush face-plate with switchhook, transmitter, receiver and push-button and card holder for janitor. The letter-box unit consists of a flush face-plate to which three compartments are attached. Below each compartment is a push-button for signaling the apartment to which the box is assigned. Any number of letter-box units can be used with one vestibule Inter-phone set.

Switchboards.—A flashing ring-off and recall signal has been developed for use with magneto switchboards to prevent "hangup" troubles and increase operating efficiency. This signal provides a distinct signal for each operator that will indicate by an insistent intermittent flashing that a ring-off drop or signal has fallen and that she should listen-in for a possible recall or take down the cords for another connection. The equipment per position consists of a lamp, lamp socket, lamp cap and a few pieces of operating apparatus. It can easily be added to existing equipments.

An all-metal switchboard for use on board ships of the navy has been designed and put in successful operation. The switchboard is of the central battery type with combined jack and signal equipment. It is entirely encased in sheet brass finished in black. When the switchboard is required for use, a hinged panel is dropped and the cords, keys and signals are exposed to view. Eight cord circuits are wired. Access to all parts of the switchboard may be had either from the front or from the rear.

Rural Telephones.—A new type of the familiar No. 1317 magneto telephone to be known as the No. 1317-C type has been developed to meet the demand for a more compact and serviceable telephone than any now available.

A saving in depth is accomplished by using a transmitter mounted on a short bracket increasing the slope of the writing shelf, thus bringing it in nearer to the cabinet and placing it in a better position for writing purposes. This, together with the fact that the new powerful No. 50 three-bar generator is used, makes possible a saving in width. The height has also been reduced somewhat by a re-arrangement of terminals and other apparatus.

Railway Telephones.—Further experimentation and development work on the loud-speaking telephone for railway train dispatching work has resulted in a loud speaker that is an unusual combination of distinct enunciation and large volume. A number of these instruments have been installed during the year on many of the lines of important railroad systems where they are doing efficient work.

An electro-magnetic circuit breaker, known as the No. 12,020 has been developed to replace the slower acting fuses used on train dispatching circuits to limit the supply of battery current going to the telephone and telegraph instruments. The use of the circuit breaker will effectually prevent the burning of relay points due to its quick breaking of the circuit. The point at which the circuit breaker operates is regulated by adjusting the air gap between the coil core and the armature. The operating range extends to two amperes. A slate base is used to prevent the warping and arcing that wood base instruments would be subject to.

A booth switch, the No. 1-A, has been produced for use on telephone booths placed at railroad sidings. The switch is connected to the hasp of the booth lock so that it cuts out the siding telephone only when the door is locked. It does not cut out when the door is closed behind the man who is using the telephone.

Miscellaneous.

Relays.—A heavy duty relay, to be known as the "E" type relay, has been developed for use where a large number of contacts must be operated at the same time. The type of construction employed is the same as that in the No. 194 high-efficiency line and cutoff relay with the

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flat coil and vertically mounted springs. The springs in the "E" type relay are mounted in two banks. The banks of springs are approximately one inch apart, making them readily accessible for inspection. Mounting them vertically has the effect of keeping the contacts clear and making the relay compact, without sacrificing accessibility to the parts.

Key.—A universal type of telephone switchboard key has been designed for use with the universal type of key-shelf. The feature emphasized in this key is the method of fastening to the key-shelf. A long machine screw at each end of the key base passes through the two iron framework strips at the front and back of the key-shelf. By means of a washer and nut at the end of each screw, the key is firmly clamped in place. In this way a key may be moved to any position on the key-shelf, regardless of its width or the number and size of key spaces.

Protectors.—A new protector, coded as the Nos. 1,168 and 1,169, has been developed as an improvement upon the various types heretofore offered for central office use. The new protector, which is intended for group mounting, has among others, three important features to recommend. First, the ground bar is of punched instead of heavy rolled steel and considerably thinner without, however, sacrificing any electrical requirements. The lighter protector thus made possible puts less strain on the distributing frame. Second, the individual protectors may be removed as units. In the old types, only the springs were individual to the protectors and the insulators made in strips to serve for a whole group, necessitating work on the whole group to repair or replace one protector. Third, the spring design has been made such that a variation in the size of the protector carbons or a variation in the setting of the heat coil will not prevent the proper functioning of the grounding device when the heat coil is operated.

Forest Service Hand Set.—A new type of hand telephone set, known as the No. 1,004, has been developed in collaboration with the United States Forest Service for use in forest service patrol works.

This hand set is a complete local battery telephone set which weighs only two and three-fourths pounds. The omission of a hand generator makes this possible. Signaling of other stations on the line is done with an interrupter mechanism which operates a howler connected at the permanent station in addition to the regular bell of the stationary telephone. It is possible with this equipment to send a howler signal over longer lines than it is possible to ring a bell with the ordinary telephone hand generator.

The hand set consists of a transmitter, receiver, induction coil, battery, signaling interrupter and talking and signaling push buttons. The body is of aluminum. When used on single-wire circuits, a bayonet type ground rod and a line connector are used for making ground and line connections.

Police Signal Lamp.—In the larger cities with their highly organized police forces, a demand has arisen for a means by which police headquarters can quickly signal for the policeman on a beat in an emergency. Bells and horns are objectionable on account of the disturbance they create. It remained, therefore, to produce a lamp whose light would be visible both day and night and from any angle. This result cannot be obtained with the ordinary bull's-eye type of lens as its light can only be seen straight ahead.

Development work on this problem has resulted in a lamp equipped with a special high-power spheroidal lens. The light projected through this lens is distinctly visible from any one of the 360 degrees of the quadrant and at a distance of 1,000 feet or more in daylight. The lamp is operated by closing a local circuit through an alternating-current relay located in the telephone set on the lamp post.

Navy Type Hand Set.—A watertight hand set telephone with ringer box has been developed for use on naval vessels. The hand set, as well as the ringer box, is of all-metal construction and made proof against salt water corrosion. This applies also to the hand set cord and the ringer and receiver coils. Water is kept out of the bell box by passing the ringer rod through a stuffing box. The hanger, which holds the hand set when not in use, is a part of the switch hook. Lifting the hand set from the hanger operates the switch hook.

A number of these sets are in use on ships of the United States Navy.

Loud-Ringing Bells.—An improved loud-ringing extension bell, known as the No. 392 type, has been produced for use on telephone lines in noisy factories and on farms or other outdoor places. The efficiency of the new bell is exceptionally high. This means that less current is required to operate this bell than other types, or, on a given line, more bells can be rung with a given current. High impedance prevents appreciable transmission loss. All metal parts are protected against rust or other corrosion, and the bell movement is thoroughly moisture proofed. Adjustments can be made by turning one screw. Space is also provided for mounting a condenser.

Household Helps.

Dishwasher.—An electrically operated dishwashing machine has been added to the already large line of household helps. Dishes, glasses and silverware are placed in a rack and wire basket which fits into the top of the machines.

Junior Electric Range.—A decided novelty in the electrical field is found in the Junior electric range, a practical miniature cook stove. This range is intended for young girls and serves at once for a toy and a means for teaching cooking.

Toy Transformer.—The increasing use of a large variety of electrically operated toys, and the necessity for replacing dry batteries frequently have brought about the development of the toy transformer, a medium through which a low voltage current may be obtained from an alternating current lighting circuit. Voltage variations made necessary by the different current strengths required by small and large toys, are accomplished by means of three terminals and a switch with a number of contacts.

Battery Lantern.—An electric lantern operated by dry battery has been placed upon the market to meet the demand for a safe light that can be left burning anywhere without fire danger. This lantern is made in two sizes, one giving a powerful light and making use of two dry batteries and another, with a slightly less brilliant light, arranged for one battery only.

A noteworthy feature is found in the fact that turning the reflector lights the lantern and turning it in the opposite direction extinguishes the light. Turning the reflector operates the switch which is wholly concealed, so that there are no moving parts on the outside of the lantern casing. A swinging bail is provided for convenience in carrying and for locking on the top. A rigid slotted handle is also provided for hanging the lantern on a rail.

Floor Lamp.—An electric floor lamp that can be placed anywhere in a room and is easily portable is the latest addition to the Western Electric line. The lamp is finished in brush brass, has a sturdy standard and a broad base to keep it from tipping. The lamp height is adjustable from 30 inches to five feet.

Drills and Hammers.—A portable electric drill and a portable electric hammer have been placed on the market. The drill is well balanced, compact and light in weight.

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Westinghouse Electric Developments in 1915.

Steam Turbines.

Last year the installation of a 30,000 kilovolt-ampere turbine in New York was reported. A few weeks ago the Commonwealth Edison Company of Chicago awarded the Westinghouse Electric and Manufacturing Company a contract for a turbine with a rating of 35,300 kilovolt-amperes and still more recently this company has been awarded a contract by the Duquesne Light Company, of Pittsburgh, for a 40,000 kilovolt-ampere unit, and it is said that units as large as 50,000 and 60,000 kilovolt-amperes are contemplated.

These large sizes involve turbines of two-cylinder construction, both tandem and cross-compound design, for very high range of expansion, utilizing high temperature steam and high vacuum. The advancement in turbine practice has made it possible to design such units for economies hitherto unknown. Among the other points of interest that might be mentioned in connection with these larger units are: It has been of paramount importance to build these large units (with so much power concentrated in one machine), of even greater reliability than turbine units have heretofore possessed that possibly more consideration has been given to this point than to any other. Every detail of design has been planned with the primary object of insuring continuity of service. Stresses have been kept low, permitting the use of materials that were only required for ordinary turbine units, large factors of safety being employed on all running parts.

Reduction Gears.

The year has seen a very extended development in reduction gears, permitting a much wider application of the steam turbine. In past years the application of the turbine for direct-current generator use, for driving pumps, blowers, slow-speed shafting, or any other application where heretofore there have been irreconcilable differences between the speed of the turbine and of the driven unit was limited. A great many of these reduction gears have been installed by the Westinghouse company in all kinds of service, and their mechanical operation has been so successful as to thoroughly establish this device.

Underfeed Forced Draft Stoker.

Among important development in power plant apparatus has been the underfeed forced draft stoker. This type of stoker meets the requirements of the large power plants where high efficiency in combination with overload conditions are the rule. Many important improvements in details have been effected in the design of condensers, the business of which continues large as experience points the way.

Rotary Converters.

Small size 60-cycle rotary converters, both for industrial and railway service, have been designed, using commutating poles and bracket type bearings, instead of the usual pedestal type bearings. This development of bracket type of machines has fulfilled a long felt requirement, especially in rotary converters for industrial uses, the great advantage being the light weight, requiring a minimum floor space and head room. These machines have demonstrated superior qualities by very satisfactory operation.

The tendency for several years has been towards higher speeds in both rotary converters and motor generators. During the past year speeds have not been relatively increased for rotary converters, although a number of new ratings have been developed embodying the latest features, such as commutating poles, welded damper windings and speeds corresponding to those of converters of the same design.

Larger motor generators have been built of considerably higher speed than formerly used, which has been made possible by compensating the generators. This is a generator design feature, that previously has not been used to any great extent, but which is now coming into favor primarily on account of its use, making it possible to produce a better machine at a higher speed.

Switchboards.

One feature which has probably received the most attention in switchboard work during the past year has been the small details used in connection with the rear of the board and also the necessary changes in wiring details, which have followed the change made from asbestos-covered Underwriters' wire to rubber insulated instrument and control wiring. The last point in particular has resulted in certain changes and marked improvement along these lines, particularly as effects standard boards of larger dimensions built on angle iron framework. Micarta cleats arranged so that different wires are in actual physical contact, and in the case of boards involving a number of wires, running these wires up the side of the angle iron in one, two, and even three tiers have resulted in a much cleaner rear of board, and also a very marked increase in the safety factor as far as breakdown wires is concerned.

Another feature is the design of small switchboard fittings, such as meter brackets, busbar supports, transformer brackets, rheostat idlers, chair guards, etc. Use of malleable iron has resulted in a marked decrease in necessary cross section, with a very considerable reduction in weight. This development, together with the wiring feature mentioned above, is a tendency towards increased simplicity and efficiency in switchboard design.

A further and very important feature has been the development of a complete line of busbar supports of the pillar insulated type. These supports will shortly be furnished for all voltages from 750 to 44,000. The use of one single tapering porcelain with corrugated sides, of varying sizes for different voltages for this class of material is contemplated, malleable iron clamps and fittings of the correct proportions are also to be used, with the net result that in addition to eliminating all cement, an adjustable and interchangeable line of supports is available.

Another development of considerable interest is the increasing use of motoring and switching equipments for outdoor service in connection with other outdoor equipments, such as transformers, lightning arresters, etc. By combining series tripping self-contained inverse time element oil circuit-breakers with necessary integrating, and where required, indicating meters, in one weatherproof box, complete low tension control is available and this with the elimination of the accompanying charge involved in a complete building for this equipment. These equipments are available for either ground, pole, tower or wall mounting. They are furnished with all internal connections complete, so that installation simply presents the problem of connecting into the power lines, placing oil in the circuit breaker tank, and mounting the meter on its panel.

Another development is the bringing out on switchboard mounting circuit breakers of a modification permitting of mounting the breaker unit itself on either pipe framework immediately at the rear of the board, or, in case of boards employing pipe framework, on the framework itself. In a considerable number of switchboard applications this is of very great value.

The development of round tank oil circuit-breakers having their tanks finished from one piece of sheet metal, is growing in importance as regards increasing application, and breakers of this type are now operating successfully on capacities as high as 4,000 amperes.

Static Protective Apparatus.

The condenser has always been recognized as an excellent

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form of arrester, but has been too expensive for such use. The condenser recently brought out with a reasonable limit of cost is made small in size and convenient in shape, and also of great electrostatic protective capacity. This is due to the use of a new insulating wax of higher dielectric strength than paraffin. This arrester combines the qualities of the highest protective effect possible on a railway car or for line mounting without requiring any attention or expense for maintenance.

In addition to the line of 15-inch diameter aluminum coils which has been used for many years, a new line of nine-inch diameter choke coils has been prepared for the market, in order to give the user the advantage of a lower price where the impedance required is less than that of the 15-inch coil. These are provided for mounting, either on an insulated base or for suspending on the line.

For the electrolytic form of arrester the most important advance has been in the development of a new electrolyte. This electrolyte maintains the arrester in operating conditions under temperatures as high as 135 degrees Fahrenheit. It maintains the film at a higher critical voltage, and provides increased discharge capacity.

Circuit-Breakers.

Small oil breakers, mostly used for motor starting purposes, have been made to include two dash pots, giving increased time element. They have also been changed to a weatherproof form, including an undervoltage release under the cover, these breakers being intended for either indoor dustproof service or outdoor weatherproof service. The undervoltage release has been changed to be entirely self-resetting and positive in action.

After more than three years' development a line of small and medium size oil circuit-breakers has been on the market. This line is very extensive, including switchboard mounted, wall mounted and pipe mounted, remote control hand operated and remote control electrically operated, weatherproof and subway forms. Capacities are obtained in individual breakers up to 800 amperes, by connecting all contacts of a multiple breaker in multiple, for use as a single pole, capacities up to 3,000 amperes are obtained. The voltages run as high as 13,200. The unique and most important feature of these breakers is the finger contacts, which represent a great advancement. The fingers, flexible in all directions, are separated by a stop, and protected from all arcing by separate butt type arcing tips.

Oil breakers for large power plants have been further developed to cover new forms of mounting and control. They may be mounted in cell structure or on pipe framework, and all poles have in some cases been assembled on one cast base in order to obtain minimum mounting space. Electric control is possible by solenoids mounted in any position relative to the breaker.

Oil breakers have been developed to meet the demand for a high-voltage breaker of moderate breaking capacity and price. They are supplied for voltages from 35,000 up to 70,000, and in breaking capacities of about 20,000 to 30,000 kilovolt-amperes. The tanks are of the floor mounting elliptical form, but may also be mounted on parallel pipe framework, so as to allow the tanks to be removed for inspection of contacts. The terminals are of the condenser type, which have proven so satisfactory in the higher voltage breakers.

Lighting.

In the lighting field the use of incandescent Mazda lamps for street lighting has greatly increased, particularly in residence districts. In order to operate Mazda C gas-filled lamps on ornamental poles from constant-current regulator, there was needed a transformer to raise the current to 20 amperes and at the same time insulate the lamp and the secondary winding from the high-voltage circuit. To meet this demand the Westinghouse Electric and Manufacturing Company has recently developed a special waterproof transformer mounted in the base of the poles, which will give the proper current for the incandescent lamps. These transformers are specially constructed for this service and the insulation is capable of withstanding 20,000 volts for one minute.

Battery Charging Rectifiers.

There has been felt for a long time the need of a reliable, economical and simple rectifier outfit for battery charging. This seems to have been fulfilled in the outfit recently brought out by the Westinghouse company, which consists of the usual equipment of such a device mounted on cast-iron frame, known as the type W, with the rating of 30 amperes and capable of charging from 38 to 46 lead cells and 56 to 66 Edison cells, with a direct-current voltage range of from 76 to 120. For charging the smaller storage batteries, such as those used on Ford cars, a modified type of rectifier has been designed, which is simple and compact and suitable for mounting on the wall or wherever most convenient. It consists of a cast-iron bracket, which carries in front a small slate panel, on which are mounted the necessary switches and connections. The bulb is mounted behind the panel, where it is well protected, and is tilted by means of a knob on the front.

Elevator Equipments.

In the field of industrial motor application considerable interest has been taken in the Westinghouse gearless traction elevator equipments which have been placed on the market during the preceding 12 months. This type of elevator engine is especially designed for high speed passenger service. The equipment consists of a full automatic, magnetic controller and a slow-speed, direct-current motor, on the shaft of which is mounted the sheave for driving the elevator. All gearing is eliminated.

The development of this line of apparatus puts the Westinghouse Company in the first line as a manufacturer of elevator equipment.

Coal Mining Service.

It is interesting to note the favorable impression being made by the rotary converter in coal mining, particularly since the manufacturer has developed the new commutating-pole machine in smaller sizes. One of the chief troubles in mining work, particularly with small rotaries, has been the commutation, because the mining load varies anywhere from 10 per cent of full load to 100 per cent overload in a very short space of time. With the noncommutating pole rotary, it was necessary to shift the brushes with the change in load, or sparking and damage to commutator would result. This damage to commutator would result finally in short-circuited coils and burnouts.

Realizing these conditions the Westinghouse Electric and Manufacturing Company has developed a special rotary converter for this purpose. The machine is built in several different sizes, from 150 kilowatts to 500 kilowatts.

For use in mining where the gathering reel mine locomotive is not especially adapted, the Westinghouse company has brought out a combination trolley and storage battery gathering reel locomotive, which has the advantage of being able to operate on trolley when this is available, and then obtain energy from the storage battery in the mines and other places where trolley construction is not available.

The locomotive is mechanically the same as the standard trolley-wheel type, having bar steel frame and MCB brake shoes, and the automatic lock screw type of brake. The motor equipment is also standard size, being 28 horsepower commutating-pole motors, while in addition there is a battery of 48 cells and a trolley as well.

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The particular advantage of this locomotive is that it can continue to pull cars to and from the rooms, if for any reason the trolley voltage fails, and can always be operated independent of the trolley voltage.

Large Motors.

There has been a large development in the steel industry during the past six months and in the majority of cases the mills added are driven by motors instead of steam engines. Among the list of drives supplied by the Westinghouse Company are several important items, including in particular, several equipments for reversing blooming mills, two 12,000-horsepower being the largest electric motor-driven steel mills in the world.

The efficiency and many incidental advantages as offered by motor drive have gained much prominence for it in the steel industry, and it is adopted as a rule, rather than the exception. Undoubtedly, during the next six months there will be a very large increase in the amount of horsepower installed in steel mills for large roll drive.

The Westinghouse Company is at present installing in the Bethlehem Steel Company's works one 1,500-horsepower alternating-current motor, which will have unusual characteristics, in that it has a special type of control, making the motor adjustable speed, independent of load, through about 40 per cent speed reduction range. The equipment is so arranged that the driving unit will deliver constant horsepower to the rolls through this wide speed range. The efficiencies of the equipment will be very much on a par with a direct-current motor, using field control, and is quite in contrast with the older methods of obtaining speed regulation with wound rotor alternating-current motors where resistance is inserted in the secondary circuit of the motor.

During the past year there have been supplied several additional rotaries, 60-cycle, 2,500-kilowatt capacity, which will make a total of 19 units of this capacity to be located in the plant of the Aluminum Company of America, at Marysville, Tenn., making one of the largest rotary stations in this country.

In the field of small motors there has been a general increase in the use of motors for household, office and shop devices. This holds true particularly in the following specialized industries: small motors for use in garages and automobile service stations, small ventilating units, motor equipment for moving-picture shows. The motor-driven washing machine and vacuum cleaner continue to be the most popular small motor-driven devices.

In the battery charging field there have been developments in motor-generator and switchboard equipment for large battery-charging stations, and also particularly small motor-generator sets for charging, lighting, starting and ignition batteries used on gasoline cars.

In the moving-picture show industry there has been an increased demand for motor generator sets.

Electric Vehicles.

In the electric vehicle field little progress has been made in the pleasure vehicle due to the advance in the use of gasoline cars with electric starters. The small electric truck is, however, becoming much more popular, and the demand is increasing rapidly. This holds true also of the electric taxicab, which has been tried out in Detroit by the Detroit Taxicab Company, and has been eminently successful. A fleet of electric taxicabs is now operating in Detroit, and there is a good future for this field.

Railway Equipment.

PK control, consisting of an electropneumatically operated cylinder head, which manipulates both K-controller drums and the reverse drums, was exhibited for the first time three years ago at the electric railway convention at Atlantic City. Further developments have been made during the year, so that it now may be applied to practically all of the K-type controllers. It is possible for railways to secure train operation, as well as remove the heavy controllers and all heavy current-carrying wires from the car platform. The control inherently prevents too rapid acceleration on the part of the motorman, and may be provided for automatic acceleration.

A number of slight detailed improvements have been made in the standard HL control, which, however, are interchangeable with standard parts. One marked improvement is the assembly of the reverser switch and other parts in the same box, thus reducing the amount of car wiring and conduit required.

Many detailed improvements have been brought out during the year on the ventilation of railway motors, which materially increase the continuous rating, making it possible to use 25 or 35 horsepower motors on work which formerly required 40 to 50 horsepower motors.

An experimental line on the Michigan United Traction Company systems is equipped with 5,000-volt direct-current car equipments, using 5,000-volt trolley direct from substations. This car equipment has performed very satisfactorily for several months.

Improved types of single-phase railway motors have been developed. The Paoli electrification of the Pennsylvania Railroad is equipped with this type of motor.

Pressed steel axle collars that will greatly reduce the weight and materially increase the life of these parts have been developed.

Many improved details have been brought out on brushholders which will increase the life of brushholder castings, carbons and commutators.

The New York Municipal Railways are equipped with an improved type of electropneumatic control, using part unit switches and part PK drums. This material reduces the weight, wiring and conduit to a minimum.

Control apparatus suitable for operation on 1,500 volts has been developed for use without dynamotors, thus greatly simplifying the wiring and details on such apparatus.

Many improvements have been made in the field control motors for locomotive use, which enable locomotives to pull heavy loads with a low power consumption, etc.

In order to enable railways to successfully meet the jitney competition extremely light weight and inexpensive, yet reliable, motors have been developed with a rating of 17½ horsepower and 24 horsepower. These motors weigh approximately 850 pounds and reduce first cost, as well as maintenance of these equipments.

Transformers.

There has been very little done in the way of hydroelectric development or other large single developments which would call for any marked increase in either voltage or size of transformer over the preceding year. In volume of business the year 1915 far exceeded the previous year, due to a large extent to increased industrial activity.

The 5,000 kilovolt-ampere O. I. S. C. radiator type transformers previously described have been installed, and are operating successfully. Several orders for large O. I. S. C. radiator type transformers have been received, and the transformers put into operation, and considerable activity along this line is anticipated in the future.

The year also saw a marked increase in the use of transformers of all capacities and voltages for outdoor service.

During the year considerable interest has been aroused in the matter of electrical precipitation of smoke, dust and fumes in various industrial operations, such as smelting. This aplication calls for transformers of small capacity and high voltage, in the neighborhood of 100,000 to 150,000 volts

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or higher, and capacities from 5 to 75 kilovolt-amperes. This has required the development of small high-voltage transformers at a reasonable cost. Quite a number of such transformers have been built and put in service.

Type OA Polyphase Meters.

The simplified and low-priced watthour meters—type OA—have been developed to include the polyphase form. This has about the same accuracy as the well known type C polyphase meter, but with the simplified details of the type OA. When properly connected these meters indicate the true power in a two-phase, three-wire or four-wire, or a three-phase, three-wire circuit, regardless of the power factor or the degrees of unbalance between phases. Meters for three-phase, four-wire are also made in capacities up to 25 amperes, above which size transformer meters are required.

Watthour Demand Meters.

The watthour demand meter, brought out in 1914, has also been extended to include the polyphase form—an important development, inasmuch as the greater number of applications of electric power, where the charges are based both on maximum demand and power delivered, are on motor circuits which are generally polyphase.

The watthour demand meter is a single meter that records both the kilowatt-hours consumed and the maximum kilowatt demand over a definite interval. It provides precisely the readings needed on systems that base their charges on maximum demand and power delivered. Both readings can be taken monthly, or as desired.

The meter is installed as an ordinary watthour meter and requires no additional apparatus or wiring. It contains no clocks, contacts or other delicate parts that are likely to require attention, and the mechanism is so simple that maintenance costs are little more than that of watthour meters.

Cycle Counter.

To secure satisfactory results in the testing and timing of high accuracy time element relays for selective action, something more than a stop watch is needed. For this purpose a cycle counter has been developed, which indicates definitely the number of cycles required for the relay to close its contacts and open the breaker.

The instrument contains two dials counting up to 300 cycles. It is virtually an electric self-winding clock, with escapement operated by an alternating-current oscillating magnet instead of a pendulum or balance wheel. The escapement magnet is not depended upon to drive the indicator, but simply to regulate its speed, so that the instrument acts as though it had no inertia, that is, it starts the instant power is applied, and stops the instant power disappears. This instrument is also suitable for a great variety of testing where it is necessary to measure elapsed intervals too short to be satisfactorily observed with a stop watch, and where readings in steps of one alternation are sufficiently accurate.

By adding contacts to machine tools, elevator machinery, etc., the time required for various functions can be determined. It is also useful in many laboratories and test rooms for timing purposes.

Relays.

Another forward step has been made by the Westinghouse Company in the development of high accuracy relays for selective protection of complicated circuits.

The types CO overload, CR reverse power and CV voltage induction relays can be used to solve practically any problem that may arise in connection with such protection. Operating on the induction principle, the time element is controlled by magnetic damping, and produces accurate selective results, even if relays are set one-half second apart, and in some cases as close as one-third second.

The CO and CR relays combine with the desirable inverse time element at ordinary overloads a definite minimum tripping time within which the relays cannot trip on any overload. This overcomes the disadvantage of all previous forms of inverse time element relays, which became practically instantaneous on severe overloads, and, therefore, lost completely their selective action.

Type U Graphic Meters.

Improvements and refinements made in the low-priced portable type U graphic meters have greatly extended their field of usefulness, as evidenced by their greatly increased use in obtaining records of load conditions on various parts of central-station circuits. These improvements consist of a reservoir and capillary feed for the recording pen, dash pot to damp the motion of the pen, improvements in the record paper and in methods of manipulating the meter. This is the only low-priced graphic meter on the market that furnishes a continuous record for a whole week.

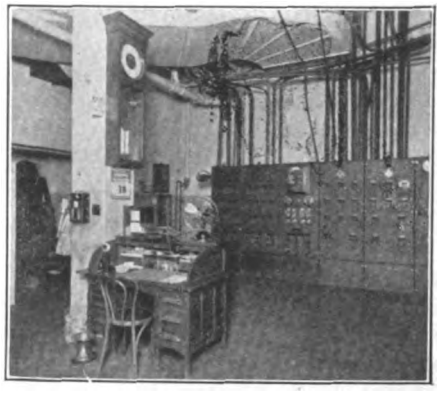
Crest Voltmeter.

The crest voltmeter is a new Westinghouse device for measuring the crest or peak value of alternating-current voltage wave, which is particularly useful in determining the break down strength of insulation.

A condenser in the form of a Westinghouse "condenser terminal" is used in connection with a Cooper Hewitt rectifier, the current flowing in the rectifier depending on the peak voltage impressed on the condenser terminal. This current is measured with a direct-current ammeter. The device is generally furnished as an attachment for an insulation testing transformer.

Telephone System for Luxurious Club House.

One of the features of the new home of the Detroit Athletic Club, Detroit, Mich., is an intercommunicating telephone system designed to do away with the "buzz and walk" systems now still too frequently met in club houses. In



Telephone Board in Club House in Detroit.

view of the fact that this club is one of the most pretentious of its kind in the United States, the directors decided that the system to be installed must be in accord with the surroundings. In selecting a Western Electric No. 1 Interphone system, they found that they had ornamentation and service at a sacrifice of neither.

The system has a capacity of 16 stations, of which 12 have been installed and are in operation. Each station is equipped with a series of buttons, pressing any of which puts the operator in touch with the station wanted. The stations are scattered throughout the building in such a manner that every telephone is in an important place, with none going to waste. As there is no operator required, the upkeep attendant upon the system is practically nothing.

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INDUSTRY ACTIVITIES

Arnold Company, engineers and contractors, 105 South La Salle Street, Chicago, Ill., is sending to its patrons a very attractive New Year's greeting embodying a colored view of some of the recent construction work done by this organization.

Trumbull Electric Manufacturing Company, Plainville, Conn., is distributing the December issue of Trumbull *Cheer*, which is appropriately dedicated to Christmas messages. One of the very interesting contributions in this number is entitled "Patriotism and Service."

Delta-Star Electric Company, 617-631 West Jackson Boulevard, Chicago, Ill., is distributing a descriptive leaflet known as No. 910, showing special high-tension disconnecting switches, "Unit type" indoor equipment, suspension-type disconnecting switches and surge arresters. Copies of this leaflet will be sent upon request.

The Railway & Industrial Engineering Company, Greensburg, Pa., has moved its sales offices to the Peoples Bank Building, Pittsburgh, Pa. L. C. Hart, sales manager of the company, has arranged an exhibit of Burke horn gap apparatus in addition to a very complete file of blue prints, photographs and data on the application of outdoor equipments.

Pittsfield Plant of General Electric Company Busy.—According to General Manager C. C. Chesney, of the Pittsfield plant of the General Electric Company, new business at that plant during the past three months has been 400 per cent better than during the corresponding months of last year. The number of employees will be about 50 per cent more this winter than last.

Horton Manufacturing Company, Fort Wayne, Ind., is distributing an interesting folder which shows by means of cartoons how advertising the Horton electric washer by its users by word of mouth has resulted in numerous sales. The washer is equipped with a three-way wringer permitting it to be moved in any one of three positions, thus eliminating the necessity for moving tubs.

Capital Electric Company, 321 North Sheldon Street, Chicago, Ill., is conducting a special campaign on its "Baby" Geyser washer. An attractive circular containing many illustrations showing how the washer is prepared for use, operated and drained and cleaned, is being sent out and during the campaign a special discount is being made on this type of machine. The baby washer has been designed to meet the need of a small portable machine which could be used exclusively for baby clothes if desired and can be used in the bath room.

Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a special folder illustrating and describing Hubbell interchangeable attachment plugs and receptacles. Especial attention in the folder has been given the Hubbell duplex receptacle which is designed so that energy can be supplied for two different devices at the same time and neither can interfere with the operation of the other. Each outfit is electrically independent as it is housed separately in a porcelain base. Both outlets have T-slots to take large and small Hubbell interchangeable caps with either vertical or horizontal contact blades.

The Robbins & Myers Company, Springfield, O., in appreciation of the services rendered by all employees connected with the company during 1915, presented each with a life insurance policy, the amount of which will increase from $5 for one year's service, to $1,000 for five years' service and over. The policy is paid for by the company, and all annual premiums will also be paid by the company as long as the recipient is employed by the company.

Emerson Electric Manufacturing Company, St. Louis, Mo., has ready for distribution catalog No. 7,000 which is devoted only to the popular types and styles of fans for 110 volts, 60 cycles and direct current. Complete data with lists of odd windings and more detailed information will be published in the form of a bulletin to be known as No. 4,000 which will be sent on request to any dealer. The most striking feature of the new catalog is the greater variety of ceiling fans illustrated for 1916 which include in addition to the usual types a new line arranged for chain suspension.

Westinghouse, Church, Kerr & Company, 37 Wall Street, New York, N. Y., is sending out bulletin No. 20 of the "Work Done" series which contains a layout of the new shops of the Chicago & Alton Railroad, at Bloomington, graphically indicating the increased efficiency which has been made possible by the new arrangement. In its message to prospective customers, the company states that the principle underlying the design and construction of these shops for the Alton applies as directly to an industrial plant as to a railroad shop. The work to be done in the shop as well as the machinery with which to do it must be well laid out before the buildings are designed.

Snyder Electric Furnace Company, 53 West Jackson Boulevard, Chicago, Ill., has issued a statement showing the rapid increase in number of Snyder furnace installations for 1915 as compared with the previous year. There are at present in process of installation, furnaces for the following companies: Crucible Steel Casting Company, Milwaukee, Wis.; Otis Elevator Company, Buffalo, N. Y.; Niagara Electric Steel Corporation, North Tonawanda, N. Y.; Gerlinger Steel Casting Company, Milwaukee, Wis.; Dayton Steel Foundry Company, Dayton, Ohio; S. Fair & Sons, Inc., Saginaw, Mich.; Halcomb Steel Company, Syracuse, N. Y.; Sivyer Steel Casting Company, Milwaukee, Wis.; Electric Steel Company, Chicago, Ill.; Haynes Stellite Company, Kokomo, Ind.; Thomas Davidson Manufacturing Company, Montreal, Quebec, Canada; Canadian Brakeshoe Company, Sherbrooks, Quebec, Canada; Daimler Motor Car Company, England; Summerson & Sons, Ltd., England; Thwaites Brothers, Ltd., England.

The Okonite Company, New York, N. Y., announces that it has established a research department at its factory, and has employed Mr. J. P. Millwood, the well known chemist, who for 20 years was head of the Chemical Research Department of the United States Navy Yard at New York. Mr. Millwood is considered one of the ablest rubber chemists of the country, and everything that goes into the manufacture of Okonite is to be thoroughly tested for its purity, as will all other products of this company. The Okonite Company has retained as consulting engineer in its electrical department, Dr. Comfort A. Adams, professor of electrical engineering at Harvard University. Dr. Adams is an authority in his line, and his scientific knowledge and skill will undoubtedly be of the greatest help to the Okonite Company in the matter of insulation tests and other properties. In starting the New Year with these strong additions to its staff the Okonite Company is following its long established plan to keep abreast of the times with the latest scientific methods, thus keeping its products at the highest quality and efficiency.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

CONDUIT BOXES.—D. C. Overbagh, 700 Jackson Boulevard, Chicago, Ill.

Pressed-steel conduit boxes, catalog Nos. 506-12, inclusive.

Overbagh stud boxes, consisting of pressed-steel conduit boxes with three-eighths-inch stud spot-welded in bottom, catalog Nos. 40, 42.

Listed November 23, 1915.

CONDUIT BOXES. — The Pratt Chuck Company, Frankfort, N. Y.

Pressed-steel conduit boxes. Types BA Universal, CAO, FAO.

Listed November 22, 1915.

CONDUIT BOX FITTINGS, Covers.—Weber Electric Company, Schenectady, N. Y.

Porcelain covers for conduit boxes for use as rosettes. Catalog Nos. 2000, 2001.

Listed November 22, 1915.

EDISON DICTATING MACHINE. —Thomas A. Edison, Incorporated, Orange, N. J.

Transophone attachment, consisting of a special switch to be clamped to typewriting machine and magnet supplied on dictating machine for setting back reproducer.

Listed November 29, 1915.

FLEXIBLE TUBING FASTENERS.—The Gier & Dail Manufacturing Company, Lansing, Mich.

Consisting of circular sheet-metal plate having four tubing holes, with prongs around edges of holes for gripping tubing.

Note.—This fitting is to be used only in connection with sub-bases for surface snap switches listed under this manufacturer. When tubing smaller than 0.25-inch is used, the prongs on this fitting should be compressed with pliers to grip tubing.

Listed November 29, 1915.

FLOOR OUTLET BOXES. — Sprague Electric Works of General Electric Company, 527 West Thirty-fourth street, New York, N. Y.

Cast-iron floor outlet boxes, with plates with or without nozzles.

Non-adjustable, catalog No. 6880.

Listed December 3, 1915.

FUSELESS ATTACHMENT PLUG. —Best Electric Company, Fifty-first and Harrison Streets, Pittsburgh, Pa.

Non-separable swivel composition attachment plug. Best, 600 watts, 250 volts, catalog No. 2400. (See cut.)

Listed December 1, 1915.

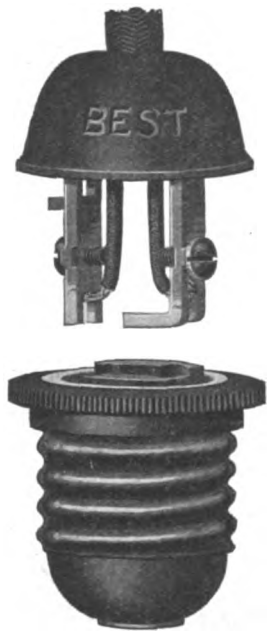
FUSELESS ATTACHMENT PLUGS.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Separable attachment plugs, with porcelain or composition caps and each having an extra contact blade, clip and terminal plate for connecting ground wire to exposed surface of portable appliances. 660 watts, 250 volts, catalog Nos. 6040, 6146.

Listed December 6, 1915.

FUSELESS ATTACHMENT PLUG.—No-Twist Swivel Manufacturing Company, San Diego, Cal.

Fuseless cord connector for pendant circuits, consisting of two similar com-



Fuseless Attachment Plug.—Best Electric Company.

position parts turning on a pivot bolt and inclosed in two similar brass shells. No Twist, 660 watts, 125 volts.

Listed December 6, 1915.

FUSES, Plug.—Six-In-One Fuse Company, 37 Wall Street, New York, N. Y.

Plug fuses, having six fuse elements any one of which can be connected in circuit by twisting upper part of plug. Six-In-One, 0-10 amperes, 125 volts.

Listed November 5, 1915.

GROUND CLAMPS.—David Killoch Company, 57 Murray Street, New York, N. Y.

Ground clamp for use with No. 4 B. & S. gauge ground wire. A single-piece clamp of copper, provided with suitably spaced holes and with a copper-plated bolt and nut for clamping to rigid conduit. Adjustable for use with conduit up to and including one-inch size. One end of clamp is channeled to form equivalent of a lug for soldering to ground wire.

Listed November 20, 1915.

OUTLET BUSHINGS, Service Entrance.—James C. Phelps, Springfield, Mass.

Pressed-steel, cast-iron or composition outlet bushings, J. C. P. Caplets, Type FM.

Standard, for use only at an exposed end of conduit (but not under fixture canopies), and only where conduit wires pass out through fitting without splice, joint or tap within fitting.

Listed November 26, 1915.

SIGNAL APPLIANCES.—Sterling Devices Company, Incorporated, 559 West Twenty-sixth Street, New York, N. Y.

Direct-current bell-ringing transformers. A vibrating mechanism connects alternately to supply circuit each of two primary coils of a transformer in such a manner as to induce in a secondary coil connected to signal circuit a voltage of about 9.5.

Standard for use on 125-volt primary circuits for operating bells and signal appliances when primary wiring is installed in accordance with Class C of the National Electrical Code; for use on 250-volt primary circuits for similar service when both primary and secondary circuits and appliances are installed in accordance with Class C of the National Electrical Code.

Listed November 23, 1915.

SIGNS, Electric.—C. I. Brink, Incorporated, South Boston, Mass.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters, have labels attached.

Listed November 22, 1915.

WIRES, Miscellaneous. — American Electrical Works, Phillipsdale, Rhode Island.

Special cables for electrically-operated organs, consisting of 600 conductors or less, each of No. 22 to No. 26 B. & S. gauge, solid tinned copper wire, insulated with silk and cotton wraps. The cable has a double paper wrap and paraffine-filled braid.

Marking: One large yellow thread or braid in center of the cable.

This cable is considered suitable for use for purpose of organ operation where source of energy is either a self-excited generator rated at not over 15 volts, or a primary battery. Parts of cables not in conduit and not within organ proper, organ sections and organ console must be covered with a closely wound fireproof braid.

Listed November 22, 1915.

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CURRENT ELECTRICAL NEWS

ATLANTIC STATES.

WARE, MASS.—This town is considering the installation of an electrically-driven plump at its pumping station. The Water Commissioners have the matter in charge. W.

PHILADELPHIA, PA.—The Consolidated Ice Manufacturing Company will erect a two-story brick, concrete and steel ice plant at 2331 North Bodine Street. Peuckert & Wunder, Philadelphia, are the architects.

PHILADELPHIA, PA.—A certificate of corporate amendment has been filed with the State of Delaware to increase the capital stock of the Citizen's Gas and Electric Company from $700,000 to $800,000.

READING, PA.—The Reading Transit & Light Company is contemplating extensive improvements to its power equipment, and it is understood that extensions involving the expenditure of $300,000 will be made during 1916.

HAGERSTOWN, MD.—The Northern Virginia Power Company will extend its transmission line by way of White Post from Boyce to Riverton in Warren County, Va.

CHICKAMAUGA, GA. — The Crystal Springs Bleachery will install a lighting plant for public lighting.

SOUTH CENTRAL STATES.

GEORGETOWN, KY.—The city is considering the construction of an electric-light plant.

FLAT RIVER, MO.—The city is considering the installation of an electric light plant and water works. Address mayor.

MARKS, MISS.—James Fitzel has secured a franchise for the construction of an electric light plant.

OXFORD, MISS. — The city has voted an issue of $7,000 bonds to improve the electric lighting system and will install underground conduits.

PASS CHRISTIAN, MISS. — The city will issue $7,000,000 in bonds to improve the electric light system. Underground conduits will be installed. Address Xaxier A. Kramer, engineer, Magnolia, Miss.

SUMNER, MISS. — The Electric Light and Power Company has increased its capitalization from $4,000 to $25,000, and has changed its name to the Southern Electric Service Company.

SHARON, TENN.—A bond issue has been voted of which $10,000 will be spent for an electric lighting plant. Contracts will be closed as soon as bonds are sold.

DECATUR, ALA. — Mayor James A. Nelson and the board of aldermen are considering the construction of an electric lighting plant. The cost is estimated at $40,000.

TULSA, OKLA.—The Oil Fields Gas and Electric Company has been organized here with a capital stock of $200,000. The incorporators are J. A. Frates, of Springfield, Mo.; Frank Brown, of Independence, Kas.; C. F. Hopkins, of Sapulpa, Okla.; S. W. Barnes, of Kansas City, Mo., and others. D.

KENNEDY, TEX.—The Kennedy Light Company contemplates installing a 75-kilowatt generator in its electric light plant.

WESTERN STATES.

MIAMI, ARIZ.—At a recent election here $40,000 bonds were voted, the proceeds to be used in constructing a municipal electric light and power plant. D.

PALAMOS, ARIZ.—S. H. Woodruff, of Los Angeles, Cal., and associates, plan to utilize the underflow of the Gila River, near here, to reclaim a large tract of land by means of irrigation. Electrically-operated pumps will be installed upon a number of large wells that will be dug in the dry bed of the river and the water lifted to the surface in that manner.

PRESCOTT, ARIZ.—It is planned by Col. E. P. Thayer, of Indianapolis, and associates, to construct a large water storage dam and hydroelectric plant on Burro Creek, near here. A survey for the site of the proposed works is now being made. D.

CULBERTSON, MONT. — Donaldson Brothers, owners of a local electric light plant, have announced extensions and improvements will be made to the local plant and distributing lines. O.

KALISPELL, MONT. — The Mission Range Power Company has been granted a franchise by the county commissioners, to construct a power transmission line from the company's hydroelectric power plant in the mountains east of Polson, to Polson, where the company will supply that city and neighboring towns with current for both light and power. O.

SPOKANE, WASH.—On a bid of $27,000, the Washington Water Power Company, of Spokane, has been awarded contract by city council for installation of an ornamental lighting system on the south side of Trent Avenue, from Division to Lincoln Streets. The contract provides that 36 lights be installed, the equipment to become the property of the city of Spokane at the end of 10 years. O.

BELLINGHAM, WASH.—The city council has instructed the Puget Sound Traction, Light and Power Company to immediately install some 450 tungsten lights in various parts of the city, these to be installed without cost to the municipality, other than rental charges provided in the contract between the city and corporation.

PROSSER, WASH. — Preliminary surveys for a dam for a proposed municipal power and light plant to be constructed on the Yakima River, near here, have been completed and estimates of cost of the construction of the plant, transmission lines, distributing system, etc., will be submitted to the city council for its approval early in January. A special election to vote bonds for construction will be held, providing the council approves plans. It is reported, if present intentions do not miscarry, the plant will be built during the summer or 1916. O.

WATERVILLE, WASH. — County Commissioners of Douglas County, D. F. Kinder, County Auditor, has granted a franchise for the construction of a power transmission line over Douglas County public roads between Mansfield and Bridgeport, to the Okanogan Valley Light and Power Company. This company has a franchise to furnish both Bridgeport and Mansfield with current for light and power, and it is reported the installation in the two towns and construction of the transmission line will begin early in January. O.

JEWELL, ORE. — A small power plant for both lighting and power will be installed on James Jamieson's ranch, near this city, by D. S. Ewart, electrical engineer, of Astoria, Ore., after the first of the year. O.

PROPOSAL.

NAVY ELECTRICAL SUPPLIES. —The Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., has asked for bids for electrical material as follows: 150,000 feet incandescent lamp cord, schedule No. 9151, for delivery at Navy Yard, Brooklyn, N. Y.; 11,000 solid and cored arc lamp carbons; 18,200 feet single conductor wire, schedule No. 9153, both for delivery at Navy Yard, Brooklyn, N. Y.

NEW INCORPORATIONS.

CLEVELAND, O.—The Cleveland Electric & Machine Manufacturing Company. Increase from $25,000 to $50,000.

CHICAGO, ILL.—Oakland Talking Electric Sign Company. Capital, $70,000; incorporators, Thomas Kerwin, F. C. Otis and H. B. Houck.

LAKE GENEVA, WIS.—Southern Wisconsin Electric Company. Capital, $100,000; incorporators, John B. Sanborn, C. E. Blake and W. J. P. Aberg.

JERSEY CITY, N. J.—The New Jersey Power and Light Company, to manufacture electricity for light, heat, power, etc., capital, $2,000,000.

CHICAGO, ILL.—The Anchor Electric Company has been incorporated with a capital of $8,000, by Timothy J. Fell, 133 West Washington Street.

NEW YORK, N. Y.—Kilmer Lighting Company, Inc. Electrical apparatus, etc. Capital $5,000. Incorporators: William S. Kilmer, Richard J. Kent and John H. Gibson.

BISMARCK, N. D.—The Woodruff Electric Light and Power Company has organized. Capital, $25,000. Incorporators, W. G. Woodruff, G. F. Dullam and others.

ZANESVILLE, O.—The Amrine-Coffman Electric Company; capital, $20,000. Incorporators: Charles L. Amrine, David A. Coffman, Carl J. Fischer, Gilbert Snyder, John F. Bartholomew and C. W. Wendell.

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MILWAUKEE, WIS.—The Electric Steel Casting Company has incorporated with a capital of $300,000. Incorporators: Chauncey Yockey, Leo. G. Smith and F. G. Wetter.

KIRKSVILLE, MO.—Adair County Light, Power and Ice Company has been incorporated with a capital of $10,000, by Harry M. Still, John C. Mills and others.

INDIANAPOLIS, IND.—The Welsh Manufacturing Company has been incorporated. Capital, $50,000; electrical appliances; directors, J. H. Welsh, J. L. Gasper and L. S. MacEnamey.

OLYMPIA, WASH.—The Pacific Power Development Company, a foreign corporation of Mobridge, S. D., filed articles of incorporation with the secretary of state here. Capital stock is $1,000,000.

NEW YORK, N. Y.—Electric Stethoscope Co., Inc., to manufacture electric devices, etc. Capital $250,000. Incorporators: Samuel B. Wellington, John C. Gordon and Edmund R. Dodge, all of 154 Nassau Street, New York City.

NEW YORK, N. Y.—Redtop Electric Company, Inc. Electrical apparatus, etc. Capital $500,000. Incorporators: Nelson H. Truett and Grover C. Trumbull, both of Malba, L. I., N. Y., and Henry J. Lucke, 2 Rector Street, New York City.

MORTON, VA.—Norton Electric Supply & Equipment Company, Inc.; electric supply business. Capital stock: Maximum, $15,000; minimum, $10,000; par value, $10. Incorporators: W. H. Keller, president; M. B. Keller, secretary, both of Norton, Va.

PORTLAND, ME.—The Cathay Development Corporation has been organized with a capital stock of $1,000,000, to do a general electrical and railway business. The officers and directors are: J. H. Pierce, R. V. Snow, S. O. Symonds, and David W. Snow, clerk. W.

WILMINGTON, DEL.—The Kennedy Engineering Works, Inc., has been granted a charter in Delaware to manufacture elevators, engines and machines of all kinds. The capital is $4,000,000 and the incorporators are F. R. Hansell, Philadelphia George H. B. Martin and John A. McPeak, Camden, N. J.

CHICAGO, ILL. — The Chicago Motor and Vibrator Company has been incorporated with a capital stock of $25,000. The company is to manufacture and deal in electrical apparatus and light hardware. Charles L. Wood, Joseph Burke and John W. Marshall are the incorporators. Z.

SPRINGFIELD, ILL.—Secretary of State Stevenson has issued a license to incorporate the Tamms Ice, Light and Fuel Company, of Tamms, with a capital stock of $2,500; the object is to generate electricity and to manufacture ice for the general public. The incorporators are: E. J. Hodges, Sr., E. J. Hodges, Jr., and Mildred Hodges.

WILMINGTON, DEL.—The Phonordograph Company has been incorporated in Delaware to manufacture moving picture machines, telephone and electrical apparatus and devices of all kinds. The capital is $300,000 and the incorporators are Joseph F. Curtin, Samuel B. Howard and S. A. Anderson, all of New York City.

CHICAGO, ILL. — The National Pulley and Manufacturing Company has been incorporated. The company's capital stock is $100,000, and it is to manufacture and deal in machinery, electric motors and merchandise. William D. Bradfield, Francis M. Kauffman Albert J. H. Miller, M. J. Bates, and James M. Wait are the incorporators. Z.

FINANCIAL NOTES.

York Railways Company has called for payment, at par and accrued interest, on January 30, 1916, all its outstanding dividend scrip. The transfer books on the dividend scrip closed December 31, 1915, and no transfer will be made after that date. The company also has purchased substantially all its $500,000 one-year six-per-cent notes which mature February 1, 1916, and after that date will be practically without debt, except that represented by its first mortgage bonds. At a meeting of the directors, John E. Zimmerman and Charles H. Bean, of Philadelphia, were added to the board, the board having been increased from seven to nine members.

Dividends.

	Term	Rate	Payable
Am. Pub. Service, pf	Q	1.75%	Jan. 1
Am. Tel. & Tel	Q	2 %	Jan. 5
Cal. Ry. & Pw., pf	Q	1.75%	Jan. 3
Chicago City Rys	Q	2 %	Dec. 30
Cin., Newport & Cov. Lt. & Trac., com	Q	1.5 %	Jan. 15
Cin., Newport & Cov. Lt. & Trac., pf	Q	1.125%	Jan. 15
Elec. Lt. & Pw. of Abington & Rockland	S	$4.00	Jan. 1
Elmira Water, Lt. & R. R., 7% pf	Q	1.75%	Dec. 31
Elmira Water, Lt. & R. R., 5% pf	Q	1.25%	Dec. 31
Gen. Gas & Elec., pf	Q	1.75%	Jan. 3
Gen. Gas & Elec., extra	—	0.5 %	Jan. 3
Gen. Gas & Elec., extra	—	0.25%	Jan. 3
Harrisburg Lt. & Pw., pf.	Q	1.5 %	Dec. 31
Internat'l Trac., 7% pf	—	0.875%	Jan. 15
Internat'l Trac., 4% pf	—	0.5 %	Jan. 15
Mass. Ltg., old com	—	$1.75	Jan. 15
Mass. Ltg., pf	—	$1.50	Jan. 15
Mass. Ltg., new com	—	25c	Jan. 15
New Eng. Tel. & Tel	Q	1.75%	Dec. 31
Niagara Falls Pw	Q	$2.00	Jan. 15
No. Ont. Lt. & Pw., pf	S	3 %	Jan. 15
Penn. Ltg.	Q	1.25%	Jan. 15
Pub. Serv. Corp. of N. J.	Q	1.75%	Dec. 31
Republic Ry. & Lt., pf	Q	1.5 %	Jan. 15
So. Carolina Lt., Pw. & Rys.	Q	1.5 %	Jan. 3
United Util.	Q	1.75%	Jan. 2
Utah Pw. & Lt	Q	1.75%	Jan. 3

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 27	Dec. 20
American Tel. & Tel. (New York)	128⅞	128⅜
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	244	242½
Electric Storage Battery common (Philadelphia)	66	66
Electric Storage Battery preferred (Philadelphia)	66	66
General Electric (New York)	173	172¾
Kings County Electric (New York)	126	126
Massachusetts Electric common (Boston)	5½	6
Massachusetts Electric preferred (Boston)	34	36
National Carbon common (Chicago)	165	165
National Carbon preferred (Chicago)	121	121
New England Telephone (Boston)	132¼	131
Philadelphia Electric (Philadelphia)	28¾	28¾
Postal Telegraph and Cables common (New York)	78½	78
Postal Telegraph and Cables preferred (New York)	65	65
Western Union (New York)	86½	89
Westinghouse common (New York)	68⅞	68½
Westinghouse preferred (New York)	78	79

Reports of Earnings.

GEORGIA RAILWAY & POWER.

	1915	1914
November gross	$ 608,324	$ 546,656
Net after taxes	291,668	212,877
Eleven months' gross	5,868,466	5,762,392
Net after taxes	2,497,638	2,321,974

REPUBLIC RAILWAY & LIGHT.

	1915	1914
November gross	$ 289,151	$ 241,625
Net after taxes	121,886	88,560
Total income	122,385	90,132
Surplus after charges	63,547	34,126
Balance after preferred dividends	37,590	8,169
Eleven months' gross	2,800,428	2,741,626
Net after taxes	1,094,436	1,037,816
Total income	1,096,026	1,041,365
Surplus after charges	460,142	420,855
Balance after preferred dividends	174,615	135,328

DAYTON POWER & LIGHT COMPANY.

	1915	1914
November gross	$111,094	$ 89,992
Net	56,628	40,729
Surplus after preferred dividends	26,688	12,883
Eleven months' gross	966,485	845,880
Net	465,516	379,035
Surplus after preferred dividends	149,451	83,341

DUQUESNE LIGHT COMPANY.
(Philadelphia Co. Subsidiary.)

	1915	1914
November gross	$ 473,993	$ 434,326
Net earnings	248,316	221,528
Eight months' gross	3,272,832	3,127,330
Net earnings	1,583,242	1,295,512

SOUTHERN CALIFORNIA EDISON.

	1915	1914
November gross	$ 409,933	$ 400,086
Net after taxes	218,165	214,367
Total income	221,568	223,300
Surplus after charges	136,179	142,987
Balance after depreciation	66,179	72,987
Eleven months' gross	4,395,695	4,339,318
Net after taxes	2,368,688	2,220,148
Total income	2,474,705	2,305,301
Surplus after charges	1,547,676	1,455,932
Balance after depreciation	927,676	835,932

DATES AHEAD.

Pan-American Scientific Congress, Washington, D. C., December 27-January 8. Secretary General, John Barrett, Washington, D. C.

Western Society of Engineers. Annual meeting, Hotel Sherman, Chicago, Ill., January 12. Secretary, E. N. Layfield, Monadnock Block, Chicago, Ill.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, January 17-19. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, January 25-27. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

American Electric Railway Association. Midyear meeting, Congress Hotel, Chicago, Ill., February 4. Secretary, E. R. Burritt, 8 West Fortieth Street, New York City.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York City.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

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PERSONAL MENTION.

MR. R. E. BAILEY, power salesman in the Salt Lake division of the Utah Power and Light Company, has been transferred to the sales department of the company's general office at headquarters in Salt Lake City.

MR. H. S. WELLS, superintendent of residence district sales in the Salt Lake division of the Utah Power and Light Company, has returned to Portland, Ore., for a couple of weeks where he was called to testify in a law suit in which the Pacific Power and Light Company with which he was formerly connected as sales manager, is involved.

MR. CHARLES FFRENCH, for several years advertising manager of Electrical Review Publishing Company, Inc., with headquarters at Chicago, Ill., and now the publisher of the *Musical Leader*, of Chicago, has recently been confirmed by unanimous vote of the city council as Mayor Thompson's appointee upon the Board of Education of the City of Chicago.

MR. E. L. PHILLIPS, 50 Church Street, New York City, entertained the employees of the North Shore Electric Light & Power Company, of Port Jefferson, L. I., on Saturday, December 11, as they had achieved a gain of over 30 per cent in output during the past year. The party attended a performance at the Hippodrome in the afternoon and dinner afterwards.

MR. HAROLD E. WHITNEY, secretary of the Connecticut River Power Company, which operates a large hydroelectric generating plant on the Connecticut River at Vernon, Vt., was married December 25, to Miss Marguerite S. Benedict, supervisor of drawing and manual training at Brattleboro, Vt. Mr. and Mrs. Whitney will reside in that town.

MR. W. D'ARCY RYAN, illuminating engineer of the General Electric Company, who has been in San Francisco for the past two years in connection with the illumination of the Panama-Pacific International Exposition, of which he had charge, was in Chicago Christmas week having taken charge of the lighting of the municipal Christmas tree. Mr. Ryan returned to San Francisco on December 28, where he is engaged in special street-lighting investigations for the city. Later he will carry on some special work for Salt Lake City in connection with a new street-lighting system. Mr. Ryan expects to return to Schenectady early in February.

MR. A. EMERY WISHON, assistant general manager of the San Joaquin Light and Power Corporation, of Fresno, Cal., spent a week in Salt Lake City recently. While there he investigated electrical developments in that field particularly with reference to the application of electricity to cooking and baking. Mr. Wishon expresses himself as very favorably impressed with progress which the Utah Power and Light Company has made in the installation of electric ranges in apartment houses and electric bake ovens in restaurants and bakeries. He spent considerable time interviewing its customers and quite generally received unqualifiedly favorable comments.

MR. BAYARD W. MENDENHALL, sales superintendent of the Salt Lake division of the Utah Power and Light Company, has tendered his resignation, effective December 31, 1915, and will thereafter engage in business for himself. Two years ago Mr. Mendenhall organized the Electric Specialty Company, which makes a line of electrically-heated chick and bacteriological incubators, and he will now devote his entire time to the interests of this company. Mr. Mendenhall entered the employ of the Utah Light and Railway Company in the fall of 1905, as power salesman, and has been with that company and its successor continuously since this time, except for one year spent at Ely, Nev., as manager of the Ely Light and Power Company. Since May, 1908, he has held the position of commercial agent for the Utah Light and Railway Company, and as sales superintendent for its successor, the Utah Power and Light Company. Mr. Mendenhall graduated in electrical engineering from the Massachusetts Institute of Technology of Boston, in 1902. The next three years he spent in the organization of the Stone & Webster Engineering Corporation, of Boston.

MR. PAUL M. LINCOLN, whose connection with the Westinghouse Companies in their operating and engineering activities dates back for over 23 years, as of January 1, 1916, becomes associated with the sales organization of the Westinghouse Electric and Manufacturing Company, with the title of commercial engineer. Mr. Lincoln is well known in engineering circles through his active work in the American Institute of Electrical Engineers, of which he is a past president. He is a well known writer on technical subjects and has also been identified with educational work for some time, filling the chair of professor of electrical engineering of the University of Pittsburgh. Mr. Lincoln was graduated from the Ohio State University in 1892.

Paul M. Lincoln.

MR. WILLIAM F. KELLY and MR. CHARLES B. COOK, JR. have recently opened an office in the Drexel Building, Philadelphia, under the firm name of Kelly, Cooke & Company to conduct a general engineering practice in the public utility and industrial fields. Their organization is equipped for the design and supervision of construction for railways, light and power properties and industrial plants; engineering reports, appraisals and rate developments for public utilities. The firm also investigates industrial situations to develop ways and means for reducing manufacturing costs. William F. Kelly, senior member, received the degree of mechanical engineer from the University of Pennsylvania in 1893. For several years thereafter he was on the engineering staff of the Union Traction Company, of Philadelphia, and from 1901 to 1915 was a member of the staff of Ford, Bacon & Davis, acting as engineer in charge of several of their larger operations, including the construction and reconstruction of the Knoxville Railway and Light Company and the Birmingham Railway, Light and Power Company. Charles B. Cooke, Jr., was also graduated from the University of Pennsylvania, and entered the shops of the Westinghouse Machine Company, East Pittsburgh, working up finally to the position of assistant commercial engineer of the company which position he occupied for two years prior to joining the staff of Ford, Bacon & Davis. During his connection with the latter firm Mr. Cooke specialized on financial engineering reports and also had personal charge of a number of important rate developments and reports for public utility companies.

OBITUARY.

MR. GEORGE A. REDMAN died at Rochester on December 10, at the age of sixty-eight years. Mr. Redman was a pioneer in electrical work, first being connected with the Western Union Telegraph Company, afterwards assisting in the establishment of electric-lighting interests in Rochester, and in its early days was quite active in the affairs of the National Electric Light Association. Mr. Redman retired from active work several years ago, and made his home the greater part of the year in Florida.

PROF. JOHN P. BARRETT, of Chicago, died at 4400 South Michigan Avenue, December 28. Prof. Barrett was for many years at the head of the electrical department of the city of Chicago, serving under mayor Carter H. Harrison, Sr., and had charge of the electrical exhibit at the World's Fair at Chicago in 1893. He was present at the first meeting of the National Electric Light Association in this city in February, 1885, participated in its discussions, and was a regular attendant at subsequent conventions. In 1897 he retired on a pension. A widow and seven children survive him.

MR. WILLIAM C. ANDREWS, for several years advertising manager of the Edison Storage Battery Company, Orange, N. J., died suddenly in the Hotel Chelsea, New York, on Monday, December 20. Early in the morning he had called a bell boy and told him that he had taken an overdose of strychnine by mistake, and asked for a doctor. When the physician entered the room he found Mr. Andrews in an unconscious condition and he died shortly afterward. Mr. Andrews was born in Brooklyn and was 42 years old. He was a graduate of Columbia, and for a time taught civics in the university. For some time he was with the General Electric Company, and was in the editorial department of the McGraw Publishing Company for several years. He became associated with the Edison Storage Battery Company about three years ago. He was a member of the American Institute of Electrical Engineers, New York Electrical Society and several other scientific, business and social organizations. He had a very wide acquaintance in the electrical field, and his death will come as a shock to a host of close friends and intimate acquaintances.

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Record of Electrical Patents

Issued by the United States Patent Office, December 21, 1915

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,164,625. Impulse-Sending Mechanism. A. H. Adams, assignor to the Western Electric Co., New York, N. Y. Finger hold operated, for automatic telephones.

1,164,626. Impulse-Transmitting Mechanism. A. H. Adams, assignor to Western Electric Co. Modification of above.

1,164,633. Trolley-Wire Support. W. F. Detwiler, Tarentum, Pa. Adjustable arm carries adjustable hanger.

1,164,634. Electric Riveter. S. S. Eveland, Philadelphia, Pa. Special transformer control and has dia-magnetic plate as one electrode.

1,164,635. Electrical System of Distribution. G. R. Fessenden, Jr., Lancaster, N. Y., assignor to Gould Coupler Co. Battery car lighting system.

1,164,662. Party-Line Telephone System. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of connector, selective ringing, etc., in central energy automatic system.

1,164,671. Alternating-Current Electric-Despatch System. K. E. Stuart, London, England. Supply of alternating current of different frequencies and unidirectional braking current to induction motor on car controlled by controller exterior to car through contact conductors.

1,164,719. Electric-Motor-Control Apparatus. H. F. Hitner, assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa. For hoisting apparatus.

1,164,720. Stand-Lamp Reflector. P. M. Hotchkin, Chicago, Ill. Combination of indirect and direct lighting.

1,164,722. Ignition System. R. Huff, assignor to Packard Motor Car Co., Detroit, Mich. Switch attachment for spark-plug.

1,164,727. Switch for Lighting Installations. F. Krantz, assignor to the firm of Robert Bosch, Stuttgart, Germany. Has catch preventing movement to "off" position unless manually withdrawn.

1,164,728. Arc-Light Electrode. I. Ladoff, Cleveland, Ohio, assignor of 30/100 to W. D. Edmonds, Boonville, N. Y. Comprises preponderance of carbon with titanate of barium.

1,164,734. Electroplating-Generator. D. McDermid, Irvington, N. J. Arrangement of brush holders and connections on low voltage, heavy current generator.

1,164,736. Automatic Time-Lock for Workmen's Time-Recorders. F. J. Mantel and F. W. Eaton, assignors to Crouse-Hinds Co., Syracuse, N. Y. Electromagnetically operated.

1,164,737. Signaling System. C. F. Mead, Cleveland, Ohio. Circuit closing mechanism.

1,164,739. Method of Making Insulating Devices. R. D. Mershon, New York, N. Y. Manner of treating and assembling porcelain parts.

1,164,746. Secondary or Storage Battery. W. S. O'Connor, New York, N. Y. Manner of spacing and binding grids together with special view to ventilation.

1,164,749. Controlling Mechanism. C. J. Powell, Chicago, Ill., assignor of 8/25 to E. F. Falkenberg and 5/25 to S. E. Brown, Chicago, Ill. Circuit closer controlled by application of water weight to pivoted lever.

1,164,757. Lightning-Arrester. E. O. Schweitzer and N. J. Conrad, assignors to Schweitzer & Conrad, Chicago, Ill. Manner of breaking arc by control of arc gases.

1,164,767. Electric Cigar-Lighter. M. H. Spielman, New York, N. Y. Special structure for admitting air to lighting point.

1,164,786. Fire-Alarm-Box Attachment. A. Cudosky and L. Cudosky, Passaic, N. J. Grips arm of operator.

1,164,832. Automobile-Signal. P. McLaren, Whittier, Cal. Electromagnetically operated signal disk.

1,164,836. Automobile-Horn. R. H. Manson, assignor to Garford Mfg. Co., Elyria, Ohio. Special provision for escape of foreign material from operating chamber of horn having electromagnetically operated diaphragm.

1,164,876. Gas-Gun. D. Sayler, Orland, Cal. Ignition controlled by trigger.

1,164,882. Safety-Trap for Sewerage Systems. H. J. Sommer, Hollidaysburg, Pa. Electrical alarms designate stopped pipe.

1,164,906. Automatic Circuit-Breaker. J. P. Arndt, Neenah, Wis. Unitary structure adapted to be plugged into fuse socket.

1,164,907. Printing-Telegraph System. C. G. Ashley, assignor to General Engineering and Construction Co., Toronto, Canada. Control of printing elements in receiver.

1,164,920. Electrical-Wire-Regulating Apparatus. H. S. Cassel, Stockholm, Sweden. For automatically reeling in and paying out aerial wires.

1,164,932. Plating Machine. J. A. L. Deters, Chicago, Ill. Structure of partially submerged, rotatable barrel for holding articles.

1,164,933. Shaft-Drive. R. M. Dixon, assignor to Safety Car Heating & Lighting Co., Newark, N. J. For axle driven car lighting system.

1,164,955. Trolley-Harp Fastener. A. C. Miner, Missoula, Mont. Pole has sections articulated for movement in two relatively fixed rectangularly disposed planes.

1,164,971. Insulating-Joint. C. Wirt, assignor to Macallen Co., Boston, Mass. Strain insulator.

1,164,974. Insulated Rail-Joint. C. E. Ballou, assignor to Ballou Safety Rail-Joint Co., Roanoke, Va. Special structure of fish plate.

1,164,984. Electric Switch. G. Breed, assignor to Lyrachord Co., New York, N. Y. Blades separated by compressible insulation and blades and insulation bound together.

1,164,987. Method of and Apparatus for Projecting Roentgen Images. G. Bucky, assignor to Siemens & Halske A. G., Berlin, Germany. Has a grid or screen at the image plate for screening off secondary rays.

1,165,038. Variable-Speed Power Transmission. J. G. P. Thomas, Chiswick, London, England. Electromechanical drive controlled by motor in circuit of generator driven by prime motor.

1,165,055. Electric Furnace. W. J. Wrighton, assignor to Leeds & Northrup Co., Philadelphia, Pa. Method of making tubular heating element.

1,165,075. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. Joint control of resistances in several circuits.

1,165,032. Speed-Indicating Mechanism. G. P. Finnigan, Richmond, Pa. Electromotive force varying in frequency and magnitude with the speed acts on reeds of different natural periods.

1,165,092. Power-Transmitting Mechanism. W. Grunow, Jr., New York, N. Y. Electromagnets give intermittent actuation in either direction.

1,165,098. Motor Control. C. H. Herr, St. Louis, Mo. Fluid motor operating damper electrically controlled by steam gage.

1,165,100. Combined Filling and Gas Valve for Storage Batteries. W. E. Holland, assignor to Edison Storage Battery Co., West Orange, N. J. Structure of plug for mounting in cover.

1,165,101. Storage Battery. M. R. Hutchinson and C. W. Norton, assignors to Edison Storage Battery Co. Arrangement and separation of plates.

1,165,113. Electric Fuse. T. E. Murray, Jr., assignor to T. E. Murray, New York, N. Y. Details of fuse plug.

1,165,114. Insulating Pipe-Coupling. T. E. Murray, New York, N. Y. Sleeve of insulation has metal nipples secured on its ends with collar of insulation between.

1,165,117. Automobile-Signal. J. Nicholson, Sacramento, Cal. Magnet operated; for mounting on mud guard.

1,165,126. Signal Device. N. E. Rennar, Jersey City, N. J. For automobiles; circuit controlled by brake rod.

1,165,138. X-Ray Tube. H. C. Snook and G. H. White, assignors to Roentgen Mfg. Co., Philadelphia, Pa. Structure of target and electrode.

1,165,139. Elevator Signal System. J. G. Somers, New York, N. Y. Up and down push buttons on each floor for signaling cars.

1,165,140 and 1,165,141. Means for Preventing Current Leakage in Electric Cables. S. D. Sprong and W. E. McCoy, New York, N. Y. First patent: insulation at joint. Second patent: multi-conductor insulation.

1,165,152. Automatic Train-Stop. M. B. Bulla, El Paso, Tex. Magnet has circuit closed on passing danger signal, operates gong and air motor to stop engine.

1,165,176. Wire-Stripping Tool. H. A. Horner, Philadelphia, Pa. For removing insulation from wires.

1,165,192. Circuit-Breaker. J. W. McMillion, Mattewan, W. Va. Compact structure of magnet operated switch in box.

1,165,205. Fitting for Electric Conduits. J. C. Phelps, Springfield, Mass. Rosette for detachable securing to conduit.

1,165,221. Combination Magneto-Generator. W. C. Berling, Buffalo, N. Y. Lighting and igniting generators in same frame.

1,165,232. Optical Instrument. H. L. DeZeng, Maple Shade, N. J: Handle of diagnostic instrument carries battery, etc., for lamp on instrument.

1,165,254. Safety Cut-Out for Electric Railways. H. H. H. Heiberg, Simsbury, Conn. Automatic control of current supply at turn-out on single track road to prevent head-on collisions.

1,165,255. Telephone-Transmitter. C. D. Herrold and E. Portal, San Jose, Cal. Special arrangement of water-cooled resistance cells.

1,165,273. Wire-Connector. R. H. Miller, Lansing, Mich. One wire secured by set-screw, other by releasable spring grip.

1,165,288. Vibration-Absorbing Motor-Stand. J. G. Rimmer, Dorchester, Mass. Motor suspended by strips of rubber-like material.

1,165,309. Guide for Trolley Wheels of Overhead Trolleys for Electric Cars. W. N. Bauer, Cincinnati, Ohio, assignor of one-half to A. C. Kaufmann, Cincinnati, Ohio. Wire finder fingers thrown into operative position by pull on trolley rope..

1,165,312. Make-and-Break Device for Electric Circuits. J. T. Boyle, Mount Vernon, Ill. Motor operated interrupter.

1,165,336. Magneto-Switchboard Cord-Circuit. O. M. Leich, assignor to Cracraft Leich Electric Co., Genoa, Ill. Local battery system.

1,165,346. Plating-Machine. L. Schulte, Chicago, Ill. Structure of article carrying barrel.

1,165,362. Electro-Magneto Retaining Device. O. A. Ross, assignor to General Railway Signal Co., Gates, N. Y. Alternating current operated.

1,165,372. Potential-Regulator. E. H. Porter, Philadelphia, Pa. Uni-directional impulses applied to field have polarity varied and are neutralized in response to voltage of generator.

1,165,374. Ignition-Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Is adjustable with relation to interrupter to regulate spark intensity by varying relation of current peak and time of interruption.

Patents Expired.

The following United States electrical patents expired on December 27, 1915:

616,507. Incandescent Electric Lamp Socket and Base. C. Van Deventer, New York, N. Y.

616,513. Apparatus for Making Observations by Means of Roentgen or X-Rays. J. Wertheimer, Paris, France.

616,554. Razor. J. F. O'Rourke, New York, N. Y.

616,607. Support and Take-Up Device for Cable-Suspended Electric Lamps. J. H. Dorion, Springfield, Mass.

616,612. Armored Electric Cable. E. T. Greenfield, New York, N. Y.

616,620. Electric Incandescent Lamp. H. F. Joel and F. Fanta, London, England.

616,669. Recording Device for Measuring Instruments. A. H. Hoyt, Penacook, N. H.

616,673. Electric Motor and Method of Controlling Same. C. W. Kennedy, Rutledge, Pa.

616,714. Automatic Telephone Exchange. F. A. Lundquist, J. Erickson and C. J. Erickson, Lindsborg, Kan.

616,718. Telephone Gravity Switch. C. T. Mason, Sumter, S. C.

616,722. Railway-Signaling Device. F. M. Myers, Windsor, Mo.

616,755. Binding-Post for Electrical, Telephonic and Telegraphic Instruments. J. A. Williams, Cleveland, O.

616,770. Lighting or Extinguishing Automatically Incandescent Electric Lamps. C. S. Cole and J. H. Kinsman, Bridgeport, Conn.

616,779. Electrical Safety Lamp for Miners. C. Francke, Berlin, Germany.

616,800. Electric Heater. J. F. McElroy, Albany, N. Y.

616,824. Underground Electric Railway System. F. H. Chamberlain and G. B. Coleman, Washington, D. C.

616,842. Automatic Regulator. H. E. Hunt, Pittsburgh, Pa.

616,861 and 616,864. Automatic Weighing Machine. F. H. Richards, Hartford, Conn.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

MAKING THE ELECTRICAL STORE ATTRACTIVE.

The attention of the electrical contractor and dealer has often been directed to the necessity of proper window dressing and recognizing and following the principles of merchandising which have been demonstrated as applicable to other lines of business. It is generally appreciated that window displays, advertising and other points of contact with the purchaser must be fully utilized if the greatest volume of sales is to be achieved. It is not only necessary to attract the eye and the attention of the prospect who already has in mind the purchase of some electrical device or supplies, but the effort should be made to stimulate a desire in those who have not given the matter previous consideration.

In making such an appeal to the public, the electrical dealer should realize that he is in the larger sense in competition not only with other electrical firms, but with all others engaged in retail merchandising of any kind. In most communities there is a rather definite amount of resources applicable to the purchase of articles for household and personal use. The proportion in which such funds are expended in different lines of trade depends largely upon the appeal which is made by the latter to the individual in stimulating his desires, and in making the wares attractive. In this sense all retailers are in competition with each other, even though a certain amount of sales will have their nature determined by considerations entirely outside the control of the merchant. It is, however, often the margin of trade which can be influenced by proper sales and advertising methods which may determine the success or failure of a particular enterprise.

Merchandising is an art which deserves careful study by the electrical dealer along lines which have spelled success in other businesses.

DEVELOPMENTS IN TRANSFORMER CONSTRUCTION.

Reliability in operation is today recognized as the first requirement in transformer construction. Efficiency, first cost, regulation, etc., are important elements which must be fully considered in designing the mechanical and electrical features, but reliability cannot be sacrificed to any of these. Transformers are required which will not only operate under normal conditions, but which can withstand such abnormal conditons as short-circuit. General adaptability is also an important feature, and since many transformers are required for outdoor service, it is becoming general practice to fit all self-cooling transformers for such service. Self-cooling units are now available in sizes up to 5,000 kilowatts. With proper consideration to tank radiaton and construction to meet this end, there is no reason why this capacity should not be exceeded in future.

The advantage of circular coils in rigidity and strength is becoming more widely recognized. This form of coil is most easily applied in core-type construction and this type includes each year a greater proportion of the total output. Core-type transformers are now built up to 10,000 kilowatts in size.

The suitability of air-blast transformers for special locations keeps up the demand for this type of unit, and larger capacities have lately been realized in single units than ever before. During the past year a 10,000-kilowatt transformer of this type was constructed, a new record having thereby been set, as nothing so large as this had ever before been attempted in this type of construction.

BOILER-ROOM FACILITIES.

Steam engineers as a rule understand the conditions of boiler firing which are necessary to secure the highest efficiency in the use of fuel, that is, to secure complete combustion and at the same time extract from the products of combustion the greatest amount of the liberated heat. Many men have acquired sufficient judgment to decide fairly well from inspection whether the necessary conditions are being realized, and if not, what measures are necessary to do so, but to be sure of his ground even the most experienced engineer will resort to carbon-dioxide meters, steam-flow meters, etc., and will compare the figures for pounds of water pumped, pounds of coal consumed, steam pressure maintained, etc. In other words, only a quantitative knowledge of data and conditions is adequate for basing a definite opinion of performance and results achieved.

For the satisfactory and economical management of the boiler room, facilities should be supplied for making such definite quantitative checks at all times, and not merely upon the occasion of formal boiler tests. The average fireman is not a combustion expert, and his training has usually been along the line of keeping up steam pressure and seeing that the water level in the boiler does not get too low. Perhaps he has been instructed also to avoid smoke as far as possible, but in many cases he has no means of knowing whether smoke is actually issuing from the chimney. If the load is not such as to tax the capacity of the boiler he may have little or no indication of whether the fuel is being burned efficiently, whether a surplus of air is being admitted to the furnace, or whether other conditions are

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wrong. To have intelligent firing carried out, the boiler room should be provided with proper facilities and the fireman should have instruction as to how they may be intelligently used in securing the best results.

FACTORY LIGHTING CODES.

The necessity for specific requirements as to the lighting of factories and other workshops is coming to be generally recognized. The factory laws of many countries and of some of the states in this country have made some general requirements as to adequate artificial lighting, but as a rule these have not been specific enough to accomplish anything definite. During the past year committees have been at work in both England and the United States formulating codes which give in some detail the desirable characteristics for a satisfactory system of lighting, including a few numerical values for fixing definite requirements.

The British report on this subject was prepared under the direction of the Departmental Committee on Lighting in Factories and Workshops. The American report was prepared by a committee of the Illuminating Engineering Society and was presented at the last annual convention of that Society. The two reports have some features in common and in some respects differ in their scope. Each report gives a discussion of the subject as well as providing definite recommendations as the basis for legislation.

In the general principles which are applicable and in the general requirements which are set forth, the two reports are in good agreement. Both recognize the necessity of avoiding glare and of supplying illumination of sufficient intensity and uniform in its distribution, and of providing for the illumination of vertical as well as horizontal planes of work. The necessity of cleaning reflectors and other equipment is pointed out.

When it came to specifying minimum requirements numerically, the British committee was not so ready to adopt values except for poorly illuminated places such as stairways. For the latter it prescribed 0.1 foot-candle as a minimum, whereas the American code specifies 0.25 foot-candle. For open yards the British minimum is placed at 0.05 foot-candle, whereas the American code does not give any specification for such places.

For rooms where rough manufacturing is carried on the American committee has specified 1.25 foot-candles as a minimum, and for fine work 3.5 foot-candles. The British committee has not attempted to give definite values for different kinds of work, but has satisfied itself by limiting the general illumination to a value not lower than 0.25 foot-candle, with the understanding that this is to be supplemented at places where work is being done. It should be noted in this connection, however, that the American specification is not a real minimum, since another specification in the code permits a 20-per-cent deterioration from the specified value. The specification consequently is not so exacting as would at first sight appear.

The proposed standards are not high in any case, and it is not intended to suggest that they are the most desirable values. The above values are lower than those which will be found in many well lighted factories. The aim has been rather to suggest a legal minimum which might without hardship be required in every case, thus improving the conditions in those factories which have not followed good practice, without running any risk of enforcing a requirement which might in some individual case entail a greater expenditure than is warranted in preventing unsafe conditions or such as may be deleterious to the eyesight of the workers. For it is upon the latter grounds that legal requirements are at all justifiable.

The fact that so much attention is being given to adequate illumination is encouraging to those who have for a long time recognized the need of improvements in this respect. In spite of the fact that it has been demonstrated that accidents are fewer in well lighted shops and that a superior quality and quantity of output results from the supply of adequate illumination, the deplorable fact remains that the majority of factories are not properly lighted and that one of the best investments their owners could make would be to install a new system of illumination. Legislation frequently appears to be necessary to drive the majority of managers of industrial plants as well as other persons to take measures for their own benefit and gain, and the domain of factory illumination is no exception to this rule.

FLOOD LIGHTING.

The tendency towards the use of flood lighting which has gradually taken form during the last few years was accentuated by the use of this form of illumination at the Panama-Pacific International Exposition. The electric lighting at the Exposition was a revelation to many of the possibilities along this line. The attention which it attracted was intensified by comparison with previous expositions, since upon no former occasion of this kind has the lighting been of a type which at all resembled that utilized at San Francisco.

A great stimulus was given by the notable effects secured at the Exposition to the utilization of flood lighting and during the past year the number of such installations, some of a permanent character and some for only temporary purposes, has been noticeable. Not only building facades, but billboards and other objects filling an advertising need, have been extensively illuminated after this fashion. One notable example of this style was furnished by the Chicago Christmas tree which was described and illustrated in last week's issue.

One of the main characteristics of flood lighting which especially commends it, is the absence of glare which is realized by making use of hidden sources of light. This presents a notable attainment from the standpoint of art and of personal comfort as well as

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of good illumination. These are sufficient reasons for its popularity. It has, however, another merit, which consists in the flexibility which it offers for variation in the effects produced. The possibilities offered by changing colors, by shifting the high lights, and other manipulations which cannot easily be carried out with visible sources, may be easily achieved by this method.

The development of flood lighting is one which not only illuminating engineers, but purveyors of current and the general public may contemplate with satisfaction.

CURRENT RELATIONS FOR SUDDEN FUSING.

Values for the carrying capacity of wires and for the fusing currents which are ordinarily given in tables are based upon the supposition of a steady current or of one which is gradually raised to a fusing value. Under such conditions the temperature of the wire is determined by its ability to dissipate heat, and in all cases the heat generated in it is determined by the resistance and the value of the current flowing.

When a current has not a steady value, however, the instantaneous temperature which it may reach will depend not only upon its capacity for dissipating heat by radiation and convection, but also upon its heat capacity, or ability to absorb heat. The heat capacity depends upon the mass and the specific heat of the conductor. When comparing wires of different materials the specific heat may be slightly different. If the comparison is based upon equality of electrical resistance, the mass of metal involved will be quite different for the different substances. Iron, for instance, must have a considerable greater cross-section than copper in order to have the same resistance, and its heat capacity is consequently much greater. The specific heat of iron is not far different from that of copper. An aluminum wire having the same resistance as copper will have a larger cross-section, but a smaller mass. Aluminum, however, has a much higher specific heat than copper, so that the heat capacity of the wire will not be so greatly different.

The importance of these considerations was brought out in a paper read by Prof. Frank C. Wagner at the recent meeting of the American Association for the Advancement of Science. The investigation made by him was suggested by an accident case, and it developed that a copper wire having a larger carrying capacity than a given iron wire and requiring a larger steady current to fuse it, would nevertheless melt more quickly than the iron wire under an excessive overload. This is a fact which it is well to bear in mind in connection with ground wires and protective apparatus which is to operate under conditions of suddenly applied voltage or current, such as may arise from lightning discharges, etc. It will not do to assume in such cases that the conductors will behave the same in this connection under transient conditions as under steady conditions, any more than in other electrical relations.

MAKING UTILITY CUSTOMERS FINANCIAL PARTNERS.

It is generally agreed among central-station executives that activities looking toward the promotion of more harmonious relations between a public utility company and its customers are of great importance and that, although there may be differences of opinion as to the best means of fostering such harmony, some well defined program should be followed. Public-policy advertising in newspapers and through other mediums is perhaps the oldest and most satisfactory method of gaining the confidence of the community served. Quite recently the plan of inducing central-station customers to become financially interested in the company has been given considerable impetus.

The underlying feature of such propaganda has been to encourage as many as possible to invest small amounts either in stock or bonds of small denomination rather than solicit large investments from comparatively few. In most instances where this plan has been adopted the response on the part of the public has been most gratifying. Reports received from many sources have indicated that one direct result of having its customers financially interested in the company has been that fewer trivial complaints have been received. It seems to have been the attitude on the part of the investors that, being financially interested in the company, it was good policy on their part to overlook little omissions or trouble in connection with the service that otherwise would have been cause for a grievance.

Elsewhere in this issue there is published a brief preliminary report from a syndicate operating a number of public utilities where the plan of making customers financial partners has been widely adopted. Aside from business increases, which may in some measure be attributed to this policy, the company in question reports that it has every reason to expect that the widespread distribution of securities and earnings in home territory will practically do away with unfair agitation against progressively managed corporations.

The wise central-station operator is he who looks ahead. By encouraging customers to invest in their home utilities it is obvious that the company will be in a much more favorable position at a time when franchise renewal, rate adjustments, municipal ownership, etc., are up for consideration than if this commendable phase of public-policy activity were ignored.

The form of participation may consist in the issuance of "baby" bonds in denominations such as to attract small savings, or stock of the usual par value may be offered either for cash or on the installment plan. In the latter case interest should be allowed on all payments from the time at which they are made, even though the delivery of certificates is deferred until the payments are completed.

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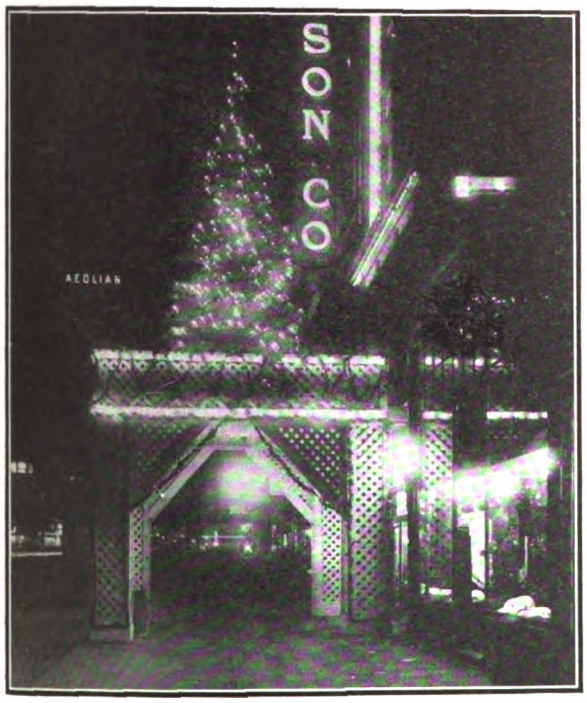
Happenings in the Industry

Unique Christmas Tree in New York—Meeting of American Association for the Advancement of Science—New York Vehicle Matters—University of Illinois Receives Historical Gift—High-Pressure Distribution Systems Discussed—Big Attendance at Sandusky Show—Miscellaneous News Notes

An Over-Sidewalk Christmas Tree in New York.

The first Christmas tree to be erected over the heads of passersby nodded its topmost light more than 50 feet above the pavement of West Forty-second Street, New York City, on Christmas. The tree, which was a giant fir about 35 feet high, came from Canada. It was set on an ornamental platform fifteen feet above the sidewalk, in front of the 124 West Forty-second Street offices of the New York Edison Company. Nearly a thousand tiny electric bulbs decked the branches of the tree and the portico itself was outlined with concealed electric lights



Over-Sidewalk Christmas Tree In New York.

and Christmas greens. The idea originated with Arthur Williams, general commercial manager of the New York Edison Company and was carried out by the Engineering Bureau. The tree could be plainly seen for several blocks and was constantly the object of admiration of groups on the sidewalk. This is the first time that a Christmas tree has ever been placed in so unique a position.

Next Institute Meeting in New York.

The 317th meeting of the American Institute of Electrical Engineers will be held in the Engineering Societies Building, 33 West Thirty-ninth Street, New York City, on Friday, January 14, at 8:15 p. m.

Charles P. Steinmetz will be the speaker of the evening and will present a paper entitled "Outline of Theory of Impulse Current," in which he shows that from the integral of the general differential equation of the electric circuit, all types of electric currents are derived as special cases corresponding to particular values of the integration constants. In presenting this subject Dr. Steinmetz will supplement the printed paper by an explanation of the general subject as fully as the time will permit.

CARRYING CAPACITIES OF WIRES FOR TRANSIENT CURRENTS.

Meeting of the American Association for the Advancement of Science.

At the meeting of the American Association for the Advancement of Science, held at the Ohio State University, Columbus, O., December 27 to 31, 1915, a paper was presented by Frank C. Wagner, of Rose Polytechnic Institute, before the Engineering Section, entitled "Relative Carrying Capacity of Different Metals for Electric Currents Greater than Fusing Currents." Professor Wagner showed that the relative carrying capacities as given in the usual tables do not apply to heavy currents of magnitudes sufficient to melt the wire; that is to say the wire which will safely carry the largest steady current is not necessarily the one which will longest resist fusion when an excessively high current is transmitted.

Professor Wagner worked out an equation for the time necessary for fusion under different circumstances. The general equation of the form $t=KF^2/I^2$, where t is the time in seconds, I is the current in amperes, K is a constant, F is a quantity depending only upon the metal of which the wire is composed. F may be calculated for substances where the necessary properties, such specific heat, conductivity, etc., are known. The following values have been verified by experiment:

For copper, $F=10.2\times10^8$.
For iron, $F=1.19\times10^8$.
For aluminum, $F=3.6\times10^8$.
For German silver, $F=1.7\times10^8$.

He cited a case where wires of iron and copper were compared. The copper wire required a current of 42 amperes to just fuse it, while the iron wire required only 25.8 amperes. When 108 amperes were sent through both wires the copper fused in 1.4 seconds, while the iron wire remained intact.

In many telephone installations where No. 12 iron wire has been used, it has been considered sufficient to make a ground connection with No. 18 copper wire. The latter will carry steadily a larger current than the former, but will fuse first with an abnormally large current. It is, therefore, not suitable for a ground connection.

The Engineering Section met under the chairmanship of Bion J. Arnold, of Chicago. Among other papers which were presented were the following: "A Cylinder Friction and Lubrication Apparatus," by Allan E. Flowers; "Automatic Mapper," by F. E. Austin; "The Engineering Laboratories of the Ohio State University," by William F. Maguruder.

Section B held joint sessions with the American Physical Society. Among the papers presented was the address of the retiring vice-president, Anthony Zeleny, entitled "The Dependance of Progress in Science Upon the Development of Instruments."

G. M. J. Mackay presented a paper by C. V. Ferguson and himself entitled "Arcs in Gases Between Non-consuming Electrodes." This described experiments in connection with such arcs as are utilized in lamps of the type described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN December 25, 1915, page 1166.

The following papers were also presented: "A Proposed Physical Method for Reducing Radiant Power to Its Luminous Value," by Irwin G. Priest and Chauncy G. Peters; "A Luminosity Curve Equation and Its Application to the Black

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Body," by E. F. Kingsbury; "Black-Body Brightness and the Mechanical Equivalent of Light," by Herbert E. Ives and E. F. Kingsbury; "The True Temperature Scale for Tungsten and Its Emissive Powers at Incandescent Temperatures," by A. G. Worthing; "Color Temperature Scales for Tungsten and Carbon," by Edward P. Hyde, F. E. Cady and W. E. Forsythe; "A New Law Relating Ionization Pressure and Current in the Corona of Constant Potentials," by Earle H. Warner; "The Hall Effect and Allied Phenomena in Rare Metals and Alloys," by Alpheus W. Smith; "A Resonance Method for Measuring the Phase Difference of Condensers," by H. L. Dodge; "A Simplified Apparatus for Measuring the Conductivity of Electrolytes," by R. P. Hibbard; "Measurements of an Electric Current from Its Heating Effect," by S. Leroy Brown; "A Study of the Law of Response of the Silicon Detector," by Louise S. McDowell; "Constant High Potential for X-Ray Work," by Albert Hull; "Carbon Compression Rheostats," by E. L. Clark; "The Black Body at the Melting Point of Platinum as a Fixed Point in Photometry," by Herbert E. Ives; "The Luminous Efficiency of the Carbon Incandescent Lamp and the Mechanical Equivalent of Light," by Herbert E. Ives and E. F. Kingsbury; "The Hall Effect and Allied Phenomena in Tellurium," by P. I. Wold.

New York Vehicle Meeting.

E. W. Curtis, Jr., of the General Vehicle Company, gave a very interesting talk on "Electric-Vehicle Conditions in Europe" at the meeting of the New York Section of the Electric Vehicle Association of America, held on December 28.

At the same meeting, S. C. Harris, storage-battery expert of the New York Edison Company, read a paper on "Methods of Design and Operation Which Assure Efficiency of the Electric Vehicle," advancing many new and novel ideas based on practical experience and thorough study of the electric-vehicle problem. This paper brought considerable discussion from many prominent engineers and proprietors of electric vehicles.

A special feature connected with the meeting of the Section was the exhibition of one of the electric taxicabs of the Detroit Taxicab Company. It was stated that 25 of the cabs have been in operation in Detroit for over a year with great satisfaction to the taxicab company, formerly large operators of the gasoline type, and that the Detroit public was keenly interested in the new development. Several engineers present, in close touch with the taxicab situation, predicted their general introduction in the larger cities of the country because these cars overcome the disadvantages of other types of taxicabs.

Cups to be Presented to Winners in Ward Electric Sales Campaign by Arthur Williams.

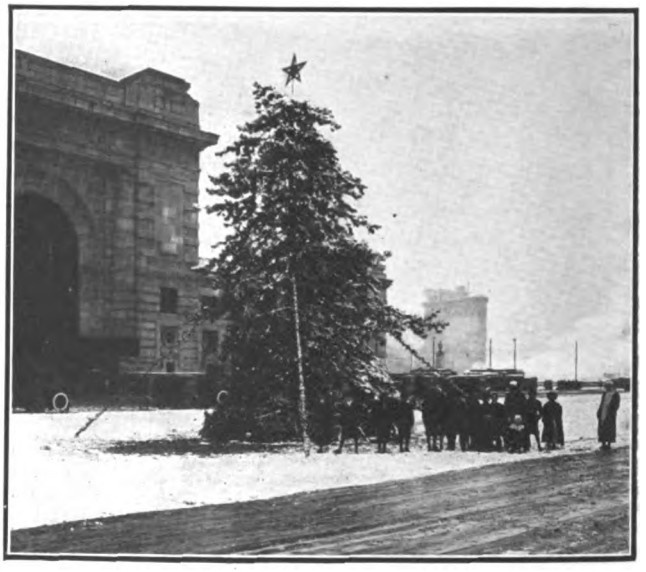
The New York Electric Vehicle Association has just announced the winners of the two silver cups offered by Arthur Williams for the best selling records in the recent two months' campaign of the Ward Motor Vehicle Company, in marketing its new 750-pound electric delivery wagon. The cups, which were offered to incite friendly competition among the salesmen of the various lighting companies, have been on exhibition during the past week in the New York Edison show rooms at Fifteenth Street and Irving Place.

The first cup, which is the team prize, was won by the New York team comprised of central-station salesmen of Greater New York. The New Jersey team came in second. The second cup, which is the individual prize, goes to Edward Friend, a salesman in the Harlem office of the New York Edison Company, for the greatest number of cars sold by one man. Henry S. Reilly and H. J. Gardnier received honorable mention.

Kansas City Christmas Tree Donated by Local Central Station.

Along with dozens of smaller towns in the West which were celebrating Christmas with "community trees," Kansas City, Mo., also celebrated, but in a way that made its festivities of considerably more than local significance. Its tree was in the Plaza at the Union Station, and the festivities were enjoyed by thousands of travelers, visitors to Kansas City, and persons waiting for trains. The tree was decorated and illuminated the day before Christmas, and was kept in place until after New Year's Day, during the period three distinct programs being given under the auspices of the Women's City League. The plan had the co-operation of the various musical societies, including the Third Regiment Band; and on one of the afternoons, hundreds of school children provided the entertainment.

The tree had been discovered in Union Cemetery, near the station, a forest fir nearly fifty feet high, and was moved to the Plaza by the Kansas City Electric Light



Kansas City Christmas Tree at Union Station Plaza.

Company. The company strung several hundred lights of many colors over the tree, with other decorations, and set a great American flag, in lights, nearby, on one of its poles. The area opposite the station, in the midst of which the tree was placed, is more than 200 feet wide; the station building rises about 100 feet from the street level, so that a large tree was necessary. On the top of it the company placed a star. The tree was illuminated every evening for more than a week, and thousands of citizens made special trips to the station to view it.

University of Illinois Secures Historical Generating Unit.

The College of Engineering of the University of Illinois is to receive from the Commonwealth Edison Company of Chicago, Ill., through the courtesy of its president, Samuel Insull, as a museum exhibit, a vertical triple-expansion engine with its direct-connected generators and their equipment of transformers, regulators, switches, instruments, etc.

Mr. Insull's letter of presentation sets forth the fact that this engine, which was one of ten similar units, has a normal rating of 600 horsepower and was built in the year 1893 by the Southwark Foundry & Machine Company, of Philadelphia, Pa. It was erected during the winter of 1893-94 in the power house of the then Chicago Edison Company. Direct-connected to the engine, one on each side, were two

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200-kilowatt, 150-volt direct-current generators, built by the General Electric Company. The Chicago Edison Company later replaced these generators with the present double-current machines, which were among the first of this type of generators built. The unit was put into service on August 1, 1894.

Jovians Present Christmas Tree to Knoxville.

The Christmas tree arranged by the Jovian League of Knoxville, Tenn., aided in prolonging the Christmas celebration throughout the week, as the tree was not dismantled until after New Year's day. Each night the 1,500 lights which decorated the tree were switched on.

The Christmas Eve celebration was a successful one in all respects. The tree was presented to the city by the Rev. T. G. Broughton and was accepted by Commissioner Sam E. Hill, who paid a tribute to the Jovians. T. P. Self, of the Knoxville Railway & Light Company, Tribune of the League, was in charge of the arrangements. One of the features of the tree was the star, which went through a gradual brightening.

High Output for Commonwealth Edison Company.

On December 24, 1915, which was an unusually dark day, the output of the Commonwealth Edison Company reached 4,550,137 kilowatt-hours, the highest daily output in the history of the company. The maximum demand on that day was not correspondingly high, the record so far being reached on November 29.

An Unusual Parade of Electric Vehicles.

Mention was made in a previous issue of a parade of electric vehicles which was conducted by a purchaser of a fleet to celebrate the inauguration of electric delivery service and also as the culminating feature of a sales campaign which was based on the company's improved delivery service. The accompanying illustration shows the parade in progress. Over 90 electric trucks, loaded with 300 tons of coffee, paraded the business district of Chicago on December 22 led by a police escort and band. Considerable attention was attracted and liberal newspaper space was given the affair, resulting in much favorable publicity.

High-Pressure Distribution Systems.

At the December meetings of a number of the sections of the Institution of Electrical Engineers, in London and the English provinces, the subject of the design of high-pressure distribution systems has been discussed. J. R. Beard introduced the matter in a paper in which he first emphasized the importance of safety in operation, suitability of supply for its particular purposes, and freedom from interruption. These he described as the essential characteristics which must be secured at a minimum total annual cost by a well designed distribution system.

With high pressures, accidents are frequently fatal, so safety in operation is of primary importance. The other two limitations have a commercial basis. In all its various uses, electricity is a competitor with other forms of energy, many of them very firmly established, and if it is not supplied in suitable form, or if the supply is subject to interruption, the sale of it will be restricted. The cost of power is such a small proportion of the total cost of running a factory that material irregularity in the supply quickly involves more loss than the whole cost of the power. In such circumstances a supply of electricity will not be a paying proposition, even if it can be obtained for nothing. Failure of supply is usually caused by the breakdown of apparatus, and the primary precaution is therefore careful attention to the design, manufacture and maintenance of the various parts of the system; but since no apparatus can be made absolutely immune from breakdown through external damage, the secondary precaution is to make arrangements so that the effects of a breakdown to any part of the system are localized as much as possible.

In some cases such precautions may mean increased capital cost, but they undoubtedly result in a net economy if a broad view is taken. Fortunately, however, well designed apparatus does not necessarily cost more than badly designed apparatus, and, as Mr. Beard showed, it is possible to cheapen the system by closer localization of breakdowns.

The chief items making up the annual cost are interest on capital expenditure, repairs and provision for depreciation, switchgear attendance, and energy losses in the mains. The sum total of these should be a minimum. The author considered them all in turn, noting in what ways they are interdependent and how they are affected by the essential characteristics noted above. The essential characteristics of the system are not incompatible with designing it on the

A Parade of Walker Electrics Conducted by a Chicago Grocer. There were 90 in Line.

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basis of minimum annual cost, since though they may in a few cases increase the capital expenditure, this is discounted by savings in other ways.

Mr. Beard's object in his paper was to indicate, on the basis of the principles stated above, the most suitable choice of apparatus and the means whereby that apparatus could be used to the greatest advantage. Mains and switchgear form the important points in the choice of individual apparatus, and the methods by which such apparatus can be most economically utilized were considered in three natural successive stages. The basis of the investigations was: (*a*) The determination of the economical section of mains; that is, the correct balance between losses and capital expenditure. From this it was possible to consider progressively: (*b*) The layout of the distribution system to give the maximum economy; (*c*) the most suitable distribution voltage.

In the part of his paper relating to mains, Mr. Beard briefly considered the conditions which determined whether underground or overhead mains are most suitable for particular cases. His remarks concerning switchgear were directed to the more important or novel features which should influence the choice of the most suitable apparatus for substation use; similar principles apply, but with greater force, to power-station switchgear.

In regard to the economical section of mains, he said that although it is generally known that the economical cross-section of a main is that at which the sum of the annual charges and the value of the energy lost are a minimum, it is seldom that any practical use was made of the formula. This is partly owing to the difficulty of calculating the losses and of placing the correct value upon them when calculated, and also partly because there is an impression that the resulting cross-section would work out to a figure inconsistent with that required by considerations of carrying-capacity and voltage drop. In Mr. Beard's investigation he made an attempt to apply the formula to the special case of high-pressure distribution systems and this seemed to show that for this case at any rate the results are commercially useful.

In considering the layout of the distribution system, Mr. Beard said that, except in special circumstances, it is usually essential for each substation to have at least two separate sources of supply, and if the supply to the substation is not to be interrupted by a failure of one source, some form of discriminating protective device must be installed on each feeder in order to isolate it automatically in the event of its breakdown. It is, however, not so generally recognized that it is of equal importance that a fault on one feeder must not interfere with the supply through the sound feeders, however severe the fault may be. The only forms of protection in commercial use which meet these conditions under all circumstances are the balanced-current protective system with pilot wires, and the split-conductor protective system. Both have the further advantage that the isolation of the faulty feeder is practically instantaneous and can be effected with quite a low value of the fault current, so that the disturbance to the general system is a minimum.

Mr. Wedmore, in an earlier paper read before the Institution, recommended the split-conductor system as the more suitable for feeder protection. Mr. Beard said it was probable that one or other of them would be universally used if it were not that there is often an impression that they involve extra capital cost which is not justified by the extra security that they give. Undoubtedly they increase the cost per mile of a main of given section, but this is counterbalanced by the saving effected by the possibility of using an interconnected system, which allows (*a*) a reduction in the cost of mains, due to the saving in spare feeders; (*b*) a reduction in the cost of mains, due to the possibility of replacing a number of small feeders by a few large ones which are cheaper per ampere of carrying capacity; (*c*) a reduction in the amount of switchgear required; (*d*) a reduction in the total annual cost of mains, owing to it being possible to take advantage of the diversity between the demands of different substations.

Mr. Beard, by means of a diagram of the high-pressure distribution system on the northeast coast of England, illustrated the extent to which a system might be safely interconnected by the use of these devices. No fewer than 350 substations are connected to this system, and it is fed by 15 power stations, many of which utilize waste energy in the form of exhaust steam and coke-oven gas. The whole of the feeders shown are normally in commission and interconnected, the older ones being equipped with balanced-current protection and the more recent ones with split-conductor protection.

As showing the reliability of both these forms of protection, the operating records of this system indicate that over a period of time, selected quite at random, faults occurred on 23 feeders equipped with automatic protection, and that in 22 cases the faulty feeder was instantaneously isolated without causing an interruption of supply to a single substation, except in one instance where the substation in question was given a non-duplicate supply through the faulty feeder. In the remaining case, although the protective gear operated satisfactorily, one of the feeder switches failed to open, due to a mechanical fault; this was equivalent to a busbar fault and brought out the overload gear at two sectioning points, thus limiting the trouble to this section of the system.

Mr. Beard attempted, in a full investigation that followed, to give definite figures for the saving effected by an interconnected system. These figures showed that the saving was not only sufficient to balance the cost of the protective devices, but that a system so equipped was actually cheaper than systems protected by less efficient methods which did not give the same freedom from interruption of supply.

Over 70 Per Cent of Population of Sandusky Visits Electric Show.

Nearly 16,000 people, or over 70 per cent of the population of Sandusky, Ohio, visited the electrical show given during Electrical Prosperity Week, and this under rather discouraging weather conditions. Every merchant in the city who deals in any kind of electric appliances, all of the contractors, and the Sandusky Gas & Electric Company, had exhibits, many of them unique and all educational in character. One of the interesting exhibits was that of the telephone companies, with switchboards in operation and operators present to explain the little things about telephony that people most frequently misunderstand.

The proceedings were opened December 1 with a "pilgrimage" to Milan, Ohio, by over 150 business men, where a tablet was attached to the house in which Thomas A. Edison was born. This trip was made, in a rain and sleet storm, in special interurban cars. It marked the beginning of a movement to erect a monument to Mr. Edison at the place of his birth, which movement is now in process of organization.

The ceremonies at the Edison homestead were in charge of Major C. B. Wilcox, of the Sandusky Gas & Electric Company, a W. S. Barstow & Company property, and the principal address was delivered by James T. Bagg, superintendent of the schools of Sandusky. Mr. Edison sent the following telegram to the committee: "Your telegram has been received and I desire to express to you and to all concerned my deep appreciation of the honor that has been conferred upon me by yourselves and the people of Sandusky."

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National Electric Light Convention to Open in Chicago on May 22.

As mentioned in our issue of November 27, the thirty-ninth annual convention of the National Electric Light Association will be held at Chicago, Ill., during the week of May 22. An earlier date than usual was selected by President Lloyd because of the National Republican convention, which will be held in Chicago early in June.

Headquarters will be at the Congress and Auditorium Hotels, where it is proposed all the meetings shall be held, as well as the annual exhibit.

Electric Cooking Discussed Before Kansas City Jovians.

Louis H. Egan, general manager of the Kansas City (Mo.) Electric Light Company, delivered an address Tuesday, December 28, before the Jovian Electric Club, at Kansas City, on "Electric Cooking," illustrated with lantern slides prepared under his direction. The address had for its purpose the presentation of the problem involved in the establishment of rates for current for ranges. The slides showed, chiefly, cooking load curves from other cities, east and west, in some cases the curves being superimposed on the Kansas City residence load curves to show the probable effect of cooking loads on the local curves. The study of the experiences of central stations that have extensively promoted the installation of electric ranges was presented as suggestive of the obstacles and problems that would be encountered, as well as the advantageous features, in working out the arrangements for cooking loads and the exploitation of electricity for cooking, elsewhere. He mentioned, for instance, that in Kansas City, the cooking load would probably come at the time of the highest lighting load, in the evening, and the question would arise as to the relations between the cooking load-factor and the residence load-factor, the possibility being presented that, in fact, the cooking rate might be found not far from the residence rate, though various factors might influence the establishment of a lower rate than the operating figures justified.

The address was particularly timely, in view of the agitation that has been begun locally, for reduction of rates for current, particularly for cooking, with which is an incipient campaign for the building of a municipal plant.

There was some discussion following the address, during which it was mentioned that in fact a rate for electricity of three-tenths or four-tenths of a cent, would be necessary to compete, in fuel cost, with natural gas at 27 cents; and that it would be bad business, as well as violative of economic laws, to try to press the installation of electric ranges where an abundant supply of natural gas was cheaply available, except in cases where the many advantages of electricity as fuel, and other conditions, overcame the discrepancy in cost.

Safety Medal Winners Announced by American Museum of Safety.

Winners of the medals awarded by the American Museum of Safety for meritorious work in safety and conserving life have just been announced by Arthur Williams, president of the Museum. The Louis Livingston Seaman Medal for progress and achievement in the promotion of hygiene and the mitigation of occupational disease is awarded to William Armstrong Fairburn, president of the Diamond Match Company. This medal was awarded last year to Surgeon General William C. Gorgas, U. S. A.

The Scientific American Medal for the most efficient safety device is awarded to Elmer A. Sperry for his gyroscope compass. The Travelers' Insurance Company's Medal this year is awarded to the Hudson & Manhattan Railroad Company for achievement in accident prevention to its own employees and to the public. Dr. William H. Tolman, director of the Safety Museum, announces that the medals will be presented to the winners at the annual dinner of the Museum at the Waldorf Astoria on February 3.

Wireless to Japan.

The Japanese Government has notified the Marconi Wireless Telegraph Company of America that the new wireless station at Funabashi, near Tokio, is completed and will be ready for transpacific communication soon. Experimental work between Honolulu and Funabashi is now going on, and the reports indicate that the system is working in splendid fashion at both terminals, which are separated by a distance of 3,400 miles. The Funabashi station is equipped with the Marconi apparatus, but is owned and operated by the Japanese Government.

The new government station at Funabashi is a 300-kilowatt plant, the same as the plant near San Francisco. There are two stations at Honolulu, each of 300 kilowatts, one facing east and the other west, one to send and the other to receive in the relay work either way.

It was said that when the new transpacific service between Hawaii and Japan is opened to commercial business, the rates will be considerably lower than at present.

Book Review.

"The Electrical Blue Book." Chicago: Electrical Review Publishing Company, Inc. Cloth, 256 pages (7¼ x 10¼ inches). Supplied by publisher for $2.00.

The seventh edition of the Electrical Blue Book presents itself in a very practical and useful form, the new size adapting it for convenient filing with the business literature of the buyer of electrical material. Lighter paper is used and the volume is compact notwithstanding the comprehensive treatment of the subjects included in the work. Publication has been delayed until complete analysis and correction of changes in the National Electrical Code could be incorporated, so that this section of the Blue Book might conform to the most recent publications of the Code under the direction of the National Fire Protection Association. The underlying feature of the Blue Book is the presentation of the National Electrical Code, with illustrations and explanatory notes. Changes in the Code are made conspicuous through the use of bold-face type; there are 180 paragraphs of explanatory notes, and 79 half-tone and line illustrations showing approved methods of meeting Code requirements in electrical construction and installation. The user of electrical material having made certain of the conditions under which electrical equipment may be installed may turn to the List of Approved Fittings for a complete schedule of approved material available, and, having recorded this information may then visualize the material in the condensed catalog data presented by the manufacturers of electrical material. This co-ordinated service—the Code, illustrated and explained; the List of Approved Fittings, and the Condensed Catalog Exhibits of Manufacturers of Electrical Material, make the Electrical Blue Book a valuable adjunct to the working material of the engineer, contractor, architect or purchasing agent of the industrial corporation. In addition to the contents outlined above there are "Rules for Resuscitation from Electric Shock," "Code of Professional Conduct of the American Institute of Electrical Engineers," "Ground Detectors," and "Street-Lighting Schedule for 1916.

A Review of the Year.—Activities in the electrical industry during the year 1915 were reviewed by A. A. Gray, general manager of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, before the regular meeting of the Electric Club-Jovian League, of Chicago, on December 30.

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Electricity in Brick Manufacturing Plants

A Description of the Process Involved In Brick-Making In a Territory Where Fuel Oil Is Plentiful But Where Central-Station Service Has Been Widely Adopted—Operating Data Are Given

Industrial Power Series—Article No. 149.

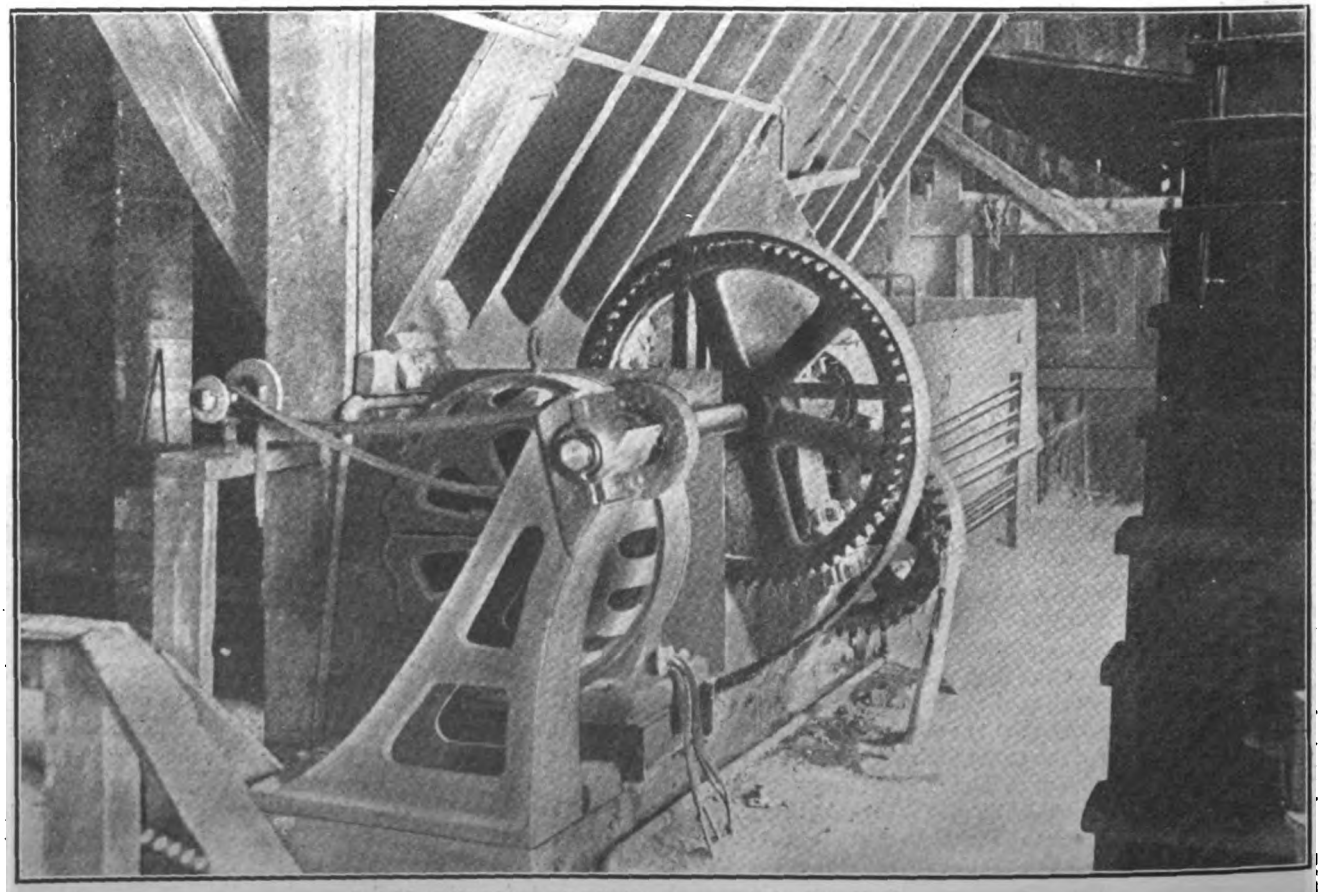
Very little development has taken place in the Southwest in the manufacture of dry-pressed brick and with few exceptions the same methods are employed today that were in use ten and fifteen years ago. Applications of new methods of manufacture have hence been difficult to start and the natural tendency to stick to the old method has been a hindrance to the adoption of electric drive.

Red, dry-pressed brick are made from a clay or shale which appears in various parts of the country in considerable quantities. This shale is found a few feet below the surface of the ground. The first factor to be considered in the location of a brick plant is the depth of the shale strata as all the top dirt must be removed before suitable raw product is procured.

The clay pit, as it is called in the ordinary brick plant, covers an acre or more of ground and is sometimes as much as 50 feet deep. The top dirt having been removed, the pit is gradually formed, the clay being used gradually for making brick. Care is taken to work the surface evenly as drainage is thus facilitated and bad weather is less likely to interfere with the operation of the plant if the pit is properly drained. Usually the pit is worked from one side to another so that at all times one side will be lower than the other or else it is worked so that a certain point is always lowest. The latter is the more usual method and when this system is used an ordinary steam or centrifugal pump is placed near this point and the water is pumped out as fast as the rains fill it up. In this way clay can be taken from the pit within a very few days after the most soaking rain.

Usually the hard shale is plowed and allowed to stand a few days before being carried into a storage shed. This serves to pulverize or slake it and it is much more easily ground. In the Southwest the storage shed is built to hold a large enough supply for one month's use. Here the clay is evenly distributed and left to be further dried out.

From the storage shed the clay is fed into what is known as a dry pan. This dry pan has a bottom made of heavy iron screen with rectangular openings. Two large, massive rollers which move in a direction opposite that in which the dry pan rotates crush the clay or shale through the openings in the bottom into a square pit where it is carried by means of bucket elevators up and over a series of screens in the loft above. The fine material is separated here and fed into a cylindrical mixer which mixes the large and fine particles together assuring an even texture in the finished brick. The powdered mass is then fed through a large rubber hose into the press boxes where as the press wheel revolves it is subjected to a pressure of over a ton to the square inch. As the brick come from the press they are placed on a long carrier and conveyed into the kiln where they are set ready for burning. Before being burned the brick are thoroughly dried out by means of slow wood fires, this process taking from 10 to 14 days, depending on the nature of the weather. When the drying process has been completed oil fires are started in arches on each side of the kiln and the fire gradually raised until the brick have reached a temperature of about 1,700 degrees Fahrenheit. The fires are then cut out and the openings sealed up and the brick



Pug Mill Driven by 40-Horsepower Induction Motor.

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allowed to cool gradually. In about a week or ten days a part of one end of the kiln is removed and the brick are loaded onto cars by means of gravity conveyors. It takes a little over a month from the time the clay is removed from the pit until it is placed in cars for shipment.

Three Stages in Manufacture.

There are three distinct stages in the manufacture of dry-pressed brick and these three stages can be still further subdivided. The three divisions are made, however, because they are practically independent of each other as far as application of electric power is concerned and any one of the stages can be operated with the balance of the plant idle.

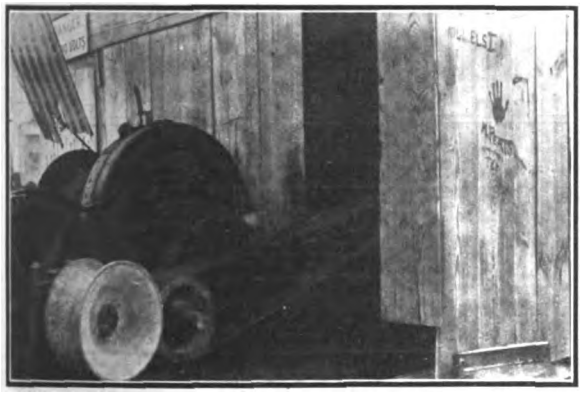
(1) Removing clay from pit and putting it in storage.

(2) Taking clay from storage and putting it through machinery which transforms it into brick, the brick being placed in the kiln.

(3) Burning process or time occupied in converting green brick into the finished product.

There are at present three general methods of conducting the first process, one method of conducting the second process, and three methods of conducting the last-named stage.

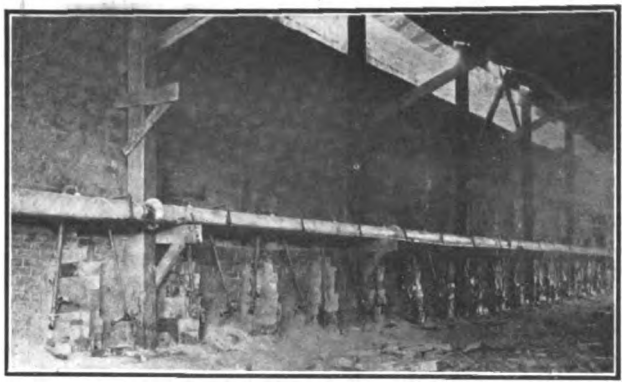
In the territory served by the Texas Power & Light Company one plant plows the shale pit and removes the clay by means of mule-team and scraper directly into the storage shed.



Motor-Driven Hoist Which Operates Clay Scraper.

Other plants use the plow and remove the clay in scrapers to a central point in the pit where it is dumped into a car which hauls it into the shed. Two plants are using a mechanical scraper to dig up the clay, one of these dragging it to a central part of the pit and hauling it into the storage shed in a car and the other taking the clay directly into the shed by means of the scraper. While the latter method is probably a little cheaper as far as labor is concerned, there is no doubt that the cost of maintenance and repairs on the equipment used in conveying the clay directly into the shed eats a large hole in the saving thus effected. The two methods are probably on a par as far as economy is concerned.

It is an easy matter to adapt electric drive to either of the latter two methods. At one plant the mechanical scraper is now being driven by a 50-horsepower, variable-speed, three-phase, induction motor which is connected to the hoist drums by means of a silent chain. This is effective, quick and efficient. No trouble has been experienced with this installation. From the central-station standpoint, however the load is irregular and not steady. On a moderately large system though this variation would prove negligible. A separate motor is used to drive the drum which operates the clay car. A 10, 15 or 20-horsepower squirrel-cage motor, the size depending on the incline and the speed desired, makes an admirable drive for this part of the equipment. Here is one place where electric drive is very advantageous, since it is often desired to operate this part of the plant without operating the main machinery and unless electric drive is used it is necessary to operate the boiler plant at a greatly reduced load in order to provide steam



Arrangement of Air and Oil Piping and Burners.

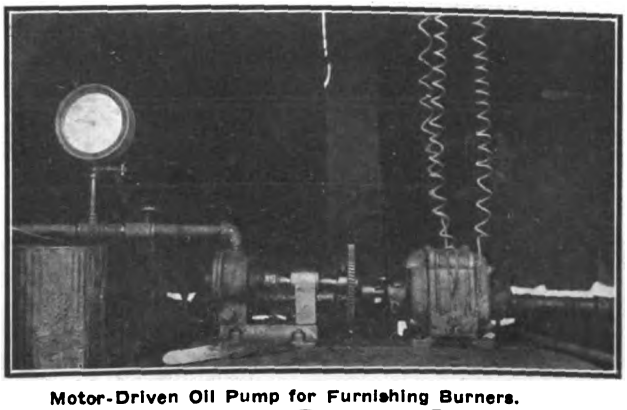
for the small engine with which these cars are usually operated in steam-driven plants. Then too in cold weather, since this small engine is of necessity a considerable distance from the main plant, a large amount of the steam condenses in the pipe line causing further loss.

Motor Drive for Brick Machinery.

Practically all of the plants are using the same method for the second stage of the process. A mule-team with light scraper is used to feed each dry pan. It takes from one to two minutes for the driver to make a trip and hence the pans are alternately crowded and empty. This causes an uneven load and consequently loss in production and efficiency. Various attempts have been made to interest these manufacturers in conveying machinery for this part of the plant but with no success as yet. With the proper conveying equipment one man could do the work that now required two men and two teams. This would effect a considerable saving, even after allowance had been made for power for the conveyors and interest and depreciation of equipment. Then too a more uniform load could be obtained with an improvement in efficiency.

Standard squirrel-cage motors are readily adaptable to the driving of crushing and pressing machinery. Most of the plants are two-press plants, each having a capacity of 20,000 bricks per day. It is very seldom that these are operated separately, although there are occasional shutdowns of one side of the plant. For this reason and on account of the variation of load due to weather conditions one motor will prove more efficient than two in this part of the plant. A 100-horsepower motor will furnish ample power for two presses, two dry pans and the necessary elevators. This machinery runs at constant speed and the load is fairly constant throughout the entire day. The load will vary somewhat during the different seasons of the year due to moisture in the clay. This makes a noticeable difference in the power consumption and also makes a difference in the fuel required to burn the brick.

It is necessary to heat the press boxes and dies in order to keep the clay from sticking and this small item has proven of considerable importance in the application of electricity to this business. Several electric heating units were tried out at



Motor-Driven Oil Pump for Furnishing Burners.

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Data Sheet—Brick Manufacturing.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for twenty-four hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant A.

Plant "A" has a capacity of 40,000 dry-pressed brick per day of approximately 10 hours. Number of men employed, 18.

Operating hours per month, 260.

Total number of motors installed, 4.

Total horsepower, 124.

Average production per month when running full time, 1,000,000 brick.

Average kilowatt-hours per thousand brick for running machinery, pumping water and oil, and supplying air for burning, 20.

Load-factor, 20 per cent.

Consumption by months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	.....	May	10,900	September	8,600
February	13,000	June	11,200	October	.....
March	14,100	July	14,565	November	.....
April	17,600	August	14,100	December	20,000

MOTOR INSTALLATION.

Following is a list of motors installed with the machines driven:

No.	Horse-power.	Speed, R. P. M.	Application.
1	100	900	Belted to line shaft, driving two Boyd mold presses; two Eagle Iron Works dry pans; two strings bucket elevators; two mixers.
1	20	3,600	Direct-connected to centrifugal blower, capacity 1,650 cubic feet of free air compressed per minute to two pounds pressure.
1	3	1,800	Direct-connected to centrifugal pump for pumping water from pit.
1	1	1,200	Geared to rotary oil pump.

Plant B.

Plant "B" has a capacity of 40,000 dry pressed brick per day of approximately 10 hours. Number of men employed, 16.

Operating hours per month, 260.

Total number of motors installed, 4.

Total horsepower, 170.

Average production per month when running full time, 1,000,000 brick.

Average kilowatt-hours per thousand brick for running all machinery and operating clay hoist and drag, 18.

Load-factor, 15 per cent.

Consumption by months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	.....	May	11,310	September	.....
February	.....	June	18,960	October	.....
March	13,909	July	14,820	November	.....
April	15,640	August	8,090	December	.....

MOTOR INSTALLATION.

Following is a list of motors installed with the machines driven:

No.	Horse-power.	Speed, R. P. M.	Application.
2	50	900	Each belted to line shaft driving one Berg four-mold brick press; one Raymond dry pan; one string of bucket elevators.
1	50	720	Drives by means of silent chain hoisting machine to which is connected a scraper for digging clay from pit.
1		1,200	Belted to drum hoist which operates clay car in storage shed.

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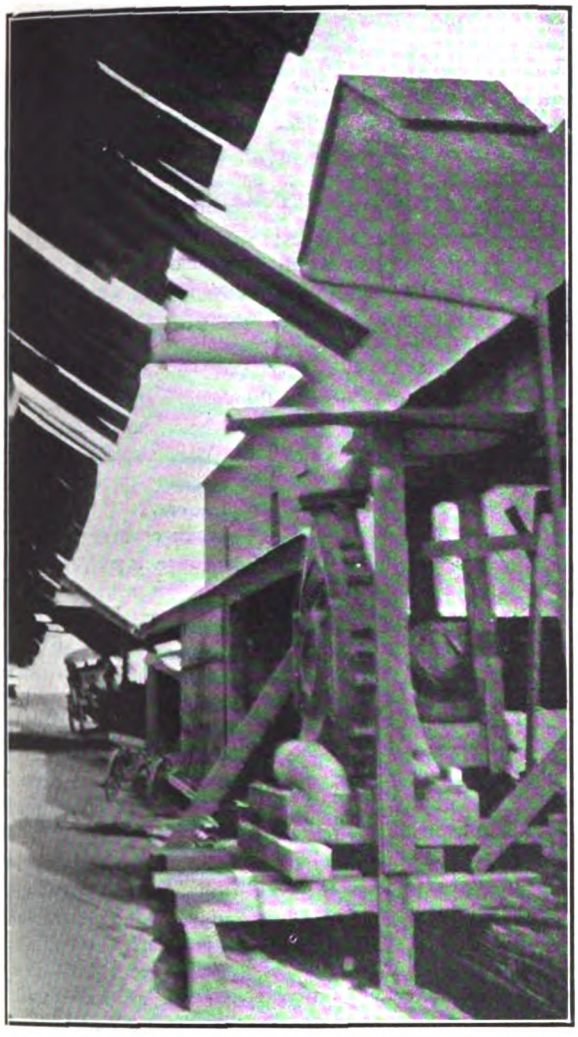


Centrifugal Blower for Atomizing Oil Supply.

one plant but the moisture in the clay is so great and the exposed surface of the die plates and press boxes so small that a heating unit could not be obtained which would do the work at a low enough cost. For this reason a small upright boiler was obtained for this purpose. This has been used successfully and requires practically no attention at all since oil is used as fuel.

The bricks are taken from the presses by the pressman who loads up a two-wheeled carrier. This carrier is wheeled into the kiln by hand. Here is a place where conveyors might again be used but as labor is comparatively cheap it is doubtful whether any saving would be effected by using mechanical conveyors. The physical nature of the plant would necessarily require a large amount of equipment which would have to be moved from kiln to kiln. This matter has never been pushed.

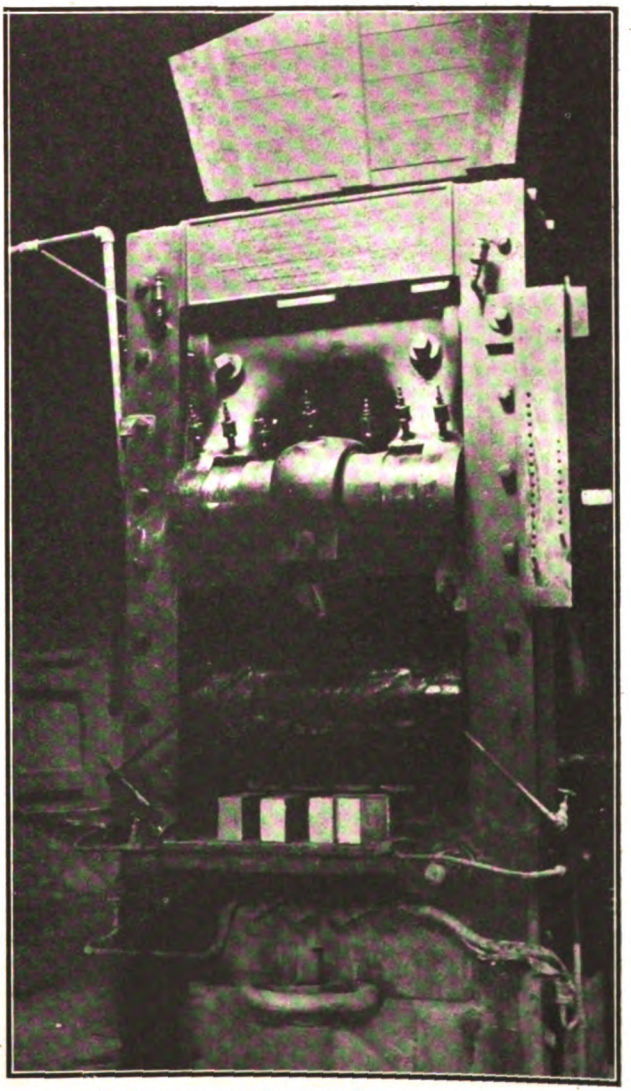
Brick Burning.

We next come to the burning process which has so far proved a big stumbling block in getting this business. The manufacturers keep all their records of fuel cost together and few of them have any data as to what portion of the fuel bill should be charged to their machinery and what part to their burning. The same boiler is used to furnish steam to the engine and to furnish steam for atomizing the oil used in burning. Hence the owners maintain that there is no saving on equipment and also maintain that there is a loss (provided they use their same equipment) due to running their boiler at a reduced load. This is true in part but nevertheless there is a certain part of the expense chargeable to the power plant proper and an analysis of this phase of the problem shows that electric drive can be employed in the operation of the machinery and steam used in the burning process with a considerable saving.

Nevertheless in order to follow the line of least resistance in obtaining this business investigations were made of other methods of burning. Natural gas is now being used in some of the plants and where this is being done this question has been eliminated. The only other method found was an old one and experiments were at once started. An air compressor was obtained and experiments made to determine the probable size of machine necessary for a plant of this size. The experiments started with a pressure of 100 pounds of air to the square inch, but it was quickly decided that this was not feasible as too large a capacity was required to make the matter successful commercially. After experimenting with various pressures it was decided that volume rather than pressure was what was needed. Accordingly tests were made with a number of patented low-pressure oil burners and one was finally chosen which it was thought would do the work.

A large motor-driven blower furnishing air at two pounds pressure was secured. A 10-inch galvanized header was run from this blower along the end of the six kilns and tees were placed at each kiln, six-inch opening being made. From these tees a lateral six-inch spiral rivetted pipe was run along the entire length of the kiln. There are 21 eyes on each side of these kilns and it was necessary to provide taps on the six-inch pipe for 21 one-inch pipes. Air was fed to the burners through these one-inch pipes and it was found that plenty of air could be obtained with this arrangement with no noticeable loss in pressure. A one-inch oil line was used as a main lateral and quarter-inch feeders were connected to this.

The oil was heated indirectly by means of a single burner, a brick vault being made with baffles in it which caused the



Motor-Driven Four-Mold Berg Brick Press.

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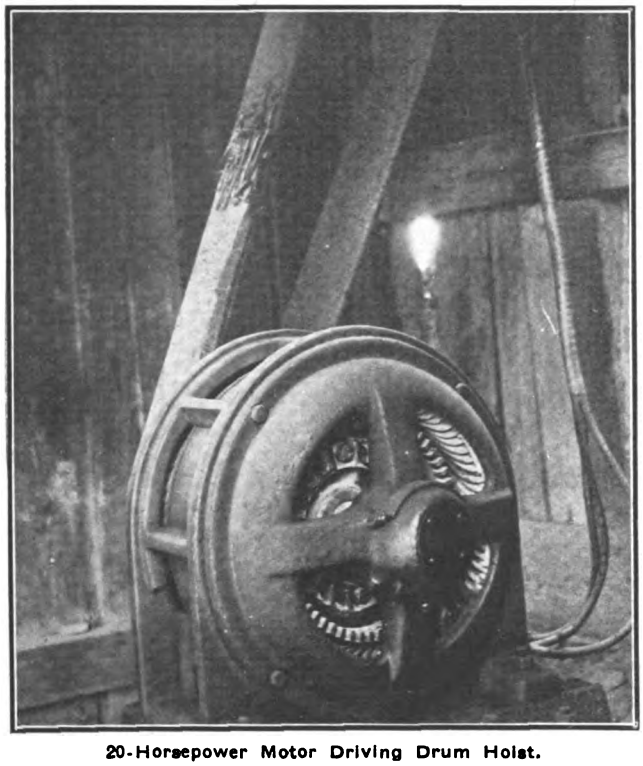
hot gases to pass around a coil of the oil pipe. This vault was placed at one end of the yard. This method of heating was not a success as the oil cooled off in cold weather before it reached the burners. Several other methods of heating the oil were tried. Pipes were placed above the kiln and the oil fed through these. It was thought that the hot gases would sufficiently heat the oil. The heat was so great, however, that the oil was in some cases converted into a gas and this caused fluctuations on the burners. The results obtained on the first kiln burned were as follows:

Number of brick in kiln	390,000
Net amount of oil used, barrels	350
Kilowatt-hours used	1,360
Duration of test, hours	105
Average load in kilowatts	13
Kilowatt-hours per thousand brick	3.23
Net barrels of oil per thousand brick	0.90

These results were considered very favorable for the first test, but the objections above mentioned together with a certain amount of opposition on the part of the labor element employed postponed the acceptance of the method. There is little



20-Horsepower Motor Driving Drum Hoist.

doubt, however, but that with the proper type of labor and the perfection of several mechanical details this method can be successfully applied to this business.

Desirable Class of Business.

The brick plant has a very good load-factor and is desirable business. They operate continously during the year and for that reason can make a very good showing on operating costs with steam. During the past 18 months due to inactivity in the building industry most of the brick plants in Texas have been forced to shut down for periods of from one to three months, and some of them have been shut down as many as six months during the year. For this reason they are not inclined to spend new capital in improvements even though by so doing they can decrease their operating costs.

Labor is employed on a basis of so many brick produced per day and hence electric drive has no advantage as far as production is concerned. It is strictly a matter of economy with the manufacturers in connection with the installation of electrical machinery. The engineer can be eliminated when electric drive is substituted for steam and saving can be made in lubricating oil, waste, repairs and other minor items. Boiler insurance must be continued, however, if steam is utilized for the burning process. Most of the plants have their own artesian wells and consequently their water costs them almost nothing.

Convenience of operation, flexibility of drive, facilities for keeping daily costs of production in the different parts of the plant, and elimination of power plant troubles are factors which assist in obtaining contracts for this class of business.

Examination for Radio Inspector.

The United States Civil Service Commission announces an open competitive examination for radio inspector, for men only, on January 19, 1916, at the usual places. From the register of eligibles resulting from this examination certification will be made to fill vacancies in the positions of radio inspector and assistant radio inspector at salaries ranging from $1,200 to $1,600 a year, depending upon the appointee's qualifications, in the offices of the radio inspectors of the Bureau of Navigation, Department of Commerce, at New York and San Francisco, and vacancies as they may occur throughout the United States in positions requiring similar qualifications.

The duties of radio inspectors will be primarily to inspect the radio apparatus on steamships, to insure its compliance with the law, and to inspect shore stations. The inspectors may also be called upon to examine radio operators. The duties of radio inspectors require some office experience, therefore competitors should outline fully in their applications any office experience they may have had.

The duties of assistant radio inspectors will be primarily the assisting of radio inspectors in the enforcement of the wireless communication laws. Assistant radio inspectors will be required to inspect the radio equipment on board vessels and in land stations, which involves the carrying of 30 or 40 pounds of testing and measuring instruments. The inspection work requires a knowledge of the installation and operation of the several types of radio installations, including the adjustment and tuning of transmitters and receivers.

Applicants for this position must have received a bachelor of science degree from a school of recognized standing, such educational training to have included a special course in radio or kindred sciences, or show that they are senior students in such institutions; or that they have had the equivalent of a high-school education and in addition not less than two years' experience in special radio work, such as the manufacture, installation, or adjustment of commercial or governmental wireless apparatus. It is desirable, but not essential, that they be wireless telegraph operators.

Water-Power Reconnaissance in South Central Alaska.

For several years the United States Geological Survey has been making a study of the water supply of parts of Alaska. At first this work was confined to Seward Peninsula; later it was extended to the Yukon-Tanana region; and Water-Supply Paper 372, just issued, describes the water resources of the region tributary to Copper River, Prince William Sound, and the lower Susitna. Stream measurements made during only one season can not, of course, be relied upon for estimating average flows, but the Survey engineers, C. E. Ellsworth and R. W. Davenport, besides makjng measurements of the flow of some of the streams, obtained much information on the topography of the drainage basins, reservoirs, and power sites. The data thus obtained, when combined with the Weather Bureau's records of precipitation, will serve as a general guide to the engineer, who, however, will at once realize that these facts must be supplemented by careful and thorough surveys and measurements before he can plan in detail any water-power project. The paper will at least show that the water powers available throughout the year are not so abundant in the south-central part of Alaska as has sometimes been assumed.

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A Retrospect of Electrical Prosperity Week

The Story of What Was Accomplished and How It Was Accomplished Reveals a Co-operative Achievement That is Without Parallel in the Electrical Industry

By H. W. Alexander

In the history of great trade movements there has never been an undertaking more extensive in scope, more lasting in effect, nor more financially profitable than was Electrical Prosperity Week, the six-day celebration held throughout the country from November 29 to December 4, 1915. It achieved its full purpose, justified the claims of its supporters. It stands as a concrete example of the value of co-operative effort among the units of an industry. From reports on hand, it is fair to assume that more than half of the country's entire population came directly in contact with its inspiring influences.

Entirely unlike any of the "day" or "week" campaigns, this event took on the full aspect of a national celebration —a country-wide exposition of that prosperity which flows from electricity. Although distinctly a trade movement, it was far beyond a merely mercenary movement. It actually engaged the co-operation of every trade and every branch of industry. It reached far into the realms of optimism and psychology. It pointed the pathway to electrical prosperity, inspiring and drawing into its fold an unprecedented volume of outside public support.

The Week has left no regrets. It was approved by the President of the United States, just as it was welcomed by the humblest merchant in the land. It is destined to survive to vindicate the sound economic theory that business always is best after the public mind has been clarified and the public pulse restored.

The celebration was dedicated to a concerted effort upon the part of every branch of the electrical industry, the country over, to focus the public mind upon the already great achievements which have been made in the electrical field. The variety of uses which electricity has been made successfully to serve are almost infinite. The possibilities offered by it for adding to the convenience an economy of nearly all lines of human endeavor, whether in the home, shop or factory, are tremendous.

From its inception, electricity has proved its value. It has been a silent solver of business and domestic problems. There are few people today who still consider electric current a luxury. Its wide application, even in the homes of persons limited to modest weekly salaries for their income, has brought comforts and conveniences unknown a few years ago.

What It Did.

It stirred the electrical industry as never before, brought about co-operation between interests—central stations, manufacturers, jobbers, dealers, contractors—such as no other campaign could bring about.

It gave special prominence to electricity as a unified industry.

As a result of the extensive advertising the papers everywhere received in connection with the publicity given the Week, they will hereafter undoubtedly give more attention to electricity.

It brought electricity and its many applications to the notice of the nation as never before.

It instituted commercial activity in sections and by merchants who previously had not taken such a keen interest in a general trade movement.

It brought about the co-operation of interests outside of the electrical industry, such as department stores and other mercantile institutions, most of whose business lies in other directions.

The Society for Electrical Development was given prominence as one of the foremost development associations in the world. Its members are certain to derive great benefits from the prestige which it has thus received.

The campaign secured a large amount of new business instead of competitive trade, such as is often sought by individual interests.

The electrical shows and demonstrations held throughout the country revealed to the various cities the value of holding co-operative displays of goods on a large scale.

These exhibitions were highly successful everywhere and thousands of dollars' worth of orders for appliances were taken as a result of their educational effect upon the people.

Origin of the Week.

The idea of instituting such a movement was conceived at a time when the country was groaning under the burden of hard times. Business was dull. From every corner of the nation came reports of commercial stagnation. Such was the condition of the country when, on the call of J. M. Wakeman, general manager of the Society for Electrical Development, a meeting was held at his office in New York City on Friday, January 8, 1915, for the purpose of discussing plans for a national trade movement to rejuvenate the electrical industry and to incidentally stimulate business in other lines. The meeting was attended by publicity men and representatives of manufacturers, central stations, jobbers, dealers, contractors, the trade press and of technical journals.

It is altogether fitting that it should have remained for the electrical men to sponsor such a movement. Their industry, while young in years, has nevertheless grown by such rapid strides since its inception that today it stands a colossus among the world's greatest industries.

The following figures regarding the electrical industry will astonish those who look back a few years to the time when Edison invented the incandescent lamp. They show the gross income of electrical industries for the year 1914:

Electrical manufacturing	$ 450,000,000
Electric railway	730,000,000
Lighting companies	400,000,000
Telephone companies	350,000,000
Telegraph companies	85,000,000
Isolated plants	125,000,000
Miscellaneous plants	125,000,000
Total	$2,265,000,000

According to census figures, the estimated valuation of the nation's wealth in 1912 was $187,730,071,090. Of this amount the census bureau estimates that $2,098,513,122 is invested in privately owned central-station, electric-light and power plants. The total investment in all electrical industries, including telephone and telegraph, was estimated at $7,999,862,157.

This is 4.3 per cent of the total wealth of the nation, a large percentage when compared with some of the wealth invested in other leading industries. It is approximately 50 per cent of the steam railroads and their equipment and 33 per cent more than the value of all the live stock in the country. It is three times the value of all the nation's gold and silver coin and bullion and about 45 per cent less than the value of all manufactured products.

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These figures are even more astonishing when one considers that the electrical industry is only in its infancy.

Organizing the Campaign.

Among the suggestions made as to ways and means of promoting the plan was that of enlisting the co-operation of the Jovian Order and other electrical societies and associations, and of national advertisers who might use their space in the magazines to arouse the interest of the public and to get their customers to make special window displays during Electrical Week; the co-operation of mayors and other functionaries of towns and cities; the co-operation of boards of trade, chambers of commerce and like civic organizations; the inauguration of "white way" lighting and similar attractions to bring people into the cities; a campaign on the part of electrical contractors to encourage all merchants to increase greatly their window illumination and display during the week; activities on the part of central stations in the way of offering prizes for the best lighted stores, best displays of other merchandise, as well as liberal advertising campaigns in local newspapers prior to and during the Electrical Week; parades of electric vehicles, floats, etc. It was suggested also that the Society prepare special posters for billboard and other use to be sold at cost to those desiring to use them in advertising the carnival, prepare special literature for distribution by central stations, supply dealers, contractors and others, arrange for lectures, special meetings, articles in trade papers, newspapers, popular magazines, etc.

It is interesting to note that most of these original suggestions were carried out in all parts of the United States.

Choosing the Name.

The choosing of a name is simple or momentous, according to the subject or event which is thus to be distinguished. If the appellation is to perform no other function than to distinguish one object or individual from another, it is not a difficult matter to decide. If, on the other hand, it is possible for the name to creat favorable or adverse impressions, it must be chosen with the utmost care. In the case of a business campaign or movement the impression which the mere title creates on the public may count for thousands of dollars in favor of or against the movement. Again, where various interests in different branches of a given line of business are concerned in the undertaking, the impression likely to be created may not accord with their commercial policies toward the public.

The name should be attractive and striking in effect. This fact is of the utmost importance in advertising. A catchy name appealing to the sense of human interest will often bring an advertisement to the attention of readers where a less attractive appellation would fail. This feature is rendered the more important in accordance with the extent of the advertising.

In the case of a national trade campaign, the impression of the title upon the various sections or localities of the country is also an important consideration. The people of the East may take a different view from those of the West. The North may differ from the South. To secure the most profitable results, all must be satisfied and pleased.

After many names had been suggested for the campaign and rejected as unsuitable, it was finally decided to call the celebration "Electrical Prosperity Week." The word "Prosperity" is wholesome, inspiring, positive. It was chosen as a part of the name of the celebration because it carried a popular appeal and at the same time conveyed the purpose of the movement. Prosperity appeals to all because it denotes progress. It is the result of efficiency, a broadening of the margin on the profit side of the ledger, a lessening of expense to produce a given result. Adding the word "Electrical" characterized the line of business along which it was primarily to be conducted.

The Time.

The time could not have been more propitious. It was set for the beginning of the Christmas shopping period, when every mercantile house in America is straining every means at its command to win its share of the Christmas trade. The people at that time are opening the traditional family stock in readiness for the greatest buying period of the year. Furthermore, the date corresponded with the closing week of the Panama-Pacific International Exposition. The management of the Exposition offered to co-operate in the movement by setting for the spirit of the Week in a blaze of illumination, parades and other events arranged especially for the celebration. The Week also came at a cool season, when people were actively receptive.

Appropriations.

The executive committee recommended an appropriation by the Society for Electrical Development of $50,000 for special expenditures, such as printing and extraordinary expenses. A large amount of the Society's regular appropriation was also devoted to the work. The expenditures of the Society alone totaled over $100,000. This money came from the regular subscription of the members. The members justly received the greater benefits from their expenditures, but the whole country and industry profited from the educational and sales work.

The work of the Society in planning this great campaign has greatly stimulated its growth in membership, particularly in lighting companies.

In addition to the expenditures which were made by the Society, leading electrical manufacturers and jobbers spent thousands of dollars in national publicity. Each company worked in conjunction with the Society. Thousands of central stations, manufacturers, dealers and jobbers throughout the country took advantage of the national campaign to institute local campaigns of their own during the Week.

Announcing the Week.

The first active work undertaken was the forming of local committees to handle the various sections of the country. The next step was to inform the public of the movement. As long ago as February, columns of news appeared in the principal papers of the United States telling their readers how (to quote from headlines of one New York paper) "Electricity Was to Hit at Hard Times."

The next step was to reach the various branches of the electrical industry, without whose whole-hearted co-operation the Week could not have been made a success. Thirty thousand copies of a "Book of Plans" were distributed to members and non-members of the Society. Reply postal cards which were distributed came back by the thousands signifying intention to co-operate and asking how co-operation could be best accomplished in their particular localities. A definite reply was sent to each of these.

The book was followed by "How To" booklets, directed to each branch of the industry separately. They gave definite instruction as to how to run special exhibitions, parades, window displays, street lighting and sales campaigns for the Week.

Bill-Posting Campaign.

Another means instituted by the Society for Electrical Development for giving broadcast publicity to the Week consisted of a bill-posting campaign. The posters provided were of the 8-sheet variety that could be used singly or be made up into 16 or 24-sheet broadsides. They contained the Goddess Electra emblem of the celebration, lithographed in six colors. At the bottom was left a space for the name of the firms making use of the posters. The sheets were placed on the most prominent billboards and were displayed during the time when numerous other means were used to promote electricity and Electrical Prosperity Week.

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Display Bureau Service.

It was apparent from the first to those in charge of the movement that the co-operation of the merchants and commercial men of the non-electrical lines of business would be highly important. It was essential that show windows attractively tell the purpose of the campaign and that stores be specially lighted.

This branch of Electrical Prosperity Week activity was entrusted to the Society's Display Service Bureau. At the annual convention of the International Display Men's Association in the Waldorf-Astoria Hotel, New York, beginning August 2, addresses were made on what Electrical Prosperity Week would mean to the merchants of America. More than 1,200 delegates were present.

The Display Bureau placed numerous articles on Electrical Prosperity Week and the Society for Electrical Development in the trade press. Many of these publications ran special Electrical Prosperity Week issues and used the Electra design on the covers.

These activities of the Display Bureau were highly instrumental in bringing about the hundreds of unusually attractive window displays of electrical appliances and the beautifully decorated store fronts and interiors which were seen during the Week throughout the country.

General Publicity.

The mass of press clippings now at the campaign headquarters warrant the assertion that it is unlikely that any trade campaign in history ever brought to the newspapers the wealth of advertising this Week discloses. One bundle of clippings reached the Society's office which contained 570 clippings. Of this number, 347 were full pages of advertising.

This result is a most gratifying one. From the inception of the campaign, the Society for Electrical Development continually urged local electrical concerns to adopt the newspaper as a medium of communicating the Week's message to its people. The Society engaged a staff of nationally noted newspaper and advertising men to specifically further this aim.

Mr. Wakeman set aside a liberal appropriation for electrotypes, matrices, headings and even color plates. These were furnished upon request and without charge to newspapers everywhere. Thousands of newspapers received the Society's advertising helps, and in many cities where the local electrical advertisers seemed lethargic, the Society directly urged these advertisers to get in back of their enterprising newspapers. Much substantial missionary work of this character served to bring new accounts to newspapers.

In addition to the publicity gained through the newspapers the trade press gave powerful support to the movement by carrying the message to the tradesmen, professionals and artisans of the country in a manner which showed them clearly how they could "cash in" on the movement by joining the ranks of the boosters.

Week Met Expectations.

The Week and its aims succeeded beyond all expectations. Every man who adopted its slogan, every institution which accepted its message, and every newspaper which stood back of its credo have benefited and have "cashed in." It was a distinctive factor in a business climb unprecedented in the nation's history.

It is yet too early to recite its financial returns. It will be weeks before the thousands of central stations, manufacturers, jobbers, dealers and contractors of the electrical industry are able to definitely state the actual cash results. It may be weeks before all the dry goods stores, decorators, merchants of every kind, and the chambers of commerce, boards of trade and civic organizations report the good that the Week brought to them.

As an educational achievement it stands by itself. Beyond estimate the electric parades, the electric shows and the electric demonstrations in dozens of cities have left lasting benefits. Great quantities of electrical appliances for the home have been sold. The newspaper advertising, begun under the stimulus of the Week, is being continued over the holidays, the appeal being the useful electrical Christmas gift.

The full benefits of Electrical Prosperity Week are not confined solely to the profits on the sales that were made during the celebration and the Christmas shopping period, which started with the Week. On the contrary, the results will extend over months to come. Countless thousands of people from every walk in life attended the electrical shows held in many cities. They saw features which were new to them, learned many facts they had not known before. They saw electricity at work, and gained a new impression of its usefulness, the broadness of its scope.

It can safely be said that many people were induced to think seriously over the electric heat, power and light question, who previously had considered electricity an expensive commodity. A large proportion of these are certain to become prospects as the convictions of the economy of electricity grows upon them. They may not make their purchases for many weeks to come, but that they will adopt the "Electrical Way" eventually, can be counted as one of the achievements of Electrical Prosperity Week. Herein lies the educational value of the celebration. It has brought the modern worker of wonders into the limelight. Generalities have given way to definite facts and figures. Understanding has taken the place of mystery. New ways of doing things have been learned. The light of truth has penetrated the mists of doubt.

Again the public has been brought into a closer acquaintance with the central stations which serve them. Their impressions of these interests have been raised. Where suspicions of greed formerly existed, there is now in many cases a feeling of confidence. The people have been shown how the companies operate, have gained a clear idea of the expense of current generation, have been shown that the profits were not exorbitant nor excessive. The companies generously stood ready to explain their systems to the people. The good impression thus created on the public is certain to be effective in preventing future controversies between the electrical interests and their patrons.

The influence has also extended to the chambers of commerce of many cities. They have seen the beautiful effects of flood-lighting, as applied to their own cities, and the appearance of their streets under increased illumination. This fact is likely to result indirectly in the future increase and improvement of the lighting of many cities.

The aggressiveness of the electrical industry, its scope and resources has been brought more closely to the attention of business men and institutions. This has served to increase the prestige of the industry.

Such have been some of the results of the celebration. They have been inspiring to the industry itself, healthy to general business. The country has profited well. The great movement has been a pioneer in its class. Its success will undoubtedly lead to the holding of more such celebrations, which cannot fail to increase in scope and volume as their good works become better known to the people as a whole. The ultimate effect of these movements upon America's institutions is certain to be of far-reaching, lasting and positive benefit.

The forty-sixth annual meeting and dinner of the Western Society of Engineers will be held on the evening of January 12 at the Hotel Sherman, Chicago. It will mark the inaugural of the newly elected officers. Several addresses will be made, the principal one by Samuel Insull, president of the Commonwealth Edison Company.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Making Utility Customers Financial Partners Shows Gratifying Returns.

An effective effort to improve the relations of utility companies and the public by making financial partners of a considerable number of consumers has been in progress during the past year by several large service companies operated from Chicago.

In some instances citizens have been offered the preferred stock of holding companies; in others, investment in interest-bearing securities has been made available in denominations as low as $50. The securities are obtainable either direct from the local operating unit or one of the leading banks.

According to observers who have followed these overtures towards bringing the public and the companies closer together, there is every reason to expect that the widespread distribution of securities and earnings in home territory will practically do away with unfair agitation against progressively managed corporations.

Two of the Chicago managed utility holding companies which have tried out plans of this kind are the Northern States Power Company and Standard Gas & Electric Company, both controlled by H. M. Byllesby & Company. The Northern States organization operates in Minneapolis, St. Paul, Mankato, Faribault, Fargo, Grand Forks, Sioux Falls, the Illinois-Wisconsin zinc fields, and other communities. In June, preferred stock was offered to the customers served, and by the close of the year approximately $250,000 of the stock had been taken in small lots by some 40 citizens, a number purchasing on the partial-payment plan. The effect on public sentiment was very encouraging, and the stock sales will be continued.

In the recent successful financing by Standard Gas & Electric Company, the company's twenty-year six-per-cent gold notes were offered to the public in a number of the cities served by operating units, including San Diego, Pueblo, Oklahoma City, Mobile, Stockton and Ottumwa, and what was considered a satisfactory amount was taken for local investment. Newspaper advertising was used extensively by both companies.

The closing year shows a decided improvement in the electric light and power and gas industries throughout the country, according to the officers of H. M. Byllesby & Company, which firm operates thirty-five companies scattered through sixteen states and serving a population of 1,730,000. Earnings, they say, have advanced in conformity with the general industrial revival, except in Oregon and Washington and some sections of the South.

Northern States Power Company, whose subsidiaries serve the principal cities of Minnesota and North and South Dakota, made an excellent showing during 1915, net earnings having increased approximately 20 per cent, and the balance, after payment of fixed charges, 31 per cent. Growth of business made necessary the addition of 26,000 horsepower to the steam generating plants of the company. Prospective increases during the next few years caused the company to contract for a large amount of power, to be delivered from a new hydroelectric development on the Chippewa River near Chippewa Falls, Wis.

Standard Gas & Electric Company greatly improved its position during the latter part of the year by the sale of long-term notes and restoration of cash dividends on the preferred stock. The sale of these notes, which will retire the short-maturity obligations of Standard, marked a turning point not only in the affairs of this particular company, but in the general financial situation as related to public utility enterprises, which for some years have had to resort to short-term notes to raise any considerable amount of money.

Pacific Power & Light Output Shows Big Increase.

The Pacific Power & Light Company, operating at Portland, Ore., and vicinity, has issued an interesting statement of its kilowatt-hour sale statistics for the last fiscal year, 1914-1915, showing a total output of 45,473,923 kilowatt-hours. This is an increase of over 5,000,000 kilowatt-hours for the preceding year, which aggregated 39,782,618 kilowatt-hours; the total sales during this period amounted to 27,696,561 kilowatt-hours, as against 32,301,832 kilowatt-hours for the twelve months just closed. An analysis of the 1914-1915 period shows the following results:

Account.	Kilowatt-Hours.
Commercial Lighting—metered	5,498,052
Commercial Lighting—not metered	921,286
Commercial Power—metered	12,548,366
Commercial Power—not metered	3,934,917
Municipal Arcs	1,607,447
Street Lighting, incandescent	626,751
Street Lighting, private	76,072
Other Electricity—Public Service Corporation	1,012,988
Irrigation Power	6,075,953
Total sales	32,301,832
Company Railway, Astoria, Ore	406,062
Used elsewhere by company	801,077
Total sales and use	33,508,971
Sold by power department	9,272
Distribution losses	4,228,611
Feeder output	37,746,854
Transmission and transformation losses	7,727,069
Total plant output and bought	45,473,923

Minneapolis Company Sends Holiday Greetings to Customers.

H. E. Young, sales manager of the Minneapolis (Minn.) General Electric Company, is responsible for the idea originated by the company this year of sending Christmas and New Year's greeting cards to all customers and prospective customers. Each member of the sales department sent out about 200 of these cards, which are engraved and specially folded so as to contain the business card of the sender. That this courtesy on the part of the company's representatives was well received is indicated by the receipt of several hundred letters expressing appreciation and thanks. A typical letter selected at random reads as follows: "I wish to acknowledge receipt of your Christmas greeting and also the Christmas present in the form of electric service which was furnished to us and the people in our neighborhood last Friday afternoon. Thanking you for your kind wishes and your efforts in our behalf, and wishing you the compliments of the Season, I am, etc.

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Municipal Plant to Buy Electricity.

The voters of the town of Hull, Mass., decided in town meeting December 22 to close down the municipal electric light plant and purchase energy from the Weymouth (Mass.) Electric Light and Power Company. The station will not be dismantled, but the machinry will be idle. The town retains its poles, wires and street equipment.

The vote authorized the purchase of current for a term of not more than 10 years, at the rate of three cents a kilowatt-hour. For some time energy has been purchased from the Weymouth Company to meet the day demand, at two cents a kilowatt-hour, and the proposition which will doubtless be accepted stipulates that if the day load exceeds that of the year previous, the rate for energy supplied from Weymouth shall be two cents a kilowatt-hour for the overplus. Energy will be measured at the switchboard of the Hull station.

"Day load" is energy taken between the hours of 1 a. m. and a half hour before sunset.

The town is largely sumer residential, being located on the seacoast near Boston. The Weymouth Company offered to purchase the plant, at about $160,000. A committee of eleven, including the selectmen, recommended the proposition that was substantially adopted. By this method, the 20 cent summer rate will be reduced to about 17 cents, and the rate of 15 cents to permanent residents will be reduced to 14 cents.

Hydroelectric Power to Be Developed and Sold to Edmonton Municipal Plant.

The Edmonton Power Company, Limited, is planning to build a solid concrete dam, 1,500 feet long and 100 feet high, on the Saskatchewan River, above Rocky Rapids, making an artificial lake about 60 square miles in area. Electricity will be generated in a power plant below the dam and brought to Edmonton, Alberta, Canada, on a steel-tower transmission line. At Edmonton it will be stepped down in the company's substation and will be sold in bulk to the city to deliver to the various departments and consumers as at present. The company is to be granted no franchise within the city and will have nothing whatever to do with the civic departments or private consumers.

This development will cost approximately $6,000,000, not including an electric railway, which, as a separate scheme, will be built from Edmonton to the proposed power site.

The building of the electric railway and complete power development will take at least four years, and, in order to enable the city to establish a rate schedule immediately, based on known power costs for 30 years, and thus secure customers now available in the city, as well as new industries, the company agrees to take over and operate the present city steam plant.

Practically all of the public utilities in Edmonton are owned and managed by the city, and this private undertaking is receiving the support of a number of citizens who believe that municipal ownership has not been profitably demonstrated in Edmonton.

New Street-Lighting Installation for Norwalk.

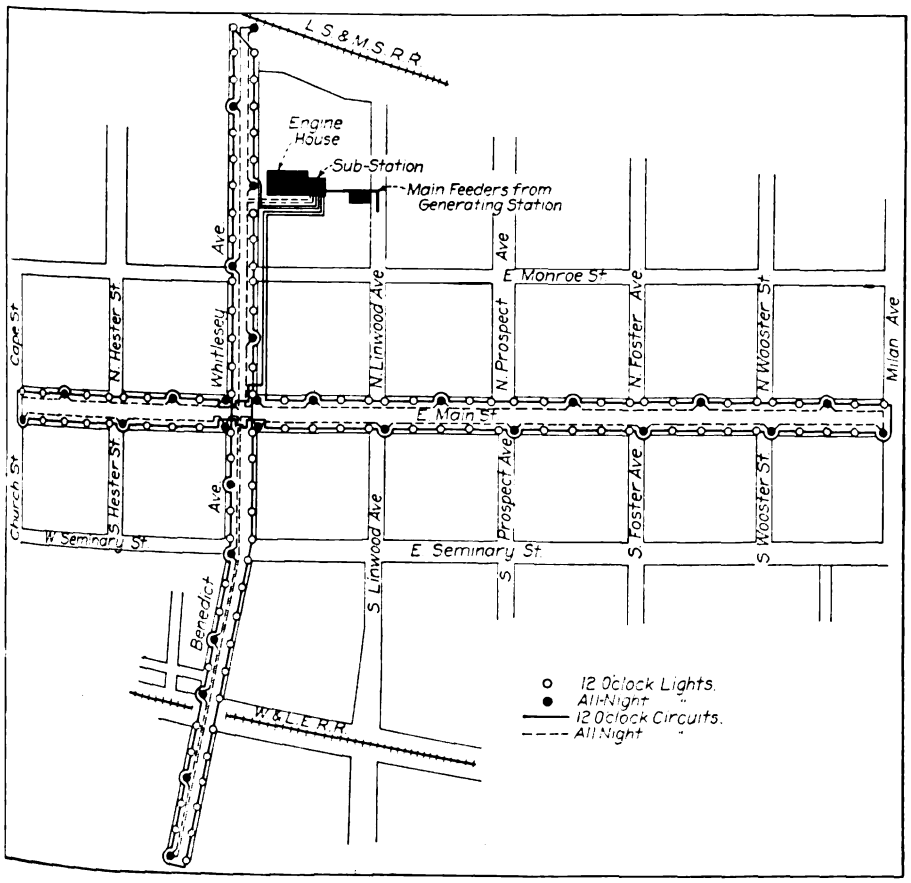
A new street-lighting installation using nitrogen-filled tungsten lamps has recently been completed for the city of Norfolk, O. There are a total of 134 400-candle-power 6.6-ampere, type C lamps used, one to a standard. As shown in the accompanying layout, there are ten lamps to a block, three of which are arranged for all-night burning. These lamps are wired on a separate circuit which is controlled from the substation shown in the view.

The remaining 105 lamps are lighted from dusk to midnight, this circuit also being controlled from the city substation.

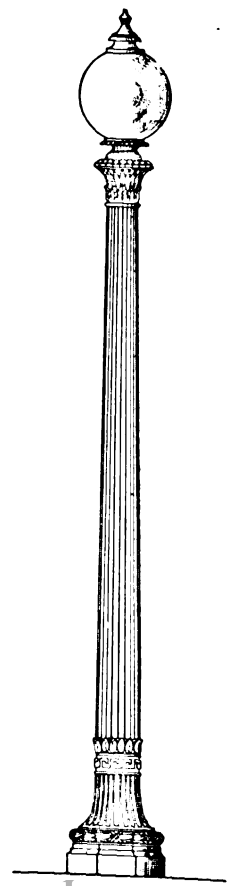
The installation is of the series type. Standard Underground Cable two-conductor steel-tape cable is used.

The design of the ornamental standards used is shown in the detailed view.

The construction work was done for the city by the Powers Electric Company, of Norwalk. The cost of this installation amounted to about $70 per standard.



Plan of Norwalk Street-Lighting Installation.



Detail of Standard.

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Commercial Growth of Southern California Edison Company Told by R. H. Ballard.

The Southern California Edison Company started in Los Angeles in 1896 as the Westside Lighting Company as a small steam-plant distributing system.

The company was enlarged and its name changed in 1898 to Edison Electric Company, and in 1909 to Southern California Edison Company. In the meantime many properties outside of the city had been purchased and the company's affairs extended generally throughout Southern California.

The principal properties purchased were: Santa Ana Gas & Electric Company, Southern California Power Company, Pasadena Electric Light & Power Company, Redlands Electric Light & Power Company, California Power Company, United Electric Gas & Power Company, Lytle Creek Power Company.

Large contracts were made to supply power to the two cement plants in Riverside and Colton, and in 1907 the company began furnishing service to the Los Angeles Pacific Railway, which is now part of the Pacific Electric system, embracing the lines running to Santa Monica and Hollywood sections.

The gross earnings of the company in 1896 were only $3,333 for the year, while the earnings in 1915 for its electric department were $4,427,000.

The increase in kilowatt-hour sales during almost the entire period has been much greater than the increase in earnings, as rates have been constantly reduced, the average rate in 1915 for the entire system in Southern California being only 40 per cent of the rate in 1905; in other words, a reduction of 50 per cent in ten years.

The maximum load on the company's stations in 1904 was about 10,000 kilowatts, while in 1915 it was nearly 56,000 kilowatts.

These facts were brought out by R. H. Ballard, secretary and assistant general manager of the company, in a hearing recently before the Railroad Commission of California in the matter of the application of the city of Los Angeles to condemn the distributing system of the Southern California Edison Company.

Testifying further as to the effect of cutting out the Los Angeles business from the balance of the system, Mr. Ballard showed that the gross earnings would be reduced from $4,400,000 to $2,300,000—a reduction of nearly 50 per cent—and that, while it is estimated the maximum load on the stations would be recovered in eight years, in the eighth year, 1923, the earnings would still be $700,000 a year less than they were before Los Angeles was taken out of the system, due to decreased efficiency.

Kilowatt-Hour Output Over 208,000,000.

Likewise the number of kilowatt-house sold during 1915, over 208,000,000, would be reduced by the loss of the Los Angeles business to 110,000,000. During the next eight years they would increase to 178,000,000, being approximately 30,000,000 kilowatt hours less than before Los Angeles was taken away.

It was shown that the combination of the Los Angeles and outside business was particularly advantageous from the standpoint of efficiency and economy, as the maximum demand for current in Los Angeles comes in the winter time, while the maximum demand for current outside ot Los Angeles comes in the sumer time.

The same plants which furnish the large winter demand on Broadway at Christmas time, are used in the summer time for pumping water for irrigation in the districts outside of Los Angeles, resulting in a lower cost both inside and outside the city, which is reflected in the company's rates to consumers. In other words, there is a great diversity between the city and the outside.

Referring to rates in the city of Los Angeles, Mr. Ballard showed that in 1905 the maximum rate for residence service was 15 cents per kilowatt-hour; in 1908 the rate was 9 cents per kilowatt-hour—a reduction of 6 cents in three years; in 1911 it was 7 cents per kilowatt-hour, and in 1915, 5.5 cents per kilowatt-hour.

Outside of Los Angeles, the rate in the districts served by the largest company purchased by the Edison Company in 1904 was 20 cents per kilowatt-hour, and at the present time it is 7 cents per kilowatt-hour.

Successful House-Wiring Campaign Conducted at Rutland, Vt.

The house-wiring campaign which was inaugurated by the Rutland Railway Light & Power Company, Rutland, Vt., late in September, has resulted in the securing of 350 new customers. The company arranged with several of the wiring contractors of the city to wire houses at a flat rate of $2.25 per outlet, not including fixtures. The contractors agreed to finance the work on the installment plan, making a uniform discount of 10 per cent for cash.

The Rutland Railway, Light & Power Company used liberal advertising space in the two daily newspapers and considerable publicity was given the campaign in other ways. Especially prepared lantern slides were used in all motion-picture houses and on Edison Day a special reception was held at the company's offices where special attention was given the promotion of house wiring. Over 1,000 chrysanthemums were given out as souvenirs. A comprehensive display of electrical appliances was maintained and demonstrations made of their usefulness.

Considerable impetus was given the campaign by Electrical Prosperity Week and the company took advantage of the many opportunities afforded to increase the interest in electricity. Incidental to the house-wiring activities a window-display contest was inaugurated through the efforts of the central station, working in co-operation with the Rutland Business Men's Association and prizes amounting to $60 were given for the best dressed and lighted windows. A children's essay contest was also carried on, the subject being "Why Electricity Is Our Best Servant." Prizes were awarded for the three best essays.

In addition to the business which was created for local supply dealers and contractors because of the house-wiring campaign, later supplemented by Prosperity Week activities, the light and power company reports an increase in connected load without parallel in its history.

Nashville Celebrates Christmas Electrically.

The Nashville, Tenn., Jovian League, in co-operation with other civic bodies, held its annual public Christmas-tree celebration on the night of December 24. Despite unfavorable weather, the affair was successful and the tree, which had been decorated by the local Jovians, aroused much admiration. It was placed in the center of Capitol Boulevard, a broad street leading off of the principal thoroughfare to the State capitol, and which was closed to traffic during the evening. It was anchored in a base of broken rock, retained with a small wall of paving stones and covered with evergreen branches. It was decorated with 500 electric lights of various sizes and surmounted with a large electric star. The Nashville Railway and Light Company contributed the current as well as bringing the Sunday-school classes of the city without charge.

Important Electric Bake Oven Installation in Los Angeles.—Nutt Brothers bakery of Los Angeles, Cal., have installed recently an electric oven of Hughes manufacture for baking small cakes and pastry. This oven which has a capacity of 100,000 cookies per day, is provided with automatic thermostatic control insuring a continuous temperature of 360 degrees.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Important Industrial Heating Business Secured by Los Angeles Company.

An important acquisition to its power business has recently been made by the Southern California Edison Company in the form of a 600-horsepower industrial electric heating load for the Ford Motor Company's Los Angeles plant. The present installation comprises two enameling ovens for automobile hoods and fenders which are to be equipped for electric heating.

At the Los Angeles works of the Ford Motor Company there is at present installed 250 horsepower in motors and the electric ovens will be equipped with two 225-kilowatt heating units equivalent to 600 horsepower additional load. This additional load will have to be increased to 900 horsepower, making a total of 1,150 horsepower installed.

The ovens are located on the top floor of a five-story building, and in order to deliver the required energy without excessive secondary loss the problem of installing transformers weighing 15 tons, on the roof, is one of no little consequence. In addition to this weight it may be necessary to construct a brick vault to contain the transformers in accordance with the city requirements.

The four ovens are 10 by 12 by 30 feet each and will require to be heated to a temperature of 450 degrees Fahrenheit for 6 hours per day. Of the many advantages to be gained by the electric oven the more important are the reduction of fire risk by eliminating gas and that fact proved that from 40 to 50 per cent increase in the finished product is obtained. These facts more than compensate any difference in the initial expense and fuel cost versus electrical energy.

Condensation results from the burning of gas. This tends to dull the finish of the enamel to a certain extent, whereas radiant heat generated by electrical energy eliminates this objectional feature, resulting in a much brighter finish.

In addition to the electric ovens there will probably be installed for this company an equipment for heating babbitt. This will require about 50 kilowatts additional, therefore a total connected load of over 1,200 horsepower is assured.

Program of Ohio New-Business Meeting.

A meeting of the new-business committee of the Ohio Electric Light Association will be held at the Portage Hotel, Akron, O., on January 19. A comprehensive program of interest to new-business men of central stations has been arranged which includes a paper by J. R. Colville, of the National Lamp Works, entitled, "The Mazda Lamp in Photography," paper by J. C. Matthieu, power engineer of the Dayton Power & Light Company, entitled, "Electric Furnace," and a general open discussion on the following questions:

(1) Is it good policy to sell appliances on the installment plan?

(2) What is the best plan in paying central-station salesmen?

(3) What is the best way to increase minimum charge to consumers?

(4) How much can the central station afford to pay for old house business?

At the close of the meeting a visit will be made to the plant of the Miller Rubber Company, which has a complete electrical installation.

J. E. North, of Springfield, O., is chairman of the committee.

Comparative Costs Between Acetylene and Arc Welding.

In the accompanying table are given some interesting data comparing the cost of electric arc welding with acetylene. These figures, which were based on tests made with a Lincoln welding machine, are based on the following costs:

Acetylene .....1 cent per cubic foot
Oxygen .....2 cents per cubic foot
Electricity .....2 cents per kilowatt-hour
Labor .....30 cents per hour

In the small sizes of metal the speed of acetylene welding is greater than that of electric, while in the larger sizes, the speed of electric welding is much greater. The calorific value of acetylene is 1,555 British thermal units per cubic foot. One kilowatt-hour is equivalent to 3,413 British thermal units.

COMPARATIVE COST DATA—ACETYLENE AND ELECTRIC ARC WELDING.

Tip No.	Thickness of Metal	Cu. Ft. Per Hour		Ft. Weld Per Hr.	Cost of Gas	Total Cost Per Hour	Cost Per Ft. Welded	Amperes in Arc	K. W. Input M-G Set	Cost of Power	Ft. Weld Per Hr.	Total Cost Per Hr.	Cost Per Ft. Welded
		Acetylene	Oxygen										
1	1/32"	3.21	3.65	30	$ .11	$ .40	$ .013						
2	1/16"	4.84	5.50	25	.16	.46	.018	70	3.00	$ .06	25	$ .36	$ .014
3	1/32"	8.14	9.28	20	.27	.57	.028	75	3.08	.06	20	.36	.018
4	1/8"	12.50	14.27	15	.40	.70	.047	80	3.20	.06	15	.36	.024
5	3/16"	17.81	21.32	9	.61	.91	.101	90	3.52	.07	10	.37	.037
6	1/4"	24.97	28.46	6	.82	1.12	.187	110	4.15	.08	8	.38	.048
7	5/16"	33.24	37.90	5	1.09	1.39	.278	110	4.15	.08	8	.38	.048
8	3/8"	41.99	47.87	4	1.38	1.68	.420	120	4.64	.09	7	.39	.056
9	1/2"	57.85	65.95	3	1.90	2.20	.733	150	5.75	.12	6	.42	.070
10	5/8"	82.50	94.05	2	2.71	3.01	1.510	150	5.75	.12	6	.42	.070

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WATER SUPPLY FOR THE TOWN OF CANTON.

Electric Pumping System Effects Economies Over Steam.

The new motor-driven centrifugal pumps at the Springdale Pumping Station which furnish the entire water supply for the town of Canton, Mass., have now been in successful operation for some time. The installation is of particular significance because it was one of the first installations in that part of the country where centrifugal pumps are used for pumping against a moderate pressure and the equipment has proved of advantage in many ways.

Water is taken from a large open well, the clear spring water bubbling up through the sandy bottom. It is raised by the electric pumps from four to 20 feet according to the level in the well and pumped two miles to the standpipe on a distant hill.

The total amount of water pumped last year was 106,000,000 gallons again an average working head of 190 feet or 82 pounds. The energy required to do this work amounted to 120,000 kilowatt-hours. It was purchased at an average rate of 2 cents per kilowatt-hour.

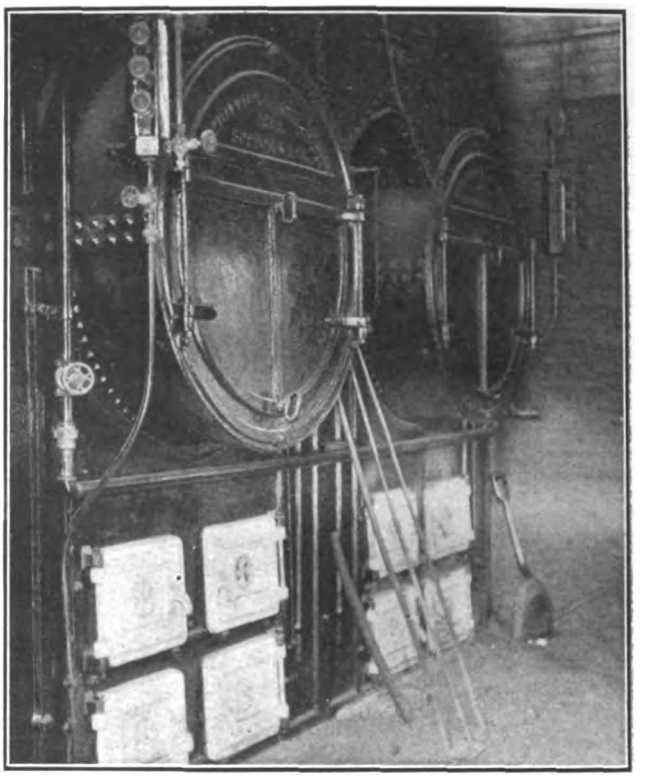
The previous steam equipment which had been in use for 24 years consisted of two horizontal boilers and two large Knowles compound duplex steam pumps of 700-gallons-per-minute capacity, with condenser and boiler-feed pumps. This equipment required a substantial brick station, engine room, boiler room, stack and building for storage and coal.

The new electric equipment consists of one 400-gallon-per-minute DeLaval three-stage centrifugal pump direct-connected to a 25-horsepower motor, running at 1,750 revolutions per minute, and one 700-gallon two-stage pump direct-connected to a 75-horsepower motor. The 75-horsepower pump is reserved for fire use only and all water is pumped by the 25-horsepower outfit.

The small space occupied by these pumps made it possible to install both electric pumps in the space previously occupied by one of the steam pumps. The simplicity of these units may be seen in one of the accompanying illustrations and their relative sizes compared with the previous boilers and pumping engines.

During the past year the cost of electric power has been less than the cost of coal used by the steam pumps, and a saving of over $100,000 has been made in labor. On the other hand the income from the sale of metered water service has been increased from $12,826 to $14,432. This increase, although not anticipated, was largely due to the high water level maintained in the standpipe, resulting in increased use. The coal used during the previous year when 10 per cent less water was pumped by the steam pumps amounted to 442 tons costing $6.00 per ton.

A Cutler-Hammer starter is used, the relay current of which is connected to three different forms of controllers, as follows:



Old Boiler Installation Which Was Removed.

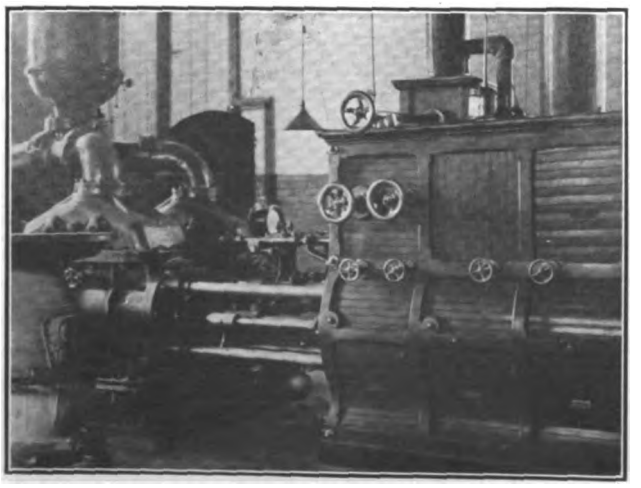
(1) A float switch in the well which stops the pump when the well is empty and prevents uncovering the check valve.

(2) A pressure gauge which starts the pump when the water level in the standpipe drops unduly.

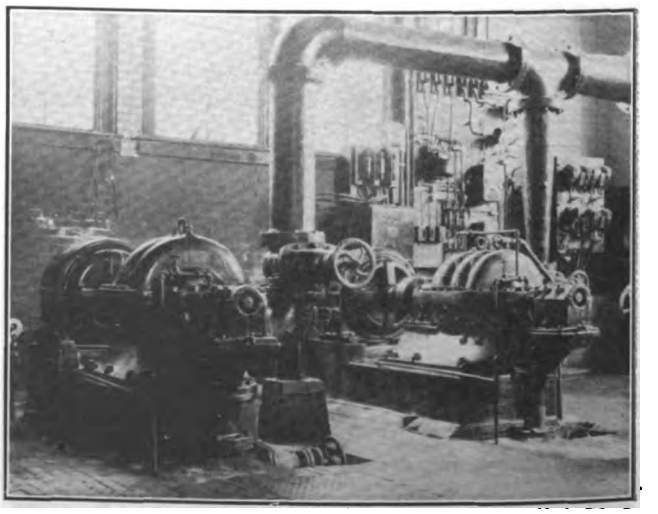
(3) A time clock which starts and stops the pump three times each day on a regular schedule—morning, afternoon and midnight.

Although the centrifugal pump is less efficent than the plunger type, it has many advantages which are of direct value in this installation, namely, reliability, absence of valves, easy starting and automatic features which more than offset the low cost of the additional electric power consumed. The long, slow pumping day and night saves energy in pipe friction; maintains the standpipe practically full and at the same time earns a low rate for electric power.

Energy is supplied to this installation by the Edison Electric Illuminating Company of Boston and J. W. Wattles, commercial engineer, had charge of the engineering work involved.



Previous Steam Pumping Engine—Canton Station.



Motor-Driven Pumps in Space Occupied by One Engine.

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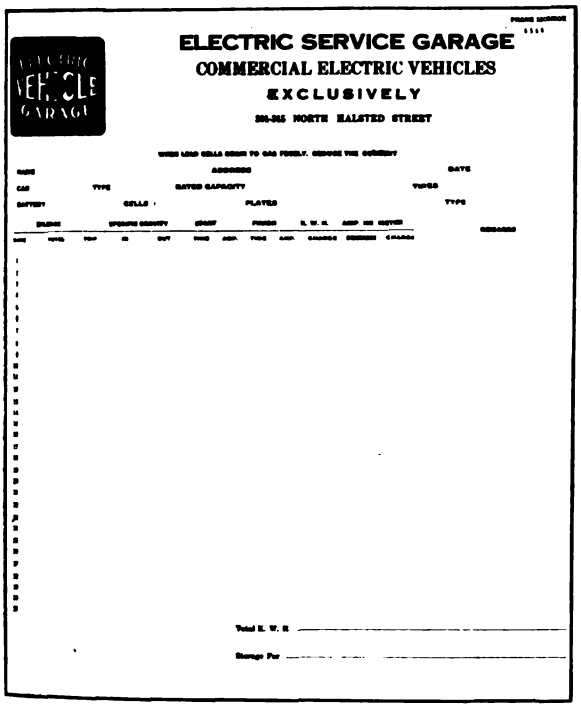
ELECTRIC VEHICLES

A Noteworthy Style of Billhead for Electric Vehicle Garage.

Because of the service demanded by the average user of electric passenger cars, electric vehicle garages necessarily have had to make a flat rate which included the cost of this service. The extension of the small electric commercial vehicle depends, however, to a very large extent upon obtaining garage facilities where charges will be made based on the cost of electricity consumed in charging batteries, plus an additional charge for storage and extra service, when this is demanded. The user who operates a half-ton truck four days a week justly has cause for


ELECTRIC SERVICE GARAGE
COMMERCIAL ELECTRIC VEHICLES
EXCLUSIVELY

Style of Billhead Used by Commercial Vehicle Garage, Providing Space for Entering Daily Performance of Car.

complaint if he is made the same flat rate as the user who operates his vehicle six days a week.

The Electric Service Garage, of Chicago, was established to handle commercial electric vehicles exclusively. Rates for service are based on an electricity charge of five cents per kilowatt-hour, in addition to a moderate storage charge, depending upon the floor space occupied by the vehicle. Washing, inspection, repairs, etc., when requested, are charged for extra. In accordance with this basis of charging, the garage has prepared for use a billhead which places before the user a complete report of the vehicle's operation during the month covered by the bill. The billhead is really a duplicate of the switchboard report which is maintained for every vehicle. It shows the daily mileage of the vehicle, the specific gravity of the battery, the kilowatt-hour input for each day, etc. As shown in the accompanying illustration, space is left for remarks, where notations relative to washing or repairs, etc., are made. The user, by a perusal of this bill, can tell instantly just what service he has obtained from his car and what service has been rendered by the garage.

Several vehicles kept in this garage are operated only a portion of each day, in two cases batteries being charged only three times a week. Were a flat rate charged, the operation of these cars would be unprofitable.

Electrically Driven Fire Apparatus Makes Successful Hill-Climbing Test in Paterson.

A demonstration of electrically driven fire apparatus was held on the steep grades in and around Paterson, N. J., on Thursday afternoon, November 18. This proved a great success and showed beyond doubt the speed, power and flexibility of this type of apparatus.

The two pieces used for demonstration were as follows: a combination chemical engine and hose wagon, converted from horse drawn to motor driven, by the Commercial Truck Company of America, Philadelphia, Pa. This was fully equipped with twenty lengths of hose and a crew of fourteen men. The weight of the truck, light, is 8,500 pounds and equipped with the hose and crew, 12,320 pounds.

The second piece of apparatus was a 65-foot aerial ladder, which was also a converted horse-drawn truck built by the same company and carried a crew of 22 men. The weight of this piece was, light, 18,000 pounds and with the regular crew, 20,000 pounds. This latter piece was of the four-motor-drive type, one motor being attached to each wheel. Both were equipped with Exide batteries.

The first part of the test consisted of a run up an 18.23 per cent grade known as "Temple Hill" having an uneven cobble-stone paving affording very poor traction. This test was easily made by both cars, the time from a dead start at the foot of the hill to the summit being, for the combination wagon, 1 minute, 13 seconds; and for the ladder truck, 1 minute, 18 seconds. This former becomes a record for the hill, which has been used as a test hill for every piece of apparatus used by the Paterson Fire Department and many others which have had aspirations, but have failed on the test. The fastest previous time was 1 minute and 40 seconds, made by a gas combination truck. The electric pieces under test were again sent up the hill, stopped dead in the center of the steepest part, and then run to the top at the same speed as before. This remarkable feat was very generously applauded by a gallery of some hundreds of spectators.

The remarkable part of the latter test was the apparent immediate resumption of speed from a dead stop on the grade which has proved too steep for most of the other types of fire apparatus to climb at all, and which the number of touring cars carrying spectators did not even attempt.

The apparatus was next put through a test on the hill known as the "Temple Street-Clinton-Street-Circle Avenue Hill"; this is also over an 18 per cent grade, and both pieces easily made the trip, the ladder truck making a new record of 1 minute, 14.5 seconds.

The facts that these two pieces, both stock and not especially prepared for the test, not only met all requirements without effort, but in both cases, where previous records have been kept, established new records by a wide margin, aroused keen interest among the large number of officials present, which will no doubt be practically expressed, when their several cities are next in need of fire apparatus."

After the tests, the apparatus were given a boosting charge and started back on their return trip to Philadelphia. At Newark a stop was made to exhibit the pieces to the fire board there, where another short demonstration was given and again at Elizabeth the cars were shown to the local fire board.

It is interesting that the run up from Philadelphia to Paterson, approximating 125 miles, was made in fourteen hours, elapsed time. This included stops at Trenton, New Brunswick and Newark for boosting the batteries.

As a result of these tests several municipalities in the East have asked for some information relative to electric apparatus.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

OUTSIDE WIRING.

By Terrell Croft.

In carrying conductors on the outsides of buildings, they may, where unprotected from the weather, be supported on standard porcelain or glass insulators, as indicated in Fig. 1. In purchasing such brackets, care should be taken to select those that provide at least the one-foot separation required between conductors. In Fig. 1, II, *A*, is shown a special extension bracket whereby the conductors are supported a considerable distance from the side of the building to avoid contact with the downspout.

Roof structures should, as shown in Fig. 2, carry their wires at least seven feet above flat roofs, so that a person can readily walk under the wires and so that, even if the wires do sag, they will not be likely to touch the roof. With a peak roof, a one-foot clearance, as shown in Fig. 2, is sufficient, because with a roof of this type there is little likelihood of a person walking on the roof contacting with the wires, or of the wires sagging sufficiently to touch the roof. Roof structures may be effectively made of wrought-iron pipe and fittings, or of structural steel, these materials

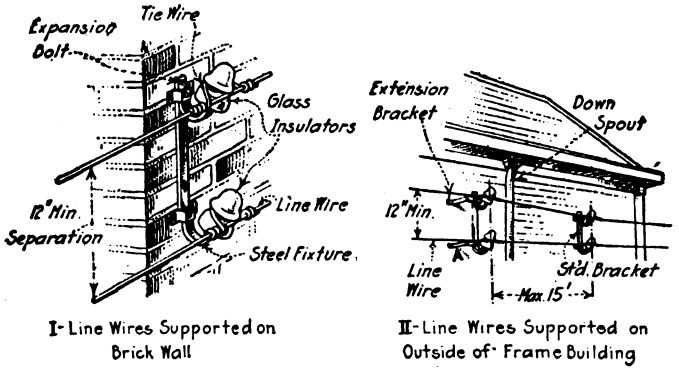

Fig. 1.—Approved Methods of Supporting Conductors on Building Exteriors.

providing sightly, and probably in the long run, the most economical supports.

Petticoat insulators are shown in Fig. 3. Insulators of this general type should be used for all exposed outdoor conductors on which a pressure exceeding, possibly, 25 volts is imposed, for the reason that ordinary porcelain knobs or cleats collect so much moisture on their surfaces during rain that their insulating values become very low. Such a film of moisture will greatly reduce the insulation resistance of an insulator, and in some cases will render the insulator practically useless. Where a petticoat insulator, similar to those of Fig. 3, is used, there will practically always be a dry surface under the petticoats at the bottom of the insulator, maintaining the insulation resistance of the insulator to a dependable value. The "umbrella" edges of an insulator of this type tend to prevent the moisture from collecting on the bottom surfaces and even if they do not keep the "petticoats" entirely dry, they are very effective in sustaining high insulation resistance.

Supports should be provided every 15 feet for conductors on exterior walls of buildings (Fig. 1). If the supports are placed very much farther apart than this there is a possibility of excessive sag in the wires and they may in some cases be deflected laterally and rest against the side of the building which supports them. Where downspouts or shutters are so located that they might interfere with conductors carried on the sides of buildings, additional brackets should be so placed as to prevent any possibility of such interference, as shown in Fig. 1.

Guard wires or irons should be provided where wires

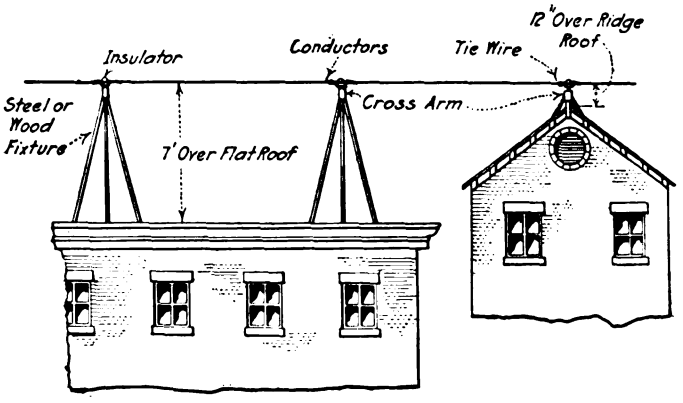

Fig. 2.—Line Wires Properly Supported on Roof Structures.

carrying pressures exceeding 600 volts are carried above low-tension wires in industrial-plant yards. Where such guards are used the possibility of the high-tension wires sagging or dropping and making contact with the low-tension conductors is eliminated.

Low-potential outside wires, unexposed to the weather, may be supported on porcelain knobs as shown in Fig. 4. That is, wires having impressed on them a voltage of 550 or less may be carried on knobs on porches or under eaves or where they are in some similar manner protected from the rain and moisture. Inasmuch as it is necessary to support such wires only one inch from the surface wired

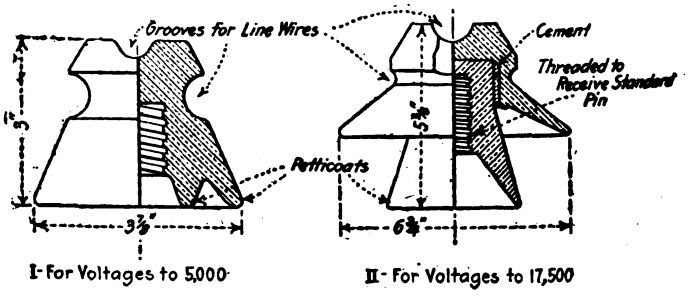

Fig. 3.—Porcelain Petticoat Insulators.

over, the supports should not be more than 4.5 feet apart. If the supports are farther apart than this there is a possibility of the conductors contacting with the surface on which they are carried.

Splices in wires should, if the splices are to be as strong unsoldered as the wires composing them, have at least five twists in the neck, as shown in Fig. 6. Then, soldering the splice further increases its strength and insures permanence

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and ample electrical conductivity. To insulate a splice, it is wrapped as shown in Fig. 7 with insulating materials of the same thickness and of the same composition as those comprising the insulation on the wire in which the splice is made. For example, to insulate a splice in a rubber-insulated wire (Fig. 7) the splice is first wrapped with rubber tape to a thickness at least equal to that of the rubber insulation around the perfect wire. Then over this a wrapping of friction tape equivalent to the braid of the conductor is served. The friction-tape layer should be at least as thick as the braid serving on the perfect wire.

To insulate a splice in wire with weatherproof insulation the wire may be served with friction tape only, to a thickness of the weatherproof insulation on the perfect conductor.

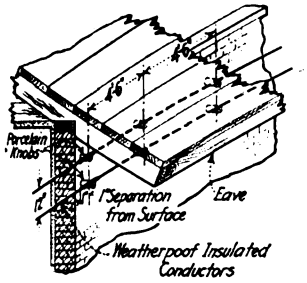

Fig. 4.—Conductors Protected From Weather.

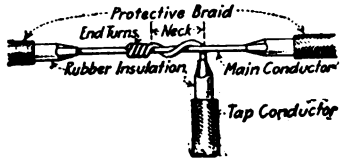

Fig. 5.—Tap Joint.

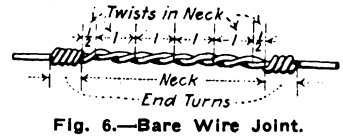

Fig. 6.—Bare Wire Joint.

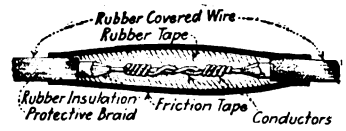

Fig. 7.—Joint in Rubber-Covered Wire.

A tap splice in a conductor is made as shown in Fig. 5. The bared end of the tap conductor is given a few long or "neck" twists around the main conductor and then the joint is finished off by serving four or five short end turns around the main conductor. The same rules and procedure are followed in insulating a tap splice as for a main-line splice like that of Fig. 7.

In splicing duplex or twin conductors the joints should be "staggered" as suggested in Fig. 8, so that there can be no possibility of the two joints contacting with each other and so that the bulge or enlargement that is made in insulating the two joints will not occur at one location. After a twin wire has been spliced by joining its two component wires as shown in Fig. 8 at *I* and *II*, and after each of these component splices has been insulated with the tape serving of the material of the insulation next to the wire, then the entire joint should be again served from *A* to *B* with friction tape, at least equivalent in thickness to the protective braid *C* on the twin wire.

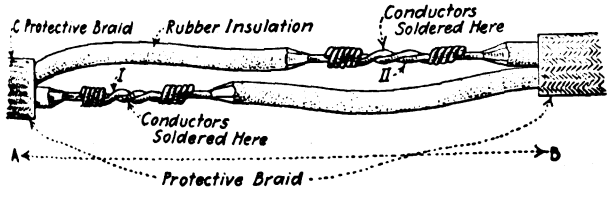

Fig. 8.—Joints in a Twin-Wire Splice Are Staggered.

Approved splicing devices are manufactured but have been applied more extensively for inside than for outside work. Figs. 9 and 10 show details of two types of the Dossert connector. All of these splicing devices are so designed that the two ends of the conductor which is to be joined are clamped, usually by a wedging action, by the device. Soldering is unnecessary. The electrical conductivity of a good joint of this type appears to be at least equal to that of a similar length of the wire itself. The mechanical strength of such a joint is usually at least equal to 75 per cent of that of the wires joined, and may be equal to the strength of the wires joined.

The Dossert connector for stranded wire is shown in Fig. 9. To make a joint with this connector the wire is first stripped and cleaned (*A*) for a distance 3/16 inch longer than the compression nut. Then (*B*) the compression nut and outside ring are slipped on and driven home (*C*) with a cup-shaped steel driver designed for the purpose. The outer strands are separated and the inner ring is pushed on over the central core (*D*) and driven home with another steel driver (*E*). Now the outside strands are formed back into position (*F*) and the nipple is screwed in place, which still further compresses the conductor, as shown in *G*.

A splicing device for solid conductors is shown in Fig. 10. With this device the inner parts are shaped to receive a double-conical split sleeve, which grips the wire with a chuck-like action. By heading over the end of the wire a trifle after it has been slipped within the split sleeve, an increase in mechanical strength is obtained.

Mechanical splicing T's, crosses and terminal lugs (Fig. 11) can be purchased. They all involve constructional principles similar to those described in connection with Figs. 9 and 10.

A conduit system installed out of doors must be waterproof to prevent moisture from short-circuiting the conductors within the duct. To be waterproof a conduit system must be so arranged that water cannot enter it. To meet this requirement it is frequently necessary to use white lead or paint on the threads of the ducts and fittings before they are assembled, and to use rubber gaskets under the fitting covers. Where an entrance or service head fitting is used, as in Fig. 12, the wire openings of the fittings should always "look" down in such a way that the water cannot enter them.

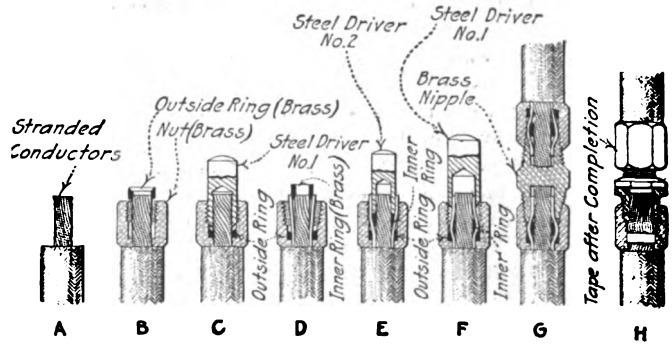

Fig. 9.—Making a Splice in Stranded Conductor With Dossert Connector.

Rubber-insulated wire must be used in making an entrance, as shown in Fig. 13. The wire outside of the building may have weatherproof insulation if it is properly supported away from members that tend to interfere, but between the last point of support outside of the building and the main cutout switch, rubber-insulated wire must be used. Such an entrance wire, where it passes through the wall to the interior of the building, is subjected to moisture, which renders desirable the use of the best possible insulation on it.

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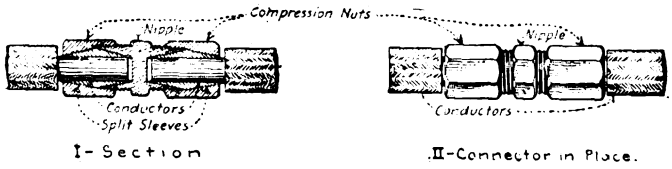

Fig. 10.—Dossert Connector for Solid Wire.

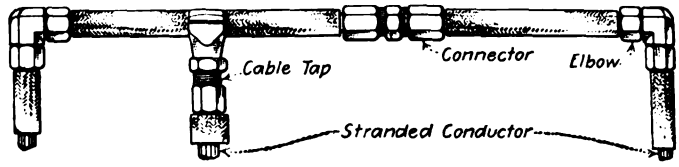

Fig. 11.—Applications of Approved Mechanical Splicing Devices.

Drip loops are bent in conductors just outside of the point where the conductors enter a building to prevent the entrance of moisture around the wire, as shown in Fig. 13. If rain does collect on the wire it will follow the wire down to the last point, *A*, and there fall off. None will enter the tube *T*.

Porcelain tubes are used to provide insulation where conductors enter buildings (Fig. 13). The tube should slant down from the inside so that condensed moisture will not flow through the tube to the inside of the building. The head of the tube should always be inside of the building to prevent the bushing from slipping out of position. In brick or masonry walls it is good practice to cement the entrance tube in position in the wall with plaster of paris or with Portland cement mortar, one-half by volume of sand and one-half of cement.

Conduit service entrances are arranged substantially as suggested in Fig. 14. The approved service heads are provided with insulating outlet bushings (*B*) which separate the wires a safe distance, *D*, where they leave the fitting and prevent the abrasion of the insulation on the conductor by sharp metallic edges. As the illustration shows, the conduit entrance pipe must extend to the service cutout, or if an entrance switch cabinet is required, the conduit must extend to and enter this cabinet. Since the cellar is now usually considered the most desirable location at which to enter a building, conduit entrances are very frequently installed, conduit providing the most satisfactory support for the conductors down the side of the building. Note that conduit entrances are permitted only for "low-potential" systems, involving pressures of 550 volts or less. The section of conduit used in making an entrance should be installed in accordance with the general requirements of the general rules for all conduit installations. The wire in the conduit must be rubber-insulated. Where the conduit passes through a masonry wall as at *M*, Fig. 14, the space between the outside of the conduit and the sides of the hole through the masonry should be sealed with Portland cement mortar, as shown around the tube in Fig. 13.

The height at which service wires should enter a building, either directly into the building or into an entrance conduit, is not specified by the National Electrical Code, but it is considered good practice to locate this entrance at least as high as the ceiling of the first floor. Where this is done there will be little danger of the service wires being interfered with by persons walking on the ground.

A method of making a service entrance by carrying the conduit down inside of a building is shown in Fig. 12. The weatherproof conductors in this case are dead-ended on strain insulators; the rubber-insulated conductors extend-

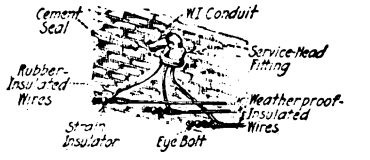

Fig. 12.—Conduit Service Entrance.

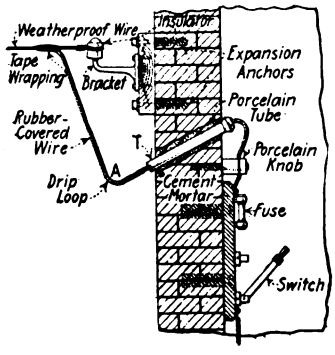

Fig. 13.—Weatherproof and Rubber-Covered Wire at Service Entrance.

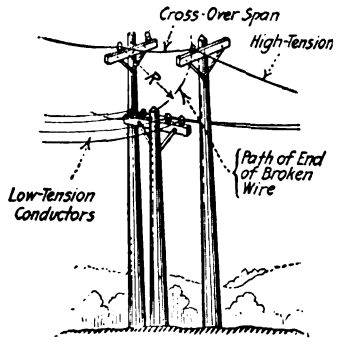

Fig. 15.—Showing How a Broken Cross-Over Span of a High-Tension Line May Foul With the Conductors of a Low-Tension Line Unless the High-Tension Poles at Crossing Are Sufficiently High.

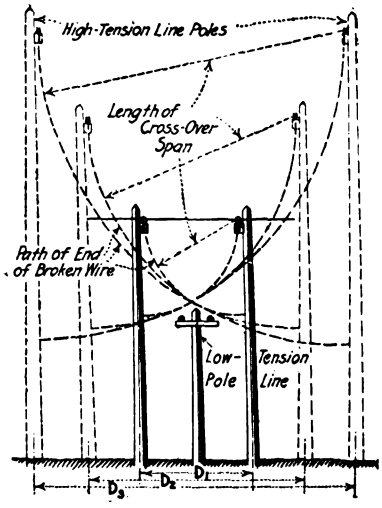

Fig. 16.—Height of High-Tension Poles Should Be Proportional to Distance Between Them.

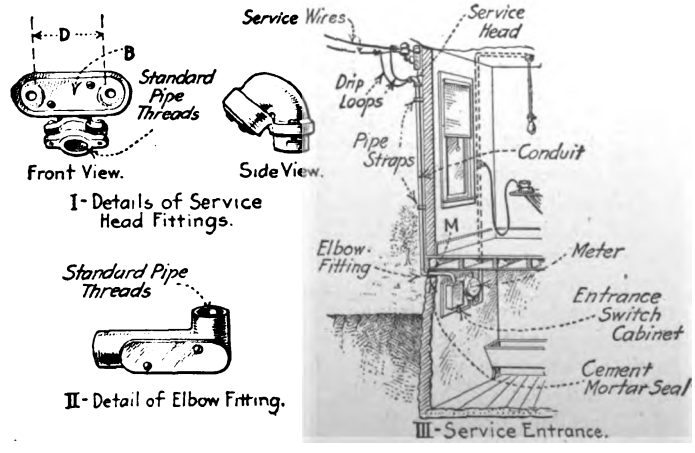

Fig. 14.—A Conduit Entrance.

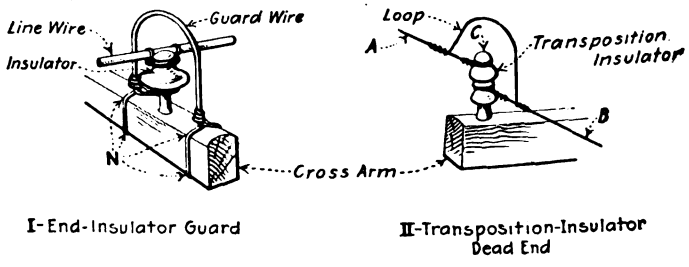

Fig. 17.—Insulators Arranged for High-Tension Crossings.

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ing from the inside of the building tap on to the weather-proof-insulation wires.

An end insulator guard formed of heavy iron wire is shown in Fig. 17, *I*. The function of such a guard is to prevent the wire supported on the insulator within it from falling off of the cross-arm and on to the wires below in case the tie wire becomes broken. In placing a guard wire of this character on the cross-arm, the arm should be notched at points indicated by *N* to prevent the guard from slipping off. A guard of another type is shown in Fig. 19. These guards consist merely of pieces of strap-iron securely bolted to the cross-arm. Guard irons should

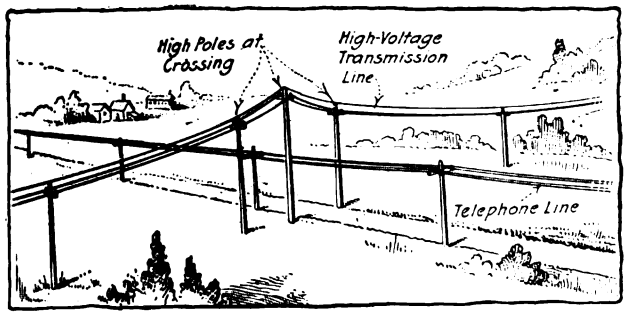

Fig. 18.—Crossing of High-Tension Transmission Line Over Telephone Line.

always be of sufficient strength that there will be no possibility of their being displaced by the conductors they are placed to restrain.

A transposition insulator may be used for dead-ending a line at a high-tension crossing as shown in Fig. 17, *II* Where the wires are dead-ended as shown, the possibility of a cross between the wires carried on the transposition insulator and those on cross-arms below is minimized. If, instead of a transposition insulator being used at *C*, an insulator of the ordinary type were employed, if the wire broke some place to the right of *B*, for instance, the weight of the cross-over span *A* might pull the whole section to the left of the break back through the tie wire on the insulator and it might fall down and make contact with the wires under *A*. Obviously, where the wires are dead-

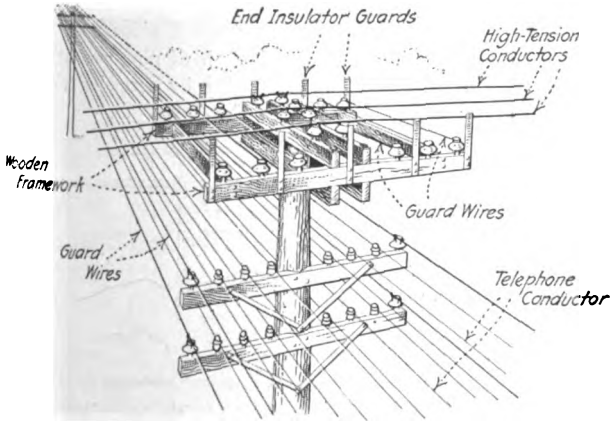

Fig. 19.—Joint-Pole Construction at a High-Tension Crossing.

ended on a transposition insulator as shown, there is no likelihood of their pulling through the tie and becoming fouled with the conductors below the cross-over span *A*.

Where a pole line carrying a pressure of 5,000 volts or above crosses another line it is desirable that the heights of the poles at the crossing be so selected that crosses between the two lines will be impossible. For example, as shown in Fig. 15, if the poles carrying the high-tension conductors, which should preferably be located above the low-tension conductors, are not sufficiently high and not sufficiently close to the low-tension line, a wire breaking in the cross-over span may drop down as shown and foul with the low-tension line. Fig. 16 indicates that if the high-tension poles are high enough it will be impossible for the high-tension wire of the cross-over span to fall down against the low-tension conductors. It is obvious from the illustration that the farther away from the low-tension line the high-tension poles are located, the higher

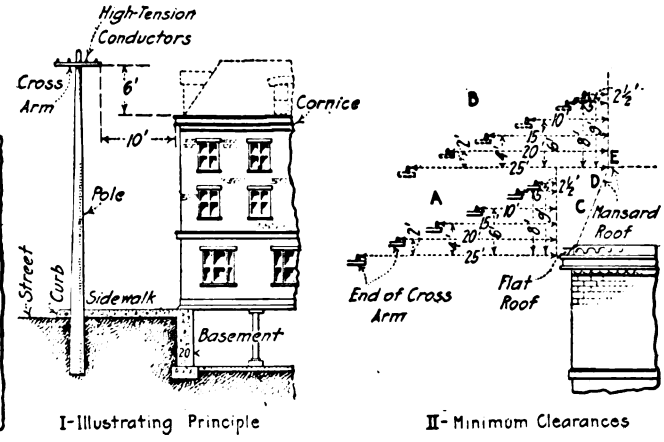

Fig. 20.—Minimum Allowable Clearances Between High-Tension Conductors and Buildings.

the high-tension poles must be to satisfy this requirement. In fact, if the high-tension poles are located very far away from the low-tension line their height becomes excessive and their cost therefore exorbitant and out of all proportion to their value. It follows then that the two poles carrying the high-tension line over a low-tension line should be set as close as possible to the low-tension line.

A good method of arranging a high-tension crossing is that pictured in Fig. 18, where one high-tension pole is set very close to, or possibly in between, the low-tension conductors. Then somewhat shorter high-tension poles can be located on either side of the low-tension line and a reasonable distance away from it. Note that end-insulator guards should be arranged on the high-tension poles adjacent to the high-tension crossing as shown in Fig. 17, and also the cross-over span for the low-tension conductors should be dead-ended on transposition insulators as shown in Fig. 17, or arranged in accordance with some other method that will provide equivalent protection.

Probably the most satisfactory method of making a cross-over on a high-tension line is that suggested in Fig. 19, wherein a joint pole is used.

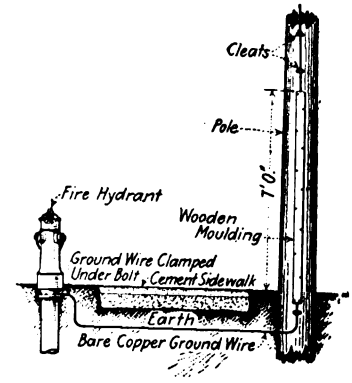

Fig. 21.—Secondary Grounded on Fire Hydrant.

A joint-pole crossing is shown in Fig. 19, which shows the high-tension conductors of a three-phase line crossing a telephone line. The construction carrying and associated with the high-tension conductors should be very strong. End insulator guards of the type shown in Fig. 17, *I*, or in Fig. 19, should be used to prevent the high-tension wires from slipping from the ends of the cross-arms. Although a three-foot spacing between the high and low-tension conductors is considered permissable in some cases, it is believed better practice to make this spacing at least five feet. In the illustration the guard wires on the telephone

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cross-arms are supported on high-tension insulators about one foot from the telephone wires and about four inches above them. These guard wires should, preferably, be grounded. Inasmuch as the guard wires on the high-tension cross-arms of Fig. 19 lie directly over the guard wires on the lower cross-arms, it would be impossible for one of the high-tension wires that broke to contact with the telephone conductors.

The end-insulator guards extend about 8 inches above the horizontal plane of the high-tension conductors. Where

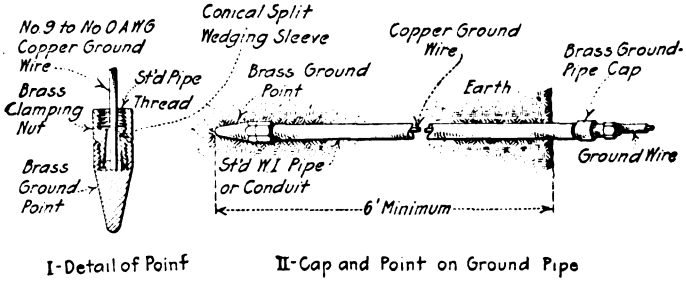

Fig. 22.—Special Fittings for Adapting Wrought-Iron Pipes for Use as Ground Pipes.

the guard wires are grounded it is not necessary to support them on high-tension insulators. Where metal poles are used for high-tension crossings, and they are probably preferable except that they are much more expensive, the metal pole should be thoroughly grounded.

When lines carrying pressures of 5,000 volts or above are carried near buildings they should be arranged in accordance with the requirements indicated in Fig. 20. The intent of these requirements is to so locate the high-tension conductors that they will not interfere with the fighting of a fire in the adjacent building. That is, they should be so located that the firemen in the street can play a stream of water on the burning structure without its striking the high-tension conductors. Where the building has a flat roof, as shown in the full lines in Fig. 20, the high-tension conductor nearest the building may be located in

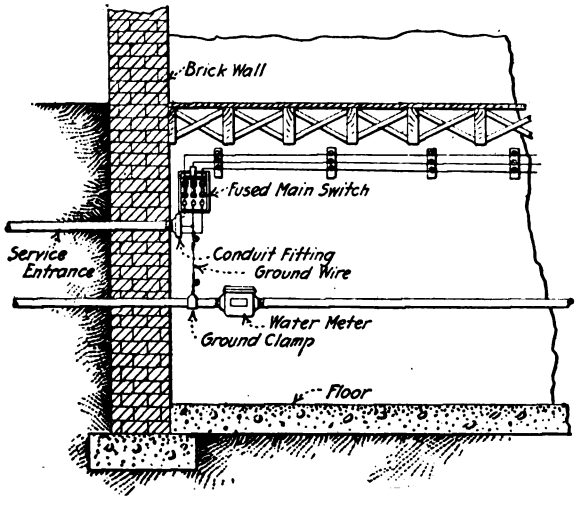

Fig. 23.—Method of Grounding an Underground-Service-Entrance Neutral.

accordance with the dimensions *A* given from the farthest extending point of the cornice. But if the building has a mansard roof, as indicated by the dotted lines, then it is obvious that conductors located as just above suggested would interfere with the operation of the firemen. Then, with a mansard roof or any roof that has a slight pitch, the conductors should be located in accordance with dimensions *B* measured, not from the actual cornice of the building, but from what in this case is equivalent to the cornice, that is, from some point, *C* or *D* of the roof, or preferably *E*, the top corner of the building.

Rubber-insulated copper ground wires should be used in or on buildings because in these locations maximum conductivity and high insulation are desirable so that a fire risk may be decreased to a minimum. Under extreme conditions ground wires may carry large currents. Iron ground wires cleated directly to the pole as shown in Fig. 21 have been found satisfactory in aerial construction.

No ground wire should ever be smaller than No. 6, A. W. G. (A. W. G. means American Wire Gauge, which is the same as the B. & S. Gauge). Wires smaller than No. 6

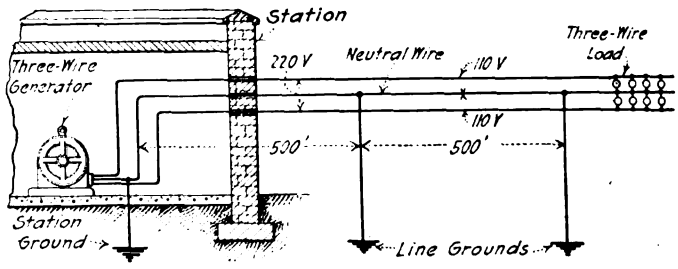

Fig. 24.—Grounds on Neutral Wire of a Three-Wire System.

should not be used because they are too weak mechanically to insure against their breakage in the exposed conditions in which they are frequently installed.

Ground wires for central stations, substations and on aerial pole lines are ordinarily of bare wire and are held to the walls of the building or to the pole with small pipe straps. Staples should not be used, because in driving them they are likely to nick the wire, rendering it liable to breakage. Furthermore, the staples may be driven in too far and therefore weaken the wire or shear it partially asunder. Heavy galvanized iron wire, preferably stranded wire like that used for guying, is often used for station and pole-line grounds. Sharp kinks, coils or bends should not be permitted in ground wires because these tend to increase the inductance of the ground conductor, which greatly increases the opposition of the conductor to high-frequency static discharges due to lightning or to surges. Fig. 21 shows a method of making a pole-line ground on a fire hydrant which has been successfully used in some localities.

Special points and caps for ground pipes may be purchased, whereby an ordinary length of pipe can be readily converted into a good ground pipe by screwing the point

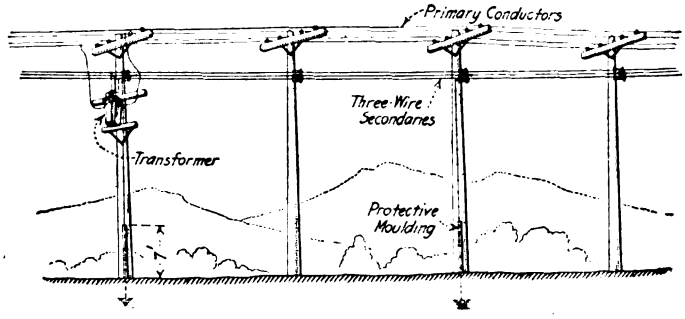

Fig. 25.—Grounds on Neutral of a Three-Wire Secondary at Transformer and Along Pole Line.

on its lower end and the cap on its upper end. With the Fargo point illustrated in Fig. 22 the ground wire is connected to the point by the wedge action of a conical split steel sleeve. It is carried down within the pipe to the point, as shown in the illustration. The ground wire is also connected to the pipe at its upper end where it passes through the brass ground cap. The provision of a point on the lower end of a pipe renders it easy to drive, and the cap at the upper end of the pipe prevents the entrance of moisture and also effects an electrical connection between the ground wire and the pipe. With some makes

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of ground-pipe points the ground wire is not carried down within the pipe to the point but is merely connected to the pipe with a soldered or a mechanical joint at the cap.

The protection of ground wires against mechanical injury may be effected by running the ground wire in iron pipe or conduit, or in molding, as shown in Fig. 21. If the ground wire is protected with iron pipe or conduit and constitutes a ground for a lightning arrester, the wire should be electrically connected to the pipe by soldering it thereto or by driving in a metal wedge at the top. The reason for this is that if the wire is not electrically connected to the pipe the pipe increases the inductance of the wire, but if the pipe and wire are electrically connected together the pipe thus becomes part of the electrical path and this objection disappears.

The ground connections for central stations should connect to all grounded metal work within the station so that no portion of this grounded metal work can become charged to a higher potential above ground than the other portions. If the different components are not electrically connected, there is a possibility of one component attaining a higher potential than another, which might cause an electric arc between them, and a fire. Furthermore, there will be danger of an electric shock to an attendant who touches two conducting members at different potentials.

The ground connection to a neutral of an underground service is shown in Fig. 23. The ground wire is connected to the water pipe on the street side of the meter, so that if the meter be removed the ground will remain intact.

Ground connections should not be made to piping systems which have cement joints because the conductivity of such a piping system may be very low. In cases where the cement has fallen away from the joints in an old piping system of this character the resistance of one of the pipe joints may be so high that the joint practically constitutes an "open" in the circuit.

The neutral of a three-wire overhead distributing system should be grounded at least every 500 feet, as shown in Figs. 24 and 25. These conductors should be grounded for the same reasons that all secondary circuits of transformers should be grounded, namely, to tend to prevent a difference of potential greater than that for which the apparatus feeding from the conductors of the three-wire circuit were designed being impressed on them. For example, if a 110-220-volt three-wire system has its neutral grounded thoroughly there is practically no possibility of the voltage between any one of the wires of the three-wire system and ground exceeding 110 volts.

Contractor Secures Profitable Business by Working for Line Extensions.

A very interesting and no doubt unique method of stimulating wiring business and incidentally sales of supplies and appliances has been carried out with exceptional success by the Standard Electric & Equipment Company, of Red Wing, Minn. The policy of this company is to make a careful survey of the electrical possibilities of neighboring towns and villages, not already served by central stations, and canvass the residences to determine how many customers would be available in the event that electric service could be secured. Frequently, also, city or village authorities are approached in the matter of street lighting. With these data available the company enters into and negotiates with the Consumers Power Company, which maintains a network of transmission lines in the territory, and if the prospective business seems to warrant, definite arrangements are made for supplying energy. The Standard Electric & Equipment Company then secures house-wiring contracts from all those desiring service, and if street lighting is to be maintained, the necessary construction work is carried out, so that when the power company is ready to supply service all wiring is completed and no delays are encountered. It has also been the practice of this company to establish branch electrical stores in places where such wiring activities have been undertaken.

Within the past few months considerable business of this nature has been secured at Frontenac, Minn., and Goodhue, Minn. In the former case on the eve of receiving service the local newspaper contained the following account:

"The securing of electricity for this village was accomplished largely through the efforts of A. P. Taber, enterprising manager of the Standard Electric & Equipment Company. Some time ago he had several inquiries regarding the possibility of getting electricity for Frontenac, and he immediately set to work to see if it could be secured.

"By obtaining a certain number of citizens to promise to use the current and interesting Frontenac people in the installations of a number of street lights, Mr. Taber succeeded in getting the power company to branch a line to this village."

Similar notice appeared in the Goodhue papers relative to the obtaining of service through the efforts of the same organization. The account concluded somewhat as follows: "Arc lamps will be installed on the streets, while many of the stores and private residences will be supplied with electricity. Mr. Taber has already made a contract with 60 consumers to do their wiring and install fixtures. He will open up a branch store in the village within a few days."

While it may seem that work of this kind would naturally lie within the province of the central-station company, still it is frequently necessary for some citizens' committee or other interested body in approaching the utility company to have some concrete evidence as to the amount of prospective business before the extension of lines to such community would be justified. By anticipating this action on the part of prospective customers, Mr. Taber is able to secure for his company a large amount of profitable business which perhaps under the usual conditions would be divided among a number of concerns.

New Outdoor Substation Installed by Pacific Light & Power Corporation.

The Pacific Light & Power Corporation, Los Angeles, Cal., has installed the first outdoor substation on its system at Saticoy, to provide service for the Ventura County Power Company. The installation comprises three 1,000-kilovolt-ampere outdoor transformers with necessary switching equipment. Three steel-frame towers and one wood-frame tower each support a pole-top switch at the top and house an oil switch at the base. Power is delivered to the substation at 50,000 volts over a 56-mile transmission line leading from the Newhall switching station on the company's Kern River line and cut down to 15,000 volts for delivery to the Ventura County company.

This company, in turn, distributes the power over three lines to Oxnard, Ventura and Santa Paula; the cities of Fillmore and Piru also receive service over the Santa Paula line. This system has previously been supplied by the Southern California Edison Company, and operated at 33,000 volts; it is now being changed to 15,000 volts. The peak of the Ventura County Power Company ranges from 600 to 1,500 kilowatts.

Among the Contractors.

W. G. Heacock has been promoted to the position of general manager of the Electrical Maintenance Company, of Youngstown, O. Other changes which will take place in this organization will be the addition of Joseph Joseph, of Springfield, Ohio, as estimator, and Poster Sowers, formerly of the Dauphin Electrical Supplies Company, of Harrisburg, Pa., as assistant purchasing agent.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Kansas City (Mo.) Electric Shop Does Big Holiday Business.

The Kansas City (Mo.) Electric Light Company did by far the largest business in its history, in the Electric Shop, presided over by Miss Marie J. Russell, during the holiday season. Miss Russell provided facilities for shoppers, and for dispatching presents bought for others, such as were provided by the downtown stores, and the service was evidently appreciated. Articles were sent by parcel post and by express, to New York and California, and nearly every intermediate state. The purchases were wrapped by the employees of the shop, who also provided presentation cards, etc., and did up the bundles with tissue paper and holiday ribbon, in approved Christmas style. This feature was particularly appreciated.

C. F. Farley, manager of the commercial department, said that many items were entirely cleaned out of the stock, including irons, toasters, vacuum cleaners, and such articles, before the last shopping day had ended. The buying public evidently had plenty of money to spend, too; for the more expensive items were in heavy demand. The first and heaviest demand was for the higher priced electric lamps. The company had expanded its advertising for the holiday season, using quarter-page space frequently in all the local papers, picturing and emphasizing specific articles of electrical use as appropriate Christmas presents bound to be appreciated.

Bright Outlook in New England.

That business along electrical jobbing, wholesaling and contracting lines in New England is on the upgrade is evident from responses to a large number of inquiries as to trade conditions at Boston, Worcester, Springfield, Portland, Providence, Rutland and other important centers.

In an interview, the treasurer of one of the largest Boston jobbing houses said to a representative of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN: "Things are booming; the past month has been the best for a long time, and prospects for the new year are very rosy. Prosperity Week no doubt stimulated things considerably, but the good times were coming anyhow."

Another large dealer said: "Business in our line was generally dull from the beginning of the war until about October 1, when it began to show a decided increase. Since that, the improvement has been rapid, November with us having shown an increase over last year of between 35 and 40 per cent, and December, thus far, of over 50 per cent.

"Just how much of this was due to the 'Prosperity Week' campaign we are unable to estimate, but there is no question but that any such movement, with such wide publicity as was given this, tends to stimulate sales. The outlook for the coming year seems to us very bright."

Still another important Boston jobbing house and manufacturers' agent stated that business is much better than last year at this time, and that it is having more orders than it can take care of promptly. "There would have been plenty of business without the stimulus given by Electrical Prosperity Week," the head of this firm said; "but with its added effect, the result is a very full rush of business, with prospects for its continuance into the new year."

Dealers in appliances report an unusually large sale of domestic devices, such as cooking and heating apparatus, with a splendid run on electric ranges. The sale of table lamps has been phenomenal.

Contractors in the Boston territory are finding large jobs relatively scarce, owing to comparatively little large building construction, but old house wiring contracts have been abundant during the fall and early winter.

At Worcester, Mass., conditions in the electrical business are improving somewhat over a year ago, but, due to a strike in the metal trades in that city, conditions are perhaps not so good as elsewhere. Some of the dealers in supplies have not yet reaped large returns from Prosperity Week campaigning and advertising, but results later are confidently expected by those who participated.

At Providence, R. I., and Portland, Me., sales of appliances were phenomenal during and after Prosperity Week. In the former city the "Electric Shop," conducted by the Narragansett Electric Lighting Company, made record-breaking sales of household appliances, while at Portland the Cumberland County Power and Light Company had a large run on appliances, lamps, etc., during the holidays.

Reports from Rutland, Vt., and places in that vicinity indicate a very prosperous condition of trade. "This may be due in part to the usual pre-holiday rush," writes one contracting and merchandising concern, "but we have a great deal of work ahead, and the prospects are good for a continuance for the next six months, at least. Our business for the past four months has exceeded the business for the whole of the previous year."

Louisville Dealers Have Record Christmas Sales.

Christmas sales closed at Louisville with records of unprecedented business by the appliance dealers of the city and with a complete elimination of the stocks of electrical Christmas tree lighting fixtures. Most of the dealers provided more elaborately than usual for electrical tree lighting requirements, some of them re-ordering, it is stated, when the early shopping contingent began to make its preparations, while contractors, decorators and wiring men have been overwhelmed with orders. The fact that this was the best Christmas, from an electrical point of view, in the history of the city is attributed by the electrical fraternity to the special publicity obtained through the exhibits incident to Electrical Prosperity Week.

In this connection it may be noted that December ordinarily is a dull month in the house-wiring field, but this month has been an exceedingly busy one. A good part of the business has been a result of the 700 prospects listed by the Louisville Gas and Electric Company during Electrical Prosperity Week. Salesmen for the company have not nearly completed their rounds of the 700, not to mention the additional list of names of those who live in unwired houses but who have not asked for estimates of the cost of this improvement. It is also stated that the power business of the company during December, ordinarily the dullest month of the year, has been showing steady and satisfactory growth.

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Business Hints for the Electrical Dealer

How a Store on a Transfer Corner Stimulated Sales—Effectiveness in Window Displays—Evils of Price-Cutting—Attention to Customers Important

By G. D. Crain, Jr.

"Come in and Wait."

A shrewd electrical dealer in an Ohio Valley city is taking advantage of the fact that few people like to stand shivering on a cold corner to wait for their car. His store is situated just a few doors above such a corner, and a good many persons are compelled to wait there several minutes at a time, a very disagreeable experience at this time of the year. Being of a warm-hearted and generous nature, the dealer has put a card in his window announcing, "Come In and Wait for Your Car," and a lot of those who formerly had to stand outside in the cold now make use of his warm and comfortable store as a waiting-room.

The advantage to him, of course, is more than the good-will thus created—important as that is; but of those who take advantage of his hospitality, there are every day some who see items in his stock that they would like to take home, and they proceed to make a purchase. Altogether, he is managing to get a good deal of cash trade and to create some desirable new charge accounts by means of this open-door policy, which could have been justified without it.

The Proof of the Pudding.

If the proof of the pudding is in the eating, then the proof of the incubator may be said to be in the hatching.

Consequently the dealer who is selling electric incubators can demonstrate them no more effectively than by using them for their intended purpose, in public, where their operations may be seen.

There are plenty of dealers who have electric incubators in stock, but comparatively few are taking advantage of the splendid opportunity which is given to show them in a novel, effective and convincing way.

The value of motion in window-displays was commented on recently in this department, and there is no more attractive form of motion than life. By the time the chicks are breaking through their shells the dealer will have a display that will keep a crowd about his window, and one that will help to sell incubators, also.

It takes a certain amount of attention to keep the incubator going and to see that the little chicks after hatching are properly nourished. But as an advertisement the stunt will prove an excellent investment.

Looking Back.

Patrick Henry said on one memorable occasion that he had but one lamp by which his feet were guided, and that was the lamp of experience.

That is a good pointer for electrical contractors. If every member of the fraternity would take advantage of all the experience which he accumulates, so that each year he would be advanced that much further on his way to the topmost point, the progress that contracting as a whole would make would be considerably more than it is now.

Too many electrical construction men forget each job as soon as it is finished, from the business standpoint. They may have cost records covering it, but the lessons which they should have been made to point are not developed.

Right now, with electrical work probably light in most sections, is a good time for the contractor to get out his cost-sheets covering all of the jobs which he has handled during the past year, and figure the net profit on each one of them. There will be some, assuredly, where the returns were disappointing. Why? The answers to these will help to formulate a few features of business policy for 1916 that may help to keep the good ship afloat and riding high, instead of going to pieces on the reefs.

What Price-Cutting Means.

Price-cutting is a confession of weakness. It points to poor salesmanship, poor quality or poor demand. And poor demand is often interpreted by the public, rightly or wrongly, to connote indifferent value.

During the recent holidays most dealers found the demand for Christmas-tree lighting outfits ahead of the supply, as the result of the creative work which had been done by all interested in a safe celebration of the event, and consequently there was no incentive to cut prices. All of the outfits went at the standard figures, carrying a good profit for everybody concerned in handling them.

The public was thus given an object lesson as to the value of the merchandise; and since experience has taught purchasers that when a desirable article is in good demand, prices remain at the normal level, the announcement of reductions will carry the suggestion of lack of popularity, if not lack of quality.

The tendency of most people is to follow the crowd; to buy goods which have won popular favor. It is therefore just as simple to make sales at a profitable level, by spending money to create a demand, if need be, as it is to try to create a demand by the artificial and uncertain method of cutting the price.

Everybody connected with the electrical merchandise business ought to get it into his head that the main object of the game is not simply to sell, but to sell at a profit; and that profits will make it possible to do educational and creative work, which will develop additional sales and still more profits; while merely cutting prices to an unprofitable level is not even a guarantee of making sales, but simply assurance that no money will be made on whatever business happens to be done.

Talk over the price-cutting element with other members of the trade, and stir up sentiment in your community in favor of doing business at the normal, legitimate, profitable level of prices.

A Traveling Advertisement.

Many contractors use runabouts in their work, and find them exceedingly useful and convenient. It is noticeable that a great many have made use of them from an advertising standpoint by having their names and addresses painted, usually in gold letters, on the sides of the cars. This is good publicity, and as the contractor's car goes into all sorts of localities, where ordinary advertising may not reach, it is likely to turn up an occasional prospect who would not have got in touch with the concern otherwise. Some commercial houses go so far as to embellish their cars by painting them unusual colors, such as bright yellow, and endeavoring to attract special attention in this way. The effort which is being put forth generally to make the motor car play its part in advertising the business shows that many people have come to regard it as a traveling billboard, and therefore a desirable medium of publicity.

Be Interested in the Customer.

The salesman of a certain fixture store is accused by some of those who know him of being rather effeminate in his

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manner. The accusation is unjust; for he is a manly fellow, and the only justification for the statement is that he is extremely dapper of dress, careful in his speech, and polite and courteous to customers, especially ladies. A good many of the latter come to the store, of course, and he is nearly always picked to wait on them. His success has been such as to show that the care with which he handles the details of his work is well worth while, and that it is appreciated by those who are in the market for fixtures.

He really puts himself in the place of the customer, and by trying to determine the sort of fixture which would be the most effective in a given location, he manages to develop enthusiasm and interest which puts him on the same side of the fence as the customer, as it were; in other words, instead of being an opponent of the purchaser, trying to force the latter into buying, he is working with her, and endeavoring to serve her interests first of all. In doing so, of course, he is at the same time serving the best interests of the house.

Goods sold under such conditions are always satisfactory, and there are few come-backs; while the aggressive salesman who dominates a customer into taking something that she doesn't want is likely to make a half-completed sale; its incompleteness due to lack of thorough satisfaction on the part of the customer.

In this connection it may be worth while to emphasize the contrast between the carefully dressed and, let us say, even foppish salesman who handles the trade in the fixture store referred to and some of those who perform similar offices in houses where contracting is handled along with the sale of a full line of electrical merchandise. In most instances many of those in the store are doing manual labor of one kind or another, handling material and getting their hands and their clothing more or less soiled. It goes without saying that a customer, particularly a woman, is not going to be impressed favorably by attention from a salesman whose unprepossessing appearance, while of course not his fault but that of his work, is not in accord with her ideas of propriety.

A concern which is handling both kinds of business, and which has a certain amount of work to be done which a salesman cannot do without detriment to his appearance, ought to reserve one or two men, depending on the amount of strictly retail business handled, for that purpose exclusively. They will then be able to devote more time to a study of the stock, as well as to details of their appearance, and customers will not be reminded when they come in to look at electrical goods, whether specialties or fixtures, that they are in a "shop," where clean hands and clean clothes are not absolutely necessary.

Co-operation Between Credit and Sales Departments Essential.

A salesman who has worked diligently to obtain a new account for his company, secured his first order, and later finds that the credit department has refused to accept the account naturally feels that he has some cause for complaint. Frequently considerable antagonism between sales and credit departments because of such occurrences has interfered seriously with the efficiency and success of an organization. At a meeting of electrical credit men recently held in Chicago, a sales manager of a prominent electrical jobbing house presented some pertinent suggestions for greater co-operation between the sales and credit departments.

Sales conferences, at which pertinent topics relative to commercial affairs are discussed, are important features of every well managed organization. It was suggested that at these meetings or conferences, which are usually held periodically, the credit department have an opportunity of discussing its problems with the salesmen, and gain, if possible, their co-operation. Salesmen perhaps, come in closer contact with the customers of a company than any other employees, and much valuable information for use by the credit department can be collected by salesmen without in any way jeopardizing their position with the customers or without interfering with their regular duties.

In regard to overdue accounts the salesman is also in an admirable position to assist the credit department by affording the human contact between the office and the customer. In one organization, where this co-operation was in vogue, many trivial differences were settled by the salesmen, and accounts upon which payment was delayed because of these differences, were promtply settled. As a further means of prompting co-operation it was suggested that a prize be offered each year to the salesman in whose territory the least credit losses were encountered.

Merchandising Electrical Appliances in New York.

Although it does not engage actively in the sale of electrical appliances, the New York Edison Company, New York, N. Y., co-operates on a comprehensive scale with the dealers and electrical merchants of that city. A permanent feature of this co-operative effort is the publication each month in the New York Edison Company's house organ of a complete directory of electrical manufacturers, agents and dealers who handle electrical appliances. The elaborate show rooms maintained by the Edison Company are simply for the convenience of its customers, as all prospective purchasers are referred to the dealer in their neighborhood in case purchases are to be made.

With the December issue of the company's house organ an attractive folder was sent to all customers illustrating many domestic electric appliances suitable for Christmas gifts. In addition to giving the range of prices for the articles illustrated the company included data as to the cost of operation. For example, an electric toaster was stated to cost 0.4 cent per hour for energy, an electric percolator 3.75 cents per hour, an electric iron 4.5 cents per hour and a vacuum cleaner 0.1 cent per hour, etc.

India Offers United States Electrical Trade Opportunities.

A recent issue of the *Indian Textile Journal,* published at Bombay, India, reviews, to a considerable extent, some of the industrial difficulties which have fallen upon the country due to the almost complete stoppage of supplies from Germany, Austria and Belgium. While hardware, glass, chinaware, furniture, toys and chemicals are among those things which India is now greatly lacking, it is understood that there is a wide open market for electrical materials owing to the shortage in the supply from other countries. John Wallau, editor of the *Indian Textile Journal,* makes the statement that Japan seems to be the only country that is trying to benefit by the present situation, but that there seems to be a very good opening for many branches of American manufacture.

Stimulus Given Merchandise Sales in Springfield.

A conspicuous example of stimulated interest in electrical things, for which Electrical Prosperity Week was largely responsible, is found in Springfield, Mass., where the department stores, hardware dealers, and other allied concerns featured the electrical device and apparatus carried for sale. This continued not only through Prosperity Week, but was extended into the weeks following, with special reference to Christmas purchases.

The local newspapers of December 12 contained many advertising columns featuring things electrical.

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PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

ARIZONA.

Uniform Classification of Accounts. The Arizona Corporation Commission has issued an order requiring all electric utilities in the state to file on or before March 1, 1916, an annual statement for the year ending December 31, 1915.

Pacific Gas & Electric Company. The Commission has authorized a bond issue of $50,000, the proceeds derived from the sale to reimburse the treasury for money expended therefrom in extensions, additions and improvements.

CALIFORNIA.

Great Western Power Company. The application of the Great Western Power Company for a certificate of public convenience and necessity permitting the exercise of certain franchise rights in the county of Contra Costa, was denied. The right which the company desired to exercise was the construction of a transmission line a distance of approximately 2,500 feet, to enable it to serve the plant of the Western Grain & Sugar Products Company, a company using a considerable amount of energy. This company is at present being served by the Pacific Gas & Electric Company, at the same rate as is provided for in the contract between the sugar company and applicant, and to construct the extension proposed would be merely to duplicate the existing facilities of the Pacific Company, inasmuch as the company does not hold itself out as willing to serve the general public of this locality, but merely desires to secure certain of the larger and more profitable consumers.

NEW YORK—First District.

George V. S. Williams, a member of the Public Service Commission for the First District, has forwarded his resignation as a Public Service Commissioner to Governor Whitman. Mr. Williams has served on the Commission since 1912, when he was appointed by Governor Dix. His resignation is to take effect January 31, 1916, when he intends to resume the practice of law. Governor Whitman has as yet taken no action upon the resignation.

OHIO.

The Alliance Gas & Power Company, Alliance, O., has appealed an ordinance passed by the city council last August to the Ohio Public Utilities Commission for adjustment. The ordinance provides for a service rate of 6 cents per kilowatt-hour for light. The company claims that no profit can be made at this rate, and asks that an increase be permitted.

VERMONT.

Vermont Power & Manufacturing Company. Upon the complaint of citizens of the town of St. Albans that certain increases in rates for electricity are exorbitant and unreasonable, the Commission has investigated the rates of the Vermont Power & Manufacturing Company. The petition specifically alleges that:

(1) The proposed new controller rate increases the price of current to consumers using controllers more than 140 per cent.

(2) The proposed new meter rate, "Class A Residences," establishes a basis upon which consumers in exactly the same class and condition will have to pay unequal rates for current consumed. For instance, one consumer who has in his residence say 50 light sockets, and consumes in a month say 50 kilowatt-hours, would be charged for that amount about 42 per cent more than his neighbor who consumed the same amount of current, but had in his house only 20 light sockets. The effect of the new rate would be thus unequal and discriminatory in practically all cases, some more and some less.

(3) The "Class B Commercial" rate proposed would be unjust and discriminatory for the same or similar reasons.

(4) Unless the consumer under the last named class accepts the unjust method proposed upon which to base the charges against him, he is required to stand the extra expense of a "demand indicator" to partially correct such unjust basis.

(5) The "Class C Commercial" rate and basis proposed are discriminatory against other consumers under practically identical or similar conditions.

(6) In "Class F General" the exclusion of power used for "the operation of dynamos or generators for electric lighting purposes" is discriminatory and monopolistic.

At the hearing the petitioners abandoned any claim that the company is receiving any larger gross revenue under the present rates than it is justly and reasonably entitled to, but still contended that the rates complained of are unequal and discriminatory.

As to Class A Residence, the Class B Commercial and the Class C rates, the petitioners claim that the "element of demand" ought not to be recognized, and that as an alternative for the present Class A, Class B and Class C rates single rates at an equalized price would be preferable. They say, however, that the small advantage that would accrue from this to some consumers would be fully counterbalanced by the loss of the opportunity now afforded to consumers to use current in excess of the "demand" at a secondary rate of six cents per kilowatt-hour, which is no doubt considerably lower than any single uniform rate that could be fixed in justice to the petitionee would be. The petitioners finally urge that the demand be computed upon a basis of leaving out inactive fixtures, or by using a percentage of the connected load instead of the whole.

The Commission, in its opinion, says: "The Commission does not look with favor upon the suggestion that a flat rate is preferable to the rates in question. The element of preparedness to serve on the part of the company in computing electric rates is now well recognized.

"An analysis of total station expense of seventy of the smaller central stations in the eastern states, which was made by E. S. Doane, and is contained in a paper read before the National Electric Light Association, shows the relative proportion of cost which depends upon the number of kilowatt-hours generated to be 37.9 per cent, the relative proportion of cost which depends upon the number of consumers connected and served to be 11.3 per cent, and the relative proportion of cost which depends upon the capacity of the station, which in turn depends upon the 'demand,' to be 50.8 per cent.

"That part of cost dependent upon station capacity is largely proportionate to the capacity of the aggregate in-

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stallation of consumers. The revenue to meet this part of cost must be and is derived from the sale of current to consumers. The nearer to capacity a consumer approaches in an even and constant use in his particular installation the greater is his proportionate contribution to meeting this portion of cost which is dependent upon station capacity, and the nearer all the consumers approach this character of use, the less is the cost dependent upon station capacity per kilowatt-hour of production. Consequently a consumer's ratio of current consumption to the capacity of his installation should determine whether he shall receive a relatively low rate or not. A flat rate would in no wise distribute this portion of cost which depends upon station capacity equably among the consumers, unless the consumption of current were nearly equal among them, which is not the fact in the present case.

"Some form of demand rate is the most satisfactory type, and the Wright demand rate, of which Classes A, B and C rates in question are examples, is the most satisfactory rate for small users and for the lighting company whose customers are mostly of that class. The petitioners suggest in their brief a computation of consumers' demand upon a portion or percentage of installation. Any such change in computing demand, if substantial, would result in reduction of revenue, unless the present primary and secondary rates for current were raised. The petitioners admitted that the petitionee is not receiving more than an adequate revenue. The Commission is of the opinion that these primary and secondary rates for current should not be increased. Further, we are of the opinion that these Class A, B and C rates are equal and not discriminatory as between customers, when the elements above set forth are considered.

"The form of the annual quantity discount made on Class B Commercial business is not warranted. The discount is regressive and should be changed. The Class C Commercial rate is approved, for the reasons above stated, with the exception of the quantity discount therein provided, which is the same as that discount in the Class B rate, and is subject to the same infirmity."

The company has a rate called "Class E General," which is not specifically mentioned in the petition, but is criticised in the petitioners' brief. This rate is five cents per kilowatt-hour for current for the operation of heating and cooking devices, subject to cash and quantity discounts, provided the consumer also uses electricity for other service. There is a minimum charge of 50 cents per month for each meter installed or service connected, if current is used for heating and cooking purposes only. The petitioners claim this rate should be extended to cover such other devices as are in use for domestic and other small power purposes.

The Comission held that there is an adequate industrial power rate provided by the Class F General rate above referred to. An extension of the Class E General rate to cover the use of current for all electrical devices used exclusively in the ordinary housekeeping of the consumer, but not to include the use of current for industrial motor service, charging storage batteries, electric furnaces and electrolytic service, and the operation of dynamos and generators for lighting purposes, should be permitted.

The petitioners complain that the Class F General rate should be extended to permit the consumer to run a motor in "operating a generator for lighting purposes" and that the exclusion of the operation of dynamos and generators for electric lighting purposes should be stricken from the rate. The Commission says: "The company has an adequate lighting rate, and to permit a consumer to curtail the company's sale of current for lighting by converting the current sold to lighting purposes, would introduce an anomalous situation which this Commission does not care to endorse.

"Without regard to the petitioners' admissions as to the revenue of the petitionee, Classes A, B, C, E and F rates are high enough. We will not look with favor upon any increase either in amount or by change of form of any of these rates by the company or any successor to its business, unless new circumstances arising in the future would warrant it."

It was ordered that the company shall so modify its tariff as to Class E General and Class E limited rates to include therein the sale of electrical energy for the operation of appliances ordinarily used in domestic housekeeping, excluding, however, industrial motor service, charging storage batteries, electric furnaces and electrolytic service and the operation of dynamos or generators for electric lighting purposes, and to file such modification of tariff with the Commission.

WASHINGTON.

Pacific Power & Light Company. Drastic reduction in the rates charged for residential lighting and power for irrigation, by the Pacific Power & Light Company, operating in 30 cities and towns throughout Eastern Washington, has been ordered by the State Public Service Commission. The new rates for lighting per kilowatt-hour follow: North Yakima and Walla Walla, 8.5 cents; Pasco, Kennewick, Toppenish, Prosser, Dayton, Sunnyside, and Pomeroy, 10 cents; Granger, Grandview, Wapato, Mabton, Richland, Witsburg, and Zillah, 11 cents; remaining nine small communities, 12 cents. Recent rates ranged from 10 cents at North Yakima and Walla Walla to 15 cents at smaller towns. The Commission finds that the new rates on present consumption will give the company a return of 5.7 per cent, and that increased sales resulting from the reduction will bring this return to 6 per cent. All of the above rates are based on the first 60 hours used; for the second 60 hours, rates for many of the towns is 8.80 cents and for any amount over 120 hours, 6.60 cents. The Commission provides that rates for irrigation power shall be computed "on the active load, rather than the connected load," in future. This, according to the Commission, will alleviate the burden on the consumer to a great extent. The quoted rates for irrigation power remain the same. The Commission finds that the company has been furnishing service to a large number of users, including railway companies, at reduced rates, and has ordered this practice stopped, claiming it is discrimination which is in violation of the utilities law.

Missouri Utilities Association Appoints Committee on Rules.

At a recent meeting of the Missouri Association of Public Utilities, held at St. Louis, a committee was appointed to confer with the Public Service Commission of Missouri in regard to a case scheduled for hearing in reference to adopting uniform rules. The committee will obtain complete information from the National Electric Light Association and from the Bureau of Standards regarding this subject. The committee is comprised of J. D. Dowles, of Springfield; F. C. Pratt, of Joplin; John Fay, of St. Louis; S. C. Bronson, of Ozark, and A. N. Richardson, of Kansas City.

Electric Railways.

At the Institution of Civil Engineers in London on December 14, 1915, the James Forrest lecture, which dealt with the subject of "Electric Railways," was contributed by H. M. Hobart of the General Electric Company, Schenectady, N. Y., and was read by J. A. F. Aspinall, manager of the Lancashire and Yorkshire Railway, which has electrified part of its system.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

MECHANICAL AND ELECTRICAL EQUIPMENT OF NEW LAKE FREIGHT STEAMSHIP NEVADA.

Exceptionally Complete Electric Kitchen.

Designed for heavy all-the-year around service, the new steel steamship *Nevada*, of the Goodrich Transit Company, is very strongly built and is adapted to battle with ice floes during the winter on Lake Michigan. It is a freight boat, but has accommodations and fittings that are lacking on many passenger steamers, being thoroughly modern in its equipment as is evidenced by its very complete electrical installation. The *Nevada* is 238 feet overall and 42 feet beam, and can carry 1,500 tons of cargo. The boat will ply between Chicago, Milwaukee and other Lake Michigan ports.

Strongly built throughout, the prow is especially braced and reinforced, and the forward plating is of steel plates one inch thick. The cruiser stern is also of some advantage in handling the boat when it is necessary to back up to buck the ice. Water-tight compartments are provided; also a launch and the necessary complement of small boats, life belts, etc.

Triple-expansion condensing engines, developing 1,600 to 1,700 horsepower and turning the propeller shaft at from 105 to 118 revolutions per minute, drive the ship at a normal speed of about 16 miles an hour. Two Scotch marine boilers, each fired by three furnaces, supply steam at 180 pounds pressure to the engines.

A steam steering gear is installed, and there is a four-ton steam derrick on the main deck aft. Here also is a steam mooring engine which replaces the familiar windlass in winding the hawsers by which the boat is secured to the dock. Forward, the main windlass is steam-driven and is used for hoisting the anchor, as well as a winding engine. There are three 4,000-pound hydraulic elevators on the boat. These are used for handling cargo, two being installed in forward hatches and one aft.

The boat is steam-heated and most comfortably fitted up, although designed to carry no passengers. Artificial refrigeration is provided, and there is also an ice-making machine.

One commendable feature of the *Nevada* is the comfortable, sanitary living quarters provided for officers and men. It is probable that few lake boats have forecastles that are as large, light, airy and comfortable to sleep in.

Aids to navigation are of the most modern type. An automatic mechanism, electrically connected with the compass, keeps a record of the course steered. There is a McNab direction and revolution indicator and a thoroughly equipped ship's telegraph connecting the pilot house and the bridge with the engine room. A complete telephone system has been installed by the Western Electric Company, and there are also other signaling systems.

There are two 18-inch electric searchlights—one mounted on the pilot house and the other on the spar deck, aft.

Fire protection has been carefully looked after, the Aero automatic fire-alarm system being installed throughout the boat. In this system fine copper tubing is used, so designed that a comparatively slight rise in the temperature will expand the air in the tubing sufficiently to cause an alarm to be sounded in several places about the boat. The turbine-driven fire pump has a capacity of 1,200 gallons a minute. Compressed air is supplied for the operation of tools and blowers.

Electricity is supplied by three 125-volt direct-current General Electric dynamos, each directly coupled to a small Curtis steam turbine. Two of these units are rated at 35 kilowatts each and one at 15 kilowatts. The electric lighting fixtures are modern, and a number of electric fans and other electrical conveniences are provided.

Food for a ship's company of about 90 persons is cooked in an electric kitchen. The principal electric cooking appliances in the kitchen consist of a large electric range, an electric broiler and an electric bake oven. The range itself is large eough to do the cooking for about 125 persons. It is of the standard hotel type, made by the General Electric Company, which furnished all of the electric cooking equipment. The range consists of two roasting ovens and a top cooking surface, the latter being divided into eight rectangular hot plates. The dimensions of the cooking surface are 37 by 24 inches. Each oven has inside dimensions of 18 by 28 by 16 inches. The roasting ovens are ventilated by flues, and the range presents much the appearance of an ordinary hotel range using coal or other fuel.

With a maximum demand of about 19 kilowatts, the probable average demand of the range is about 14 kilowatts. The hot plates on the side of the cooking surface toward the front operate at high temperatures for rapid work, while the rear hot plates are used at lower temperatures for continuous boiling, etc. The electric heating units in the range are protected by fuses, the circuits operating the heating elements being controlled by knife switches mounted on slate panels on the top of the range. The main circuit is closed through a double-pole circuit-breaker.

The electric broiler has a capacity for cooking about 70 pounds of meat an hour. The broiling area, about 14 by 20 inches, is operated on a maximum of five kilowatts, and the electrically supplied heat can be reduced to that of one-half kilowatt for the purpose of keeping meats hot. The heating unit is located at the top of the broiling chamber, and is controlled by a double-pole switch. The gridiron on which the meat rests is supported below the electric heating unit on a movable frame, so that the distance between the heating unit and the meat may be regulated.

In the electric bake oven the maximum load is about 6 kilowatts. This oven has a capacity of about 60 loaves of bread. It is arranged for three heats, and its construction is similar to that of the ordinary gas-heated ovens. The electric heating elements are located in the base, and the air is circulated through flues on each side of the oven and on each shelf, giving an even distribution of baking. The oven is constructed of heavy galvanized sheet iron, supported on an angle-iron frame, and it has double walls with heat insulation. Knife switches, conveniently mounted on the wall nearby, control the heating units.

Operating the electric range, broiler and bake oven to maximum capacity at the same time would require 30 kilo-

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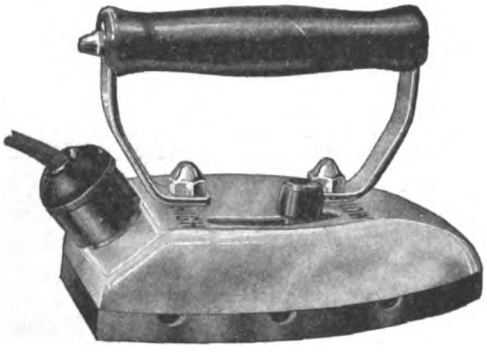
watts of energy. The advantages claimed for electric cooking equipment on steamboats, as in hotels and restaurants, are: saving in floor space; elimination of handling of fuels, compared with wood, coal or charcoal; conservation of the heat in the range itself, and not heating the kitchen excessively; greater cleanliness than other methods; saving in time, as the electrical apparatus is particularly adapted to high-temperature operations, such as broiling, frying, roasting, baking, etc., all of which are accomplished rapidly by the use of electricity with more ease and comfort than are possible by other methods. The objectionable features of smoke, gas and excess heating are entirely eliminated.

Reimers Regulator Flatiron.

In all laundry work, experience has shown that it is very desirable to provide a different degree of heat when working on very light fabrics than when working on dense and heavy materials. In the ordinary electric flatirons it is customary to adjust the amount of heat provided by cutting off the current when the iron becomes too hot, the stored heat then taking care of the work until the temperature has run down to a point requiring reclosing of the circuit. As this operation means stoppage of the work in order to open and close the circuit, time is wasted and the temperature is by no means uniform nor perfectly adjusted for the work in hand.

To meet the need for perfect adjustment, the Reimers Manufacturing Company, 130 Church Street, New York City, has recently placed on the market a new model of its regulator electric iron. As shown in the accompanying view, this iron has a very convenient adjusting switch, the handle of which projects just above the body. By means of this it is possible to change the current consumption of the iron through four different heats, so that at all times there is provided just that amount of heat that is needed by the work. This iron is a 6.5-pound appliance and although designed primarily for the use of garment factories and laundries, it has been found very satisfactory in the ordinary household.



Regulator Electric Iron.

This iron is only one of several types made by this company, but the success of this new model has been so pronounced that although it has not yet been exploited to any extent, a very large number of these irons are in use and giving excellent satisfaction.

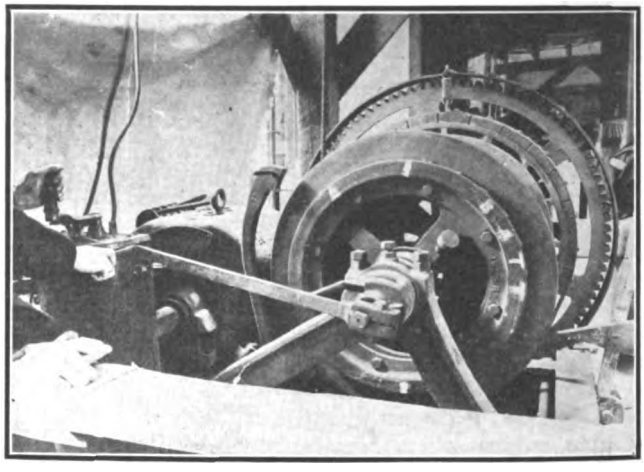
Electric Drive of Contractors' Machinery.

The electric motor is being used more extensively every year for operating contractors' machinery, such as hoists, concrete mixers, pumps, air compressors, shovels, etc. The main reason for this growing popularity is simply that electric drive is more economical and convenient than steam, provided, of course, electric current is available, as it usually is in the neighborhood of built-up communities.

In the first place, the motor does away with the steam engine and the boiler. This means that there is no fuel or water to handle, no licensed engineer is required, and smoke and sparks are eliminated. One man only is required to handle a motor-driven machine, and he need not be an experienced engineer, as any workman can learn to handle a motor in a short time. A single handle controls all operations, starting, stopping, reversing and changing the speed. There are no stand-by losses, either. The motor uses power only when actually running.

Having no boiler, the machine is lighter and more compact that a steam-driven machine, and hence is more readily moved and placed in position. On account of its compactness, a motor-driven hoist may be placed where it will not interfere with traffic. The absence of fire and sparks makes it absolutely safe, even though it is crowded under the scaffolding. Cables located overhead out of the way take the place of awkward, leaking pipes, and there is nothing to freeze in cold weather. Delays while "steaming up" are done away with. The machine is always ready to start when the whistle blows.

Another point in favor of the motor is its simplicity and reliability. Its motion is wholly rotary; there are no reciprocating parts, and only two bearings, and these are self-oiling. In consequence, it needs little attention, and has a very long, useful life. The motor is also very quiet in operation, a matter of importance in doing city work.



Electrically Driven Hoist Used by Contractor.

The Westinghouse Electric & Manufacturing Company has studied this field very carefully, and builds a line of motors specially adapted for contractors' use. Their special features are their ruggedness and strength to stand the very hardest usage to which they are subjected.

Motors for hoists, concrete mixers, and shovels, may be totally inclosed. They are designed to produce considerable power within limited dimensions, especally in starting, where the demand for power is greatest. The speed is adjustable, and the motor can be stopped and reversed almost instantly without injury.

The extensive use of electric power in such operations as the building of the Panama Canal and the Catskill Aqueduct proves its desirability for large work, while a careful consideration of the advantages enumerated above makes it evident that it is superior to any other form of power for the small job, as well as the large one.

The motor-driven hoist shown in the accompanying illustration, the photograph of which was secured with difficulty, owing to the limited space, is located on the sidewalk at Fifth Avenue and Fourteenth Street, New York City, where it is used in connection with repairs to a building. This is typical of the many uses to which the electric motor hoist is applicable where the steam hoist would be unsuitable or at least very objectionable.

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The Nokolyd Motor-Car Rear Signal.

The expeditious handling of dense automobile traffic in our large cities requires skillful operation of the cars and thorough co-operation between the drivers themselves as well as with the traffic officers. To avoid collisions on stopping or turning it is found requires a simple and reliable signal device. Such is being shown at the New York Automobile Show.

It is one of the most ingenious of all the automobile devices tested by the Safety First Society. It is, at the same time, one of the simplest, from the installation point of view, for there is no connection between the signal itself, which is located at the back of the car, and the controlling apparatus, on the steering wheel, other than three slender wires.

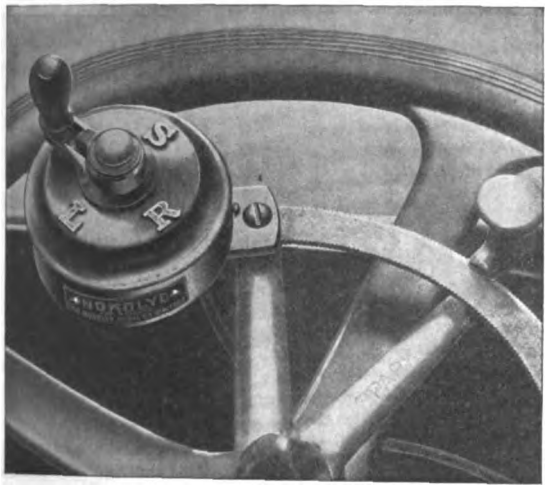


Fig. 1.—Controller on Steering Wheel.

The device is electrical. It is operated from the storage battery, which forms part of the equipment of every automobile, or it may be operated by ordinary dry cells. As each signal is set, the current is automatically cut off, from which it becomes apparent that the current consumption is very low.

Fig. 2.—Rear Signal With One of the Warning Signs.

The controlling mechanism Fig. 1, is fastened to the steering wheel, and within it is an automatic stop mechanism, which operates in similar manner to a Postal Telegraph call box. The dustproof box, at the rear of the car, has a square member inside with four faces, marked STOP, RIGHT, LEFT, and the fourth space is plain white, and shows when the controlling lever is in neutral position. When the controlling lever is turned to "S", "L", "R", or "O", the square member in the rear is turned by an electromagnetic device until the face—Stop, Left, Right, or blank, corresponds to the letters on the controller.

The Stop signal shows white letters on a red background, the Right signal shows black letters on an orange background; the Left signal shows white letters on a green background. Both the right and left signals are supplemented by arrows, showing the direction.

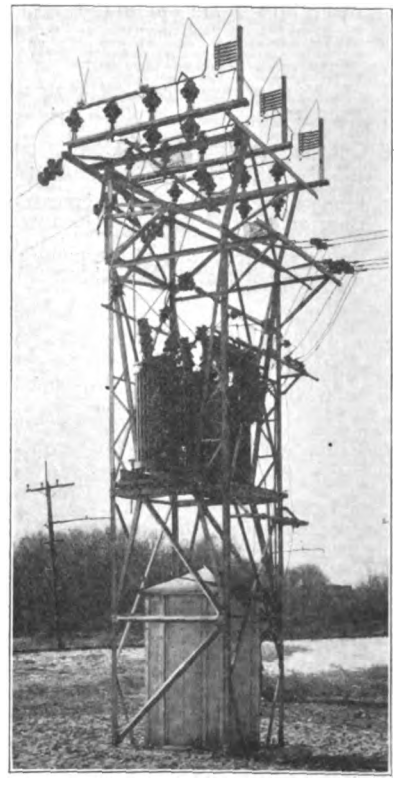
By day the signal is plainly visible for a long distance, and by night it is automatically illuminated. A tiny bell rings when the signal is given, which informs the operator that the instrument has registered correctly.

This signal is known as the Nokolyd Signal and is manufactured by the Nokolyd Signal Company, 40 West Thirteenth Street, New York City.

Modern Outdoor Substations.

Progress in high-tension distribution made during the past four years has demonstrated the fact that it is no longer a question of whether outdoor substations should be used, but rather how many can be advantageously installed in a given territory. The outdoor substation now occupies a very definite place in high-tension distribution, and the general tendency is to employ the steel-tower type.

The substation illustrated herewith occupies a ground space of 6 feet by 6 feet, and is designed for a maximum capacity of 150 kilowatts at 33,000 volts. The three-pole switch is controlled by a locking-type handle, which can be located either near the ground or about 12 feet above.



Three-Phase, 150-Kilowatt, 33,000-Volt, Steel-tower Substation.

A unique feature of this construction is in the use of a steel housing 4 feet by 4 feet by 7 feet at the base of the tower. In this house are located the various metering equipments, distribution panels, feeder regulators, etcetera, space also being provided for storage of spare parts. This equipment, which is shipped complete ready for installation, is manufactured by the Delta-Star Electric Company, Chicago, Ill.

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INDUSTRY ACTIVITIES

Thomas M. Harrigan, Woodstock, Vt., manufacturer of splicing links and insulators for pull-socket chains, is distributing an attractive desk calendar for 1916.

Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, has issued a new discount sheet applying to catalog B-21, which was recently issued. The new prices became effective January 3 and were necessitated by increases in cost of material and labor.

Holophane Glass Company has opened temporary headquarters at 340 Madison Avenue, New York City. From this office the company will resume the sale of Holophane prismatic glassware, which in recent years has been handled exclusively by the Holophane Works of General Electric Company. The company has been reorganized, with Otis A. Mygatt as president and C. Franck as sales manager. It is expected to place on the market in the near future some new types of Holophane glassware.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued several illustrated leaflets on new types of railway motors. Leaflet 3833 describes Westinghouse motor No. 306-V, which is rated at 67 horsepower, as a commutating-pole motor. Leaflet 3765 describes motor No. 307-V; this is a 55-horsepower commutating-pole motor. Leaflet 3837 describes motor No. 333-V; this motor is a 120-horsepower box-frame commutating-pole machine. Leaflet 3835 is devoted to motor No. 547-A; this motor is rated at 80 horsepower and is of the box-frame commutating-pole type. Each of these types of motor is described in detail with the aid of numerous illustrations.

The Bristol Company, Waterbury, Conn., has issued preliminary bulletin No. 231, which is devoted to Bristol's recording frequency-meter; this meter is made with both round charts and strip-type charts and is designed for the accurate indication and recording of frequency of alternating-current circuits. The company has also issued bulletin No. 206, which illustrates and briefly describes a number of Bristol's recording electric instruments; among these is the recording millivoltmeter, shunt ammeter, recording wattmeter, polyphase wattmeter, voltmeter, etc. The company has also issued bulletin No. 211, briefly dealing with the strip-chart type of recording instruments, which are made for recording a variety of electrical properties, as well as for temperature, pressure, etc.

Belden Manufacturing Company, Chicago, Ill., maker of wire and cables, is announcing a new policy regarding spools for fine magnet wire. Heretofore a small credit has been allowed for their return—usually less than one-half the cost. The result has been a decided wastage of spools, which the customers have found unprofitable to return. This has meant a heavy annual spool bill to the manufacturer, which consequently has affected the price of magnet wire. Therefore the company has revised its price of magnet wire, making reductions therein where permitted by eliminating the spool loss from the wire cost. The effort is to have purchasers return wire spools as readily as they do wire reels, thus receiving credit therefor and materially reducing the cost of this item of manufacture.

Edison Storage Battery Company, Orange, N. J., has issued a new bulletin on the use of the Edison nickel-iron-alkaline battery in commercial vehicle service. After enumerating some points of superiority of the electric wagon in delivery service and the effect that the Edison battery has had in increasing its simplicity, durability and reliability and in reducing the cost of maintenance, repairs, and the labor attending them, the book briefly describes the construction of the Edison cell and gives examples of some remarkable characteristics. The bulletin is well illustrated with pictures of trucks from practically all of the manufacturers and in a great variety of services. Several views are also shown of the effect of accidents through which the batteries have passed without serious injury. A striking feature of the book is an extract from an address by Dr. Steinmetz. The book is well printed and will undoubtedly prove of assistance to central stations, electric garages, dealers and others, in promoting the sale of the electric commercial vehicle.

The Youngstown Sheet & Tube Company, Youngstown, O., announces a profit-sharing distribution on five per cent of the earnings of its employees eligible under the company's profit-sharing plan during the year 1915. The amount distributed will be approximately $350,000. About 9,000 men are affected. This profit-sharing plan, which is the only cash distribution system in effect by any steel corporation in the Youngstown district, has been in operation since 1909, being one of the first established in this country. In 1910 the first distribution of five per cent was paid. In 1913 the distribution was five per cent, and in 1914 it was three per cent. The distribution authorized for 1915 will be made as soon as the clerical work can be completed, probably the second pay period in March. This distribution is of special interest because the company has appropriated in the past year about $8,000,000 for extensions, some of which are now approaching completion. Included in these are new bar mills, a coke-oven battery of 204 Koppers ovens, an additional blast furnace, plant office building, emergency hospitals, laboratories building, additional open-hearth furnaces, and other mill extensions which will increase the annual output of steel about 300,000 tons.

Cutler-Hammer Christmas Party.—Twenty-five hundred people, representing 1,400 employees of the Cutler-Hammer Manufacturing Company, and their families, were entertained at a Christmas Party, at Milwaukee, Wis., on December 22, by the Cutler-Hammer Entertainment Committee, composed entirely of employees of the company. Many large manufacturing concerns have in the past provided summer outings and winter entertainments, but in practically every instance the financial support has come from the employers. Cutler-Hammer outings and entertainments are engineered and financed entirely by a committee of employees. An entertainment given early in November was so successful financially as to make it possible for the Entertainment Committee to provide a Christmas Party at no cost to employees and their families. Entertainment for old and young was the aim of the committee when preparing the Christmas Party. Miss Clementine Malek, a well known soprano, sang several songs and was followed by the Rev. Wm. T. Dorward, an entertaining after-dinner speaker. Fifteen hundred people enjoyed dancing to the music of an employees' orchestra; 600 pounds of candy and numberless small gifts were distributed to 1,000 children present. Cutler-Hammer outings and entertainments have been strong forces in unifying the workers and promoting co-operation with the employers. While the employees have been in actual charge, the officers of the company have always been interested in making these events successful.

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CURRENT ELECTRICAL NEWS

ATLANTIC STATES.

BATH, ME.—Negotiations have been completed by Harvey D. Eaton, president of Waterville, and Walter S. Wyman, of Augusta, treasurer and general manager of the Central Maine Power Company, and Hon. A. H. Shaw, president of the Penobscot Bay Electric Company, and Greenville Light and Power Company, for the consolidation of the above companies, subject to the approval of the Public Utilities Commission, and papers were signed to this effect. The Greenville Light and Power Company was organized originally under the general law in 1904, with several amendments by the legislature since. Besides its hydraulic plant at Wilson Pond it has acquired the properties of the Dover & Foxcroft Light and Heat Company, the Sangerville Improvement Company, and built a water system at Greenville, taking its water on Little Squaw Mountain, six miles away. This system of waterworks, however, was not included in this deal.

MIDVALE, N. J.—Members of the Pompton township committee do not expect any objections to the franchise ordinance being granted to Butler, permitting that municipality to furnish commercial light in Bloomingdale.

NORTH CENTRAL STATES.

CHRISTIANBURG, O.—The Christianburg Light, Heat and Power Company has been incorporated with a capital stock of $5,000, to distribute current in this town from the lines of the Springfield, Troy & Piqua Traction Company. Fred J. Green, manager of the traction company, is one of the incorporators. L.

CINCINNATI, O.—It has been definitely announced, following a meeting in New York of the board of directors of the Union Gas and Electric Company, that the company will construct in the immediate future the proposed central power station mentioned some time ago. The site will be in or near Cincinnati, on the Ohio River, and the plant will be adequate for all purposes for many years to come, according to the plan now considered. L.

CINCINNATI, O.—The Norwood Board of Education will receive proposals until January 24, at 12 o'clock, for the construction of a school building, plans for which have been prepared by Bauscmith & Drainie, architects. Electrical equipment is included.

JACKSONVILLE, ILL.—Electrification of the south end pumping station of the municipal waterworks is being discussed by the city council.

HUDSON, MICH.—A new company called the Southern Michigan Light and Power Company has been organized, taking over the property of the Hudson Light and Power Company and Morenci & Fayette Light Company. The plan of the company is to extend its power transmission line to other towns and villages in southern Michigan and northern Ohio. George F. Avis is president. The principal offices of the company will be located in Hudson.

MARSHALL, WIS.—The Marshall Electric Light and Power Company, which will furnish electric light and power in the village of Marshall, has filed articles of incorporation at Madison. The company is capitalized at $1,000 and the incorporators are R. J. Russ and Joseph O. Meyers, of Reeseville, and G. C. Schmitt, of Watertown.

MONTICELLO, WIS.—For improvements to municipal light system $12,000 in bonds have been voted. Address city clerk.

HALLOCK, MINN.—Greenbush and Hallock have voted to issue bonds for electric lighting plants. Address town clerk.

LITCHFIELD, MINN.—The Municipal Electric Light Company will erect generating plant in connection with the present lighting plant.

ROCHESTER, MINN.—February 1 an election will be held to decide the question of issuing $360,000 Zumbro River electric bonds. Address Alderman Enke.

KANAWHA, IOWA.—An election will be held to decide the question of issuing $13,000 municipal light bonds. Address F. L. Bush, mayor.

BEATRICE, NEB.—The council plans to improve the electric light system. Address Mayor Mayer.

CIRCLEVILLE, KANS. — Bonds have been voted for the erection of an electic lighting plant. Address city clerk.

SOUTH CENTRAL STATES.

CHATTANOOGA, TENN.—Various light and water systems owned by the syndicate controlled by G. B. Adams and associates, of this city, which are located throughout middle and east Tennessee, will be consolidated under the general name of the Tennessee Water Company. Application for a charter for the company has been filed. The capital stock will be $600,000, and the incorporators are George B. Adams, J. L. Foust, C. O. Lindsay, George W. Erwin and R. B. Cooke.

DANDRIDGE, TENN.—By decree of chancery court, at November term, the clerk and master sold at public auction on a credit of one and two years' time, the Dandridge light and power plant here. John A. Walker bought the power plant and its equipment. It is thought the sale may be confirmed within the next month, in which event the plant may be run by water power from the Walker mill just east of town, and day service established.

MOULTON, ALA.—The Moulton waterworks, owned by O. C. Prince, is considering the construction of an electric lighting plant.

NEW DECATUR, ALA.—The city is planning the installation of a lighting plant.

SUMNER, MISS.—The Southern Electric Service Company, a reorganization of the Sumner Electric Company, and of which A. S. Carl, of Winona, is manager, will change from direct current to alternating current at 2,300 volts. It will construct a six-mile transmission line to Tutwiller, Miss., and a two-mile line to Wells, Miss.

MIAMI, OKLA.—The Empire District Electric Company has been organized here with a capital stock of $30,000. George W. Beck, Jr., is interested. D.

BEEVILLE, TEX. — It is planned by the Texas Southern Electric Company to install a new generator and other equipment in its electric light plant here. F. C. Greer is local manager. D.

COLUMBUS, TEX.—Abe Stiener and associates have purchased the local electric light plant. They will install new machinery and extend the lighting system to Glidden. D.

WESTERN STATES.

TROY, IDAHO.—The county board has granted the request of A. V. Dunkle, of Kendrick, for a franchise to utilize the public highways for the purpose of installing an electric light and power transmission line between Kendrick and Troy.

PHOENIX, ARIZ.—Sealed bids will be received by the city manager up to February 3 for furnishing all material for making extensions to the underground street lighting system.

GALLUP, N. M.—C. J. Price, manager of the Gallup Electric Light Company, is making arrangements for the enlargement of the local plant by the installation of larger and more adequate machinery.

NEWPORT, CAL.—At a recent meeting of the City Trustees the report of the lighting committee was heard, recommending the completion of the city's lighting system and advising temporary lights placed on Ocean Front, from Nineteenth Street to the pier, and in various other places.

ORANGE, CAL.—A resolution of intention has been passed by the City Trustees relative to the formation of the proposed lighting district covering the main business section of the city.

TACOMA, WASH.—The Puget Sound Traction, Light and Power Company is preparing to extend its lines to Ruston to furnish electric power, providing a franchise can be secured.

NEW PUBLICATION.

ST. LOUIS ENGINEERS' CLUB.—The *Journal* of the Association of Engineering Societies has been discontinued owing to the disbanding of the Association. The Engineers' Club of St. Louis, which constituted about 70 per cent of the membership of the Association, has decided to begin the publication of a bi-monthly, which will be known as the *Journal of the Engineers' Club of St. Louis*. The subscription price is $2.00.

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FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,605. ELECTRICAL GOODS.—A firm in the United States writes that a firm in Spain desires to obtain exclusive agencies for American electrical goods and hardware. References will be given.

NO. 19,609. ELECTRIC PASSENGER ELEVATORS, ELECTRIC INSTALLATIONS, ETC.—A commercial organization in the United States writes that the manager of a large firm in Peru desires to communicate with manufacturers of electric passenger elevators; electric installations for cities; electric material, such as copper wire and insulators for installations. Catalogs, quotations, terms, etc., are desired.

NO. 19,628. ELECTRIC LAMPS, PUMPS AND APPARATUS.—A report from an American consular officer states that a man in Spain desires to act as agent for firms manufacturing electrical goods, such as electric lamps of one-half-watt efficiency from 50 to 500 candlepower, for voltages of 110 and 220. It is stated that the inquirer can sell from 8,000 to 10,000 per month. Prices and terms are also requested for metal-filament bulbs from 10 to 50 candlepower, for which there is a sale of about 25,000 per month. An agency is also desired for electric pumps and apparatus. Catalogs and correspondence should be in Spanish, but prices, if possible, should be in francs. References are given.

FINANCIAL NOTES.

There has been added to the regular list of the Philadelphia Stock Exchange $2,560,000 additional common stock and $1,500,000 additional preferred stock of the American Railways Company of New Jersey issued in payments of the subscription of the American Railways Company of New Jersey made February 12, 1913, to a like amount of preferred and common stock of the American Railways Company of Delaware.

Dividends.

	Term	Rate	Payable
Bell Tel. of Pa	Q	1.5 %	Jan. 15
Edison Elec. Illum., Brockton	Q	$2.00	Feb. 1
Ill. No. Util., pf	Q	1.5 %	Feb. 1
Iowa Ry. & Lt., pf	Q	1.75%	Dec. 31
Monongahela Val. Trac., com.	Q	1 %	Jan. 15
New England Co., 2d pf	S	2 %	Jan. 15
New England Pw., pf	Q	1.5 %	Jan. 15
Penn. Cen. Lt. & Pw., pf.	—	1 %	Jan. 3
Pub. Serv. of No. Ill., com.	Q	1.25%	Feb. 1
Pub. Serv. of No. Ill., pf.	Q	1.5 %	Feb. 1
United Gas & Elec., pf	S	2.5 %	Jan. 15

NEW INCORPORATIONS.

NEW YORK, N. Y.—Independent Electric Lighting Corporation, Inc. Capital, $5,000. Incorporators: Helen White, City Island, N. Y.; Alexander Werner, Harry E. Diamond, New York, N. Y.

NEW YORK, N. Y.—Light and Power Meter Corporation. To manufacture meters and other electrical equipment. Capital, $500. Incorporators: Henry Wetherhon, Robert C. Lipman, New York, N. Y.; William J. Spatckhaver, Long Island City, N. Y.

PERSONAL MENTION.

MR. C. E. FAHRNEY, manager of the Ottumwa Railway & Light Company, Ottumwa, Ia., has been appointed a member of the Commercial Association Committee, which has in charge the promotion of a county fair for 1916.

MR. W. K. VANDERPOEL, formerly superintendent of distribution of the Newark district of the Public Service Electric Company, has been promoted to the position of general superintendent of distribution for the state. His position has been open ever since Farley Osgood was made assistant general manager.

MR. O. S. BEYER, JR., of Horton, Kans., has been appointed first assistant in the Engineering Experiment Station in the Department of Railway Engineering of the University of Illinois. Mr. Beyer was born in Woodridge, N. J., in 1886, and graduated from Stevens Institute of Technology in 1907 with the degree of Mechanical Engineer. He later did advanced work in economics and railway freight rates at the University of Pennsylvania and also at the University of New York.

MR. TRYGVE D. YENSEN, first assistant in the Engineering Experiment Station in the Department of Electrical Engineering of the University of Illinois, has recently been made the recipient of an unusual expression of appreciation from the officers of that institution. In response to the recommendation of the dean of the College of Engineering, seconded by all of the heads of departments of the college, the trustees, in recognition of Mr. Yensen's significant service in the development of engineering research, have voted that he be promoted, effective January 1, 1916, to be research assistant professor of electrical engineering. It is unusual for the trustees to make promotions in the middle of the college year, and they were constrained to such action in the case of Mr. Yensen because of his success in the development of alloys of iron possessing remarkable electrical properties.

OBITUARY.

MR. THOMAS WALLACE, managing director of the Waclark Wire Company, and a pioneer in the manufacture of copper wire, died on New Year's Day at his home, 346 West Seventy-first Street, New York City. Mr. Wallace would have been 89 years old had he lived until February 7. He was born in Manchester, England, and came to this country when he was five years old. With his father and brothers Mr. Wallace established at Ansonia, Conn., in 1849, the firm of Wallace & Sons, which was the first concern to make copper wire in this country. Mr. Wallace was the first manufacturer to introduce continuous fine-wire machinery for drawing fine brass and copper wire, a process which revolutionized the industry. For the last fifteen years Mr. Wallace was managing director of the Waclark Wire Company. In 1856 he married Ellen Bryant of Springfield, Mass. With four sons and four daughters she survives him.

MR. CALVIN G. GOODRICH, president of the Minneapolis Street Railway Company, and of the Duluth-Superior Street Railway Company, died at Duluth, Minn., of bronchial-pneumonia at his home on December 21, after an illness of 10 days. Mr. Goodrich was born at Oxford, O., 59 years ago. A widow and son survive him. The Duluth *Herald* says of him: "Mr. Goodrich also was president of the Twin City Rapid Transit Company, the holding company of both the Minneapolis and St. Paul Street Railway Companies.

"At the time of the death of Thomas Lowry, a few years ago, the man who made the Twin City Rapid Transit Company, it was feared his successor could not be found. Mr. Goodrich, then vice-president, was advanced to the presidency and has amply proved the wisdom of the promotion. As a hard worker he was famous.

"C. G. Goodrich, vice-president of the Twin City Rapid Transit Company, for fourteen or fifteen years has been the head and front of the street railway system of the two cities. What he said was the last word. There was none to dispute it. Only Mr. Lowry could have overruled him, but he never did. Even in the subtleties of corporation finance, and there have been anxious days in Rapid Transit affairs when a financial genius was needed to solve perplexing questions and to solve them at once, and to stay solved, it was Mr. Goodrich who solved them. His fame as a street railway manager was recognized and appreciated as thoroughly in Wall Street as it was at home. Some of that Wall Street reputation was based on the fact that back of Goodrich was Lowry, but the glory of Goodrich is not dimmed thereby.

"But, aside from any ability as a man of weight in financial centers, Mr. Goodrich was known as 'the' street railway man. If the street railway system of the Twin Cities is good, and the world knows it is, Mr. Goodrich made it so. If improvements have been made from year to year, Mr. Goodrich made them possible. If improvements have not come as rapidly as some people have wished, if city councils have failed to carry to successful conclusions street railway legislation that was demanded, wisely or unwisely, or if city attorneys have apparently laid down on legal roads that looked per-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 3	Dec. 27
American Tel. & Tel. (New York)	*127¼	128⅞
Commonwealth Edison (Chicago)	144	141
Edison Electric Illuminating (Boston)	246¾	244
Electric Storage Battery, common (Philadelphia)	66½	66
Electric Storage Battery, preferred (Philadelphia)	66½	66
General Electric (New York)	174½	173
Kings County Electric (New York)	126	126
Massachusetts Electric, common (Boston)	5½	5½
Massachusetts Electric, preferred stamped (Boston)	34	34
National Carbon, common (Chicago)	165	165
National Carbon, preferred (Chicago)	121	121
New England Telephone (Boston)	132	132¼
Philadelphia Electric (Philadelphia)	28⅝	28¾
Postal Telegraph and Cables, common (New York)	78½	78½
Postal Telegraph and Cables, preferred (New York)	65½	65
Western Union (New York)	87¾	86½
Westinghouse, preferred (New York)	*80	78
Westinghouse, common (New York)	*69¾	68⅞

*Ex. dividend.

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fectly clear and plain, then Goodrich, only Goodrich, was blamed.

"Busy as he was with Twin City matters, Mr. Goodrich was also president of the Duluth-Superior street-railway system, and he was known to Head of the Lakes business men almost as well as to those of Minneapolis and St. Paul. He also had interests in other Twin City corporations and took an active interest in their management.

"Mr. Goodrich was the soul of generosity. It is doubtful whether any worthy charity was refused by him, and he contributed generously to any Twin City enterprise that was in need of support or backing. He was one of the guarantors of the Minneapolis Symphony Orchestra, and was on the side of every worthy cause that made for the ethical advancement of the city. He was too busy for fads. He formerly had one of the best stables in either city, but of late years he rather transferred his allegiance to automobiles."

DATES AHEAD.

Western Society of Engineers. Annual meeting, Hotel Sherman, Chicago, Ill., January 12. Secretary, E. N. Layfield, Monadnock Block, Chicago, Ill.

Northern White Cedar Association. Annual meeting, Hotel Radisson, Minneapolis, Minn., January 13 and 14. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, January 17-19. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, January 25-27. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

American Electric Railway Association. Midyear meeting, Congress Hotel, Chicago, Ill., February 4. Secretary, E. R. Burritt, 8 West Fortieth Street, New York City.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

Record of Electrical Patents

Issued by the United States Patent Office, December 28, 1915

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,165,383. Elevator-Indicator System. F. A. Boedtcher, Bergenfield, N. J. Annunciator on car operated by floor push-buttons.

1,165,385. Trolley-Wire Pick-Up. G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. Clamp with insulated handle for picking up electric conductors.

1,165,412. System of Aeroplane-Signaling. H. M. Horton, New York, N. Y. Radio apparatus mounted on aeroplane.

1,165,418. Controlling Electric-Generator Prime Movers. T. H. Kerr, assignor to W. Snee and J. A. Snee, Jr., West Elizabeth, Pa. Wind-wheel-driven generator and storage-battery system.

1,165,420. Municipal-Service Post. O. D. Kleinsteuber, assignor to A. L. Doelger, Milwaukee, Wis. Street post for supporting fire alarm, telephone, etc.

1,165,427. Protector for Pipes or Conduit Units. P. McElroy, assignor to Enameled Metals Co., Sharpsburg, Pa. Conduit-end threads protected during shipment.

1,165,436. Automatic Door-Releasing Apparatus. L. M. Mochau, East Hartford, Conn. Door provided with push for electrically operating latch.

1,165,447. Switch-Controller System. F. N. Reeves and A. E. Lundell, assignors to Western Electric Co., New York, N. Y. For telephone system: primary switch operating singly on number of secondary switches is locked if two of latter are simultaneously operated.

1,165,451. Electrical Heating Element. E. H. Ruckle, assignor to Hughes Electric Heating Co., Chicago, Ill. Avoids concentration of heat at center.

1,165,454. Apparatus for Receiving and Strengthening Electric Oscillations. J. Schiessler, Baden, Austria-Hungary. Receiving and relaying means including electric arcs having oscillating electrodes.

1,165,479. Electric Switch. A. R. Wittwer, Sabetha, Kans. Details of switch having contact bar operated by rotary cam element.

1,165,485. Electrocuting Device. J. T. Adams, Vernonia, Ore. Designed to be used as a floor mat.

1,165,487. Target. E. B. Badcock, London, England. For use with moving-picture apparatus.

1,165,492. Dual Ignition System for Internal-Combustion Motors. E. A. Briggs, Hopewell, N. J., assignor of one-half to F. Pettit. Combination of high and low-tension magnetos and battery.

1,165,495. Machine for Covering Wire, Cord, Elastic, and the Like. E. W. Cooper, Coventry, England. For braiding cover on wires, etc.

1,165,519. Spring Binding-Post. D. K. Ruskin, assignor to American Ever Ready Co., New York, N. Y. Has spring grip for wire end.

1,165,530. Conduit for Electric Wires. E. Mueller, Staten Island, and W. R. McKenney, New York, N. Y. Wire molding having number of conduits, formed from single sheet of metal.

1,165,536. Match-Machine. M. Paridon, assignor to Diamond Match Co., Chicago, Ill. Electric motor driving splint carrier and composition roller controlled by fluid piston for adjusting carrier.

1,165,540. Signal-Actuating Mechanism. H. P. Ryner, assignor to Hoeschen Mfg. Co., Omaha, Nebr. Spring motor for operating signals is automatically wound by electromagnet.

1,165,542. Electric Door-Lock. O. B. Schnerre, Galena, Ill. Electrically operated switch lock.

1,165,553. Electrical Connecting Socket. J. C. Stearns, Worcester, Mass. Has a bendable tongue for securing the pin in the notch in a bayonet joint.

1,165,558. Method of Producing Electromagnetic Coils. C. H. Thordarson, Chicago, Ill. Flat wire coils formed by applying insulation to metal sheet and cutting and winding strips therefrom.

1,165,562. Suction Machine. J. Wynn, Jr., assignor to Climax Mfg. Co., Cleveland, O. Driven by split-phase induction motor.

1,165,563. Electrical Fuse. H. W. Young, Chicago, Ill. Inner fuse-carrying tube for cartridge fuse has frangible head supporting one end of fuse which gives way when fuse is secured to cartridge cap.

1,165,572. Junction Box and Switch. F. A. Culver, Worcester, Mass. Busbar connection plate for automobile lighting circuits.

1,165,581. Automatic Locking and Unlocking of Railway-Carriage Doors. M. Evans, Llanelly, Wales. Lever mechanism operated by solenoid from axle-driven generator.

1,165,592. Centrifugally Controlled Coasting-Indicating Device for Cars or Trains. W. A. Hall and C. W. Hall, assignors to Railway Improvement Co., New York, N. Y. Circuit of indicator is closed centrifugally when car is in motion and opened by application of propelling power.

1,165,595. Trolley Guard. A. P. Hawkins, Newport News, Va. Details of rope-operated device.

1,165,596. Magnetoelectric Machine. O. Heins, assignor to Bosch Magneto Co., New York, N. Y. Provision for securing proper interruption in reversible machine.

1,165,601. Electrical Ignition Device. G. Honold, Stuttgart, Germany. Adjustable induction coil.

1,165,602. Automatic Replacing Device for Circuit-Breakers. G. S. Hoover, Tippecanoe, O., assignor of one-sixth each to F. M. Hogue, H. G. Bonnell, and J. B. Gallaher. Automatically operated switch mechanism controlling motor for closing breaker.

1,165,610. Timing Device for Explosion Engines. F. H. Lansdell, Atlanta, Ga. Details of structure for multi-cylinder engines.

1,165,619. Electrode for Projection Apparatus. M. H. Moffett, assignor to National Carbon Co., Cleveland, O. Has insulating coating at one end preventing making circuit before it is properly adjusted.

1,165,639. Electropneumatic Brake Apparatus. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically controlled means for venting air from brake pipe to brake cylinder.

1,165,663. Controller. H. E. Goldberg, Chicago, Ill., assignor of one-half to R. P. Lamont, Chicago, Ill. Electromagnetically operated mechanism controlled by sheet having conducting characters.

1,165,683. Electric Switch Mechanism. J. B. Lee, Savannah, Ga. Means for driving two switch mechanisms in desired time relations.

1,165,690. Telephone-Exchange Trunking System. T. G. Martin, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of two-way trunk between subscriber's line switch and manual board.

1,165,709. Automatic Telephone System. W. T. Powell, assignor to Automatic Electric Co. Special calling trunk equipment.

1,165,712. Fly-Catcher. F. Rea, San Francisco, Cal., assignor of one-half to A. M. Sheakley. Compact, portable suction-fan device. (See cut on next page.)

1,165,728. Telephone Trunking System. J. A. Taggart, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Arrangement of selector switches, link circuits, etc., for connecting between operators' stations.

1,165,745. Electrical Measuring Instrument. A. O. Bencke, Foxboro, Mass. Structure of magnets in indicating instrument.

1,165,747. Coupling for Conduit Rods. E. L. Brockway, Glenside, Pa. For joining sections of drawing-in rods.

1,165,756. Cable Terminal. F. B. Cook, assignor to Frank B. Cook Co., Chicago, Ill. Structure of head comprising fanning strips for connecting in wires.

1,165,784. Electrically Propelled Vehicle. J. M. Klingelsmith, assignor to Klingelsmith Electric Truck Co., Chicago, Ill. Special structure of battery support and compartment facilitating handling and ventilation.

1,165,788. Means for Regulating the Speed of Electric Motors. F. G. Liljenroth, Vesteras, Sweden. Speed of direct-current motor regulated by varying generator field in response to voltage of generator driven by motor.

1,165,814. Electrically Operated Pulley Block. C. Tadey, assignor to Deutsche Maschinenfabrik Aktiengesellschaft, Duisburg, Germany. Hoisting drum geared to motor within it.

1,165,843. Removable-Unit Oil Switch. G. A. Burnham, assignor to General Electric Co., Schenectady, N. Y. Switch and oil tank form unit readily removable and replaceable.

1,165,844. Protecting Means for Electrical Distributing Systems. G. A. Burn-

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ham, assignor to General Electric Co. Arrangement of series transformers for operating circuit-breakers.

1,165,850. Frequency Meter for Measuring Electrical Current. L. Cohen, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Hot-wire ammeter with composite scale and co-operating pointers indicating current and frequency.

1,165,853. Signal-Lamp Control for Vehicles. C. W. Davis, Chicago, Ill. Manner of controlling pilot and tail lights.

1,165,862. Apparatus for Wireless Signaling. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. High-frequency inductor generator.

1,165,903. Playing Apparatus for Musical Instruments. W. C. Reed, assignor to Telectric Co., Pittsfield, Mass. Expression-controlling circuits controlled by music sheet and also manually.

1,165,904. Electromagnet. W. C. Reed, assignor to Telectric Co. Particular structure of pole pieces and armature for use in musical instruments.

1,165,916. Safety Elevator Device. I. Spiradek, S. Kalisz and W. Wilkosz, Chicago, Ill. Special structure of switch.

1,165,921. Apparatus for Sterilizing Milk. M. von Recklinghausen, assignor to the R. U. V. Co., New York, N. Y. Quartz-tube sterilization with electric alarm.

1,165,928. Power-Factor Regulator. F. H. Winter, assignor to General Electric Co. Automatically regulated rotary condenser.

1,165,935. Controlling Device. J. M. Anderson, assignor to Albert & J. M. Anderson Mfg. Co., Boston, Mass. Special gearing for time-limit circuit-breaker.

1,165,943. Electrically Controlled Lock. L. Cadenel, Paris, France. Electromagnetically operated bolt.

1,165,944. Reflector Arm for Electric Lamps. M. Chalier, Paris, France. For music stands.

1,165,949. Direction-Indicator for Motor Vehicles. S. F. Douglas, Prairie du Rocher, Ill., assignor to Vehicle Signal Co. Arrows on indicating plate operated by solenoids.

1,165,958. Heating System for Constant-Temperature Baths. T. B. Freas, assignor to V. Weber & Co., Chicago, Ill. Temperature of electrically heated chamber controlled by thermostat.

1,165,970. Signaling Glove. E. Harris, Santa Barbara, Cal. Lamp and battery on glove controlled by contacts on fingers.

1,165,983. Electrolytic Rectifier. A. L. Blanc, assignor to Gurney Electric Elevator Co., Honesdale, Pa. Aluminum cup containing electrolyte placed in bath of another electrolyte and pair of plates of other material are placed in the respective electrolytes.

1,166,003. Portable Electric Lamp. A. C. Recker, assignor to Waterbury Mfg. Co., Waterbury, Conn. Battery structure mounted in holder similar to candlestick with switch in handle. (See cut.)

1,166,008. Spinning or Twisting Machine With Separately and Electrically Driven Fliers. H. Schneider, Neusalz-on-the-Oder, Germany. Bearing for flier formed by casing of its motor.

1,166,030. Controlling Mechanism for Electric-Light Signs. W. A. Willover, C. W. Angell and J. W. Gallaspie, Lima, O. Contacts operated by perforated sheet.

1,166,034. Electrical Apparatus for Transmitting Signals. W. Akemann, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the Ruhr, Germany. Reading and setting devices in a receiver.

1,166,055. Electric Switch. J. A. Keyes, New York, N. Y. Special push-operated, quick-break structure.

1,166,081. Thermostat. J. H. Royall, Houston, Tex., assignor of 24/100 to G. W. E. Merewether, and 24/100 to J. R. Maxfield. Circuit closure effected by slight movement of thermal elements.

1,166,087. Electric Coupling. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Resilient clip for securing conductor terminal to spark plug.

1,166,090. Indicating System for Telephone Pay Station. A. J. Seymour, Minneapolis, Minn. For indicating at exchange deposit of coin at station.

1,166,094. Hair-Clipper. M. Tanaka, New York, N. Y. Electric-motor-driven.

1,166,095. Electric Heating Element. H. E. Van Doren, South Bend, Ind. Method of forming heating plates.

1,166,101 and 1,166,102. Storage Battery. T. A. Willard, assignor to Willard Storage Battery Co., Cleveland, O. First patent: Structure of jar cover. Second patent: Structure of vent plug.

1,166,108. Spark Plug. C. K. Austin, Woodstock, Ill. Both electrodes are mounted in insulating core.

1,166,114. Wire-Clamping Device. J. Cuthbert, Chicago, Ill. Wire coiling and binding clamp.

1,166,115. Indicating Device for Phonography and its Application. W. de Pezzer, Paris, France. Method of preparing a record so that it may be operated in synchronism with the band of a rythmic indicator.

1,166,129. Terminal for Contact or Spark Devices. P. R. Heyl, assignor to Commercial Research Co., New York, N. Y. Comprises palladium and silver.

1,166,134. Motor Bearing. F. R. Kunkel, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Lubrication, etc., of vertical shaft.

1,166,149. Binding Device for Panelboards. R. H. Olley, assignor to Crouse-Hinds Co., Syracuse, N. Y. Structural details.

1,166,150. Voltage - Regulator. A. H. Olmsted, Altrincham, England. Vibratory-contact field regulation.

1,166,152. Telephone Receiver. T. Rhodus,

No. 1,165,712.—Fly Catcher.

Chicago, Ill., assignor to Magniphone Co. Details of magnet in flat structure.

1,166,154. Sadiron. E. E. Rose, assignor to Westinghouse Electric & Mfg. Co. Relates to the plug holder.

1,166,157. Liquid Rheostat. K. A. Simmon and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Relates to the liquid supply.

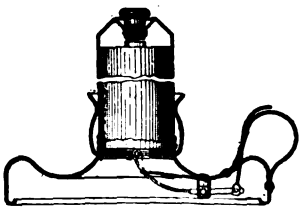
1,166,159. Method of Measuring Capacity and Power-Factor. P. Thomas, assignor to Westinghouse Electric & Mfg. Co. Employs Wheatstone bridge.

1,166,161. Brush-Holder. M. Walker, assignor to Westinghouse Electric & Mfg. Co. Special spring pressure and holding device for number of bushes side by side.

1,166,186. Starting Means for Vapor Electric Devices. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Structure and mounting of movable electrode.

1,166,189. Device for Removing and Replacing Electric Lamps. A. W. Darby, Holyoke, Mass. Pole fitting for gripping incandescent lamps.

1,166,194. Automatic Electric Coupling Mechanism for Car-Line Circuits. J. S. Doyle and F. Hedley, assignors to West-



No. 1,166,003.—Portable Battery Lamp.

inghouse Air Brake Co., Pittsburgh, Pa. Casing containing coupling mechanism, has cover opened and mechanism thrown into operative position by bringing of cars together.

1,166,196. Vapor Rectifier. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Insulating support for an electrode shield.

1,166,217. Seal. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Manner of sealing electrode into metal container in vapor electric device.

1,166,227. Telpherage System. J. Lamb, Canton, Ill. Structure of electric trolley conductor, trolley, etc.

1,166,229. Regulator. H. A. Laycock, assignor to General Electric Co. Vibratory-contact, generator-voltage regulator.

1,166,256. Electrode-Holder. J. R. Pratt, Denison, Tex. For holding arc electrode.

1,166,265. Cartridge for Flashlight Apparatus and Lamps. F. C. Schofield, assignor to the Towles-Schofield Co., Alexandria, Va. Has electric ignition.

1,166,270. Window Sign. R. M. Smith, Sioux Falls, S. D. Advertising sign having movable element driven through attraction of motor-driven magnet.

1,166,272. Electric Umbrella. F. W. Smithing, Ontonagon, Mich. Has lamps, battery and controlling push-button in handle.

1,166,331. Method and Apparatus for Safeguarding Navigation. A. G. Davis, assignor to General Electric Co. Presence of ice indicated by thermoelectric devices.

1,166,339. Electromagnetic Switch. J. Eaton, assignor to General Electric Co. Particular contact structure.

1,166,345. Switch Handle. F. P. Gates, assignor to Arrow Electric Co., Hartford, Conn. Manner of securing porcelain handle to switch spindle.

1,166,349. Attachment Plug and Receptacle. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Details of flush receptacle and co-operating plug.

1,166,366. Sparking Indicator. C. E. Harlan, Watsonville, Cal., assignor of one-half to W. H. Ames. Auxiliary spark gap.

1,166,371. Hanger for Light-Reflecting Bowls. M. Herskovitz, assignor to Peerless Light Co., Chicago, Ill. Manner of engaging bowl and securing lamp sockets thereto.

1,166,385. Spark Plug. D. W. Peck, Syracuse, N. Y. Central electrode in sections with priming channel.

1,166,391, 1,166,392 and 1,166,393. Insulator. L. Steinberger, Brooklyn, N. Y. First patent: Strain insulator. Second patent: Modification of above. Third patent: Petticoat insulator.

1,166,394. Spool-Type Strain Insulator. L. Steinberger. Special structure preventing flow of liquid along walls.

1,166,410. Electrical Instrument. G. W. Cornman, assignor to Brown Instrument Co., Philadelphia, Pa. Relates to coil pivots, counterpoise, etc., in indicating instrument.

1,166,414. Galvanic Cell. M. L. Kaplan, assignor to Beacon Miniature Electric Co., New York, N. Y. Has acid manganous polymanganite as depolarizer.

Patents Expired.

The following United States patents expired on January 3, 1916:

616,879. Electromechanical Gong. C. E. Beach, Binghamton, N. Y.

616,891. Electrolytic Apparatus for Treating Metals and Ores. G. D. Borton, Boston, Mass.

616,906. Electric Furnace. J. A. Deuther, Boston, Mass.

616,953. Telephone Receiver. J. J. Mulconroy, Philadelphia, Pa.

616,956. Electromagnetic Brake. F. C. Newell, Chicago, Ill.

616,978. Storage Battery. F. W. Schneider, Triberg, Germany.

616,979. Means for Cooling Dynamoelectric Machines. G. W. von Siemens and A. W. H. Rotth, Berlin, Germany.

617,002. Means for Producing Battery Electrodes. T. A. Willard, Norwalk, O.

617,003. Tubular Electrode for Storage Batteries. T. A. Willard.

617,004. Storage-Battery Electrode. T. A. Willard.

617,010. Timing Apparatus for Trolley-Railway Systems. H. Garrett, Dallas Tex.

617,024. Electrolytic Reducing and Amalgamating Sluice. J. H. Jory, San Francisco, Cal.

617,067. Helix for Electrical Apparatus. J. T. Williams, New York, N. Y.

617,099. Electromagnetic Apparatus for Actuating Mechanism. S. H. Hoggson, Chicago, Ill.

617,114. Electric Motor. C. R. Meston, St. Louis, Mo.

617,121. Apparatus for Electric Current Supply, etc. E. J. Preston and A. B. Gill, London, England.

617,128. Electric Elevator. A. B. See, N. O. Lindstrom and D. A. Mason, New York, N. Y.

617,139. Electric Block System for Railways. H. Baluss, Jr., Wayne, Mich.

617,145. Telephone Exchange Switch and Signal Apparatus. W. W. Dean, Boston, Mass.

617,165. System of Electrical Distribution. S. Kirlin, Watertown, S. D.

617,170. Combined Lightning Arrester and Fusible Cutout. B. L. Lawton and E. C. Wilcox, Meriden, Conn.

617,187. Means for Generating Electricity from Machinery for Locomotives. H. F. Roach, St. Louis, Mo.

617,192. Electric Propulsion of Vehicles. F. W. Schneider, Triberg, Germany.

617,193. Electric Switch. O. H. Schuck, Philadelphia, Pa.

617,275. Quick-Break Electric Switch. W. F. Bossert and G. L. Holton, Utica, N. Y.

617,287. Circuit-Closer. J. D. Garlock, Palmyra, N. Y.

Reissue 11,706. Electric Buoy. E. W. G. C. Hoffman, Charlottenburg, Germany.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

EFFICIENCY IN SELLING.

The day has passed when the world will make its beaten path to the door of the genius who has something which the world needs. It is necessary today for the man who wishes to have the world use his wares to seek his customers. Every successful business must have its selling organization, and the problem of organizing this branch of the business and co-ordinating the advertising and solicitation is one which deserves the close study of every manager. It is becoming well recognized that the most successful head of a department is one who devotes his entire energy to executive work and does not attempt to carry out the details. It is a good rule for such a man to never attempt to do anything that some one else can do better, or that some one else can do as well and more cheaply.

The executive discovers the capabilities of his men and develops them to the greatest productiveness. It is for him to put each man at the work which he can do best. It is for him to co-ordinate the efforts of the entire force and to see that direct sales efforts and advertising activities are properly fitted together. Any one can sell goods by making a sufficient expenditure for advertising and selling. The great problem is to sell the most goods or service with the least expenditure. This requires careful study and judicious use of advertising space. Modern business succeeds only through efficient advertising and a choice of advertising methods and advertising mediums must not only be intelligently made, but must be co-ordinated with the other policies of the selling organization. These principles apply to the electrical jobber or dealer as well as to every other line of business.

THE SAFETY OF ELECTRIC POWER.

One of the prominent characteristics of electric power which recommends it for application to a great variety of purposes is its comparative safety. Electrical accidents are comparatively rare and even in power stations and other places where considerable electrical apparatus is used, the number of accidents due to electrical causes is usually less than the number due to other causes. Moreover, most of the accidents of electrical origin can be directly traced to carelessness on the part of attendants and frequently to deliberate neglect of established safety rules. On the other hand, the presence of large numbers of belts in a shop or of gearing and other forms of power-transmission equipment is a frequent cause of accidents which can only be avoided by the installation of carefully devised guards and other protective and safety devices.

Another great advantage in having a supply of electric power on the premises is the possibility of furnishing adequate lighting, which can usually be done in large factories only by the use of electric illuminants. Adequate lighting not only means better output with respect to both quantity and quality, but also greater freedom from those accidents which result from inadequate illumination. It has been definitely shown that accidents from the latter cause are greater in those months of the year which include the smallest number of daylight working hours. The provision of proper artificial light would largely counterbalance this condition of affairs.

ADJUSTING SCHEDULES.

Many central-station companies have given very exacting study to the formulation of rate schedules, but in many other cases schedules have been written without thorough investigation of the requirements of the situation. In many instances due consideration has not been given to the need for simple, logical and justifiable schedules. Now that utility commissions are in existence in most of the states for reviewing schedules of electric rates and making changes in them when they cannot be justified, it is even more necessary than ever before to see that schedules are properly designed before they are put into effect or presented to the utility commission for approval. In order to pass inspection, it is necessary that schedules be intelligently worked out to fill their proper function, and moreover there must be no discrimination between different groups of customers which cannot be logically justified.

Among other things, a schedule of rates should be so devised as to be understandable to the customer, and to follow lines which will appeal to the public's sense of fairness, rather than to run counter to popular prejudices as to the merits of different classes of business. Quantity discounts are recognized in other lines of business and may well be used where other means for accomplishing the same end do not seem advisable. It is readily understood also that long-hour users are entitled to lower rates than short-hour users.

When properly constructed a rate schedule should also have the effect of encouraging consumption so as to help develop the business and increase the output. Above all things, it should be such as to provide the necessary revenue for carrying on the activities of the company. It has been amply demonstrated that a scientific rate schedule will help to develop the business and that it will often, even where reductions in the rate per kilowatt-hour have been made, effect a notable increase in net profits.

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THE FUTURE OF ALUMINUM.

The period of the European war has seen very remarkable changes in the prices of a number of metals. This has been partly due to the use of certain metals in manufacturing munitions of war and partly to the interference with ordinary production and distribution on account of the war. This tendency was not so manifest in the early months of the war as it has been during the past calendar year. The two metals most widely used in the electrical industry are steel and copper. The price of steel one year ago averaged about $19 per ton; it is now quoted at $32 per ton. One year ago copper could be purchased for 14 cents per pound; since then the price has risen, with temporary fluctuations, to over 22 cents per pound. Other metals, such as tin, zinc and aluminum, have shown even greater increases.

The principal use of aluminum in the electrical industry is as a substitute for copper in transmission lines and busbars. For a few years past the prices of aluminum and copper have been such that there has been little choice from the standpoint of cost. The difference has mostly been in favor of aluminum, however, and we have seen a large number of long-distance transmission lines constructed of this metal.

The changes during the past year, however, have decidedly reversed this situation and present prices of aluminum not only make it prohibitory to use this metal in erecting lines, but it actually pays to take down existing lines of aluminum and replace them with copper. This has been done by a number of companies and a very substantial margin of profit has thereby been effected in certain cases. Such a condition is, of course, only temporary, and a return to normal conditions of production and distribution will undoubtedly turn the scale again the other way.

A year ago aluminum was quoted at 19 cents per pound; in the latter part of 1915 the price went as high as 60 cents and at present writing is 53 cents per pound. This extraordinary rise has of course been due to the fact that the demand has been in excess of the supply. Consumers in this country have been well taken care of by domestic manufacturers and most of the product has been disposed of at prices much less than those just quoted, on a basis of contracts made earlier in the year.

The production of aluminum will undoubtedly be much stimulated by present conditions, but even in the normal course of events it undoubtedly would have continued to increase. Aluminum is one of the most abundant metals in the earth's crust, and the supply may be said to be literally inexhaustible. The price has been on the decrease for many years, and the production has steadily increased. In 1914, before the war began, the world's production was at the rate of 50,000 tons per annum. The production in 1915 has been estimated at 75,000 tons and in 1916 it will no doubt be even greater. Copper, on the other hand, is fairly plentiful today, but it has been computed by good authorities that a period of about 20 years will be sufficient to exhaust the visible supply of this metal, which is so valuable from the industrial viewpoint. While it is, of course, possible that fresh deposits may be discovered, it is well to bear in mind that it will be necessary at some time in the future to greatly restrict its use and to substitute aluminum or some other metal for every application where this is feasible. We may expect a generation or two hence to see every electrical transmission line constructed of aluminum. The recent profit-taking in pulling down aluminum lines to substitute copper, will be followed at some not far distant date by another profit-taking in the process of pulling down the copper and again substituting aluminum.

Electrometallurgy combined with hydroelectric power have enabled the aluminum industry to grow from the infantile stage to the status of an established industry within a very short period, in spite of temporary derangements. Production will, in the main, increase sufficiently to meet the demands for this metal and in the future the price may be expected to show a general trend downward, as it has in the past. Its extended use in other industries makes its electrical application a minor consideration in the balance between supply and demand, but the conditions above pointed out will undoubtedly lead to its substitution as far as may be possible for copper in the electrical industry.

EXTENSION OF ELECTRIC HEATING.

In a number of places in our Western States where coal is scarce and water power abundant, electrical energy has been used for the heating of buildings, as well as in small electric appliances and for cooking. In the issue of May 9, 1914, a description was given of the installation in the high school at Rupert, Idaho. This town comes within the area of the Minidoka irrigation project, which utilizes a large amount of electric power for pumping during the irrigation season and has spare capacity during the winter. Consequently electric energy can be supplied at a price which makes the cost of such heating of buildings but slightly greater than if coal were used, and at the same time such advantages are obtained as ease of control, cleanliness, convenience and freedom from caring for refuse.

A high school during the last year has been erected at Burley which is much larger than the one at Rupert and accommodates 2,000 pupils. The heating plant in this building utilizes electric energy to heat the ventilating air and to distribute it to the individual rooms. This heating plant has a capacity of 700 kilowatts and is the largest installation of the kind which has come to our attention. It goes without saying that electric cooking is used both in the lunch room and in the domestic science classes in this school.

The activity in the West in installing heating and cooking installations is paralleled by the recent activity

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among manufacturers in putting new equipment upon the market. Not only have electrical manufacturers greatly increased the variety of their product, but former manufacturers of gas and coal ranges are appreciating the importance of this field and are preparing to participate in the market for electrical devices. There is little doubt but what they will find an avenue for the disposition of their product, providing the latter is well suited for its purpose and that the prices are right. The field for the absorption of this class of merchandise is rapidly expanding and the demand in the near future is likely to be enormous.

BROADER TRAINING FOR ENGINEERS.

An appeal for a broader education for engineering graduates than that generally furnished by the technical schools of the country was made by Prof. Walter I. Slichter, head of the Electrical Department of the Columbia Graduate Engineering School, in a speech made recently at Pittsfield, Mass. He referred to the changes recently made at Columbia in placing the engineering schools on a graduate basis, which he thinks is a forward step in the aim to counteract the narrowing influence of the technical subjects by cultivating breadth of thought, aggressiveness, originality and a good command of English.

According to Professor Slichter, there are 117 technical schools giving courses in electrical engineering in the United States. Of these, 25 give a first-class course of professional work, 71 give electrical engineering along with the general education, and 21 give only elementary instruction in electrical engineering. These schools have granted degrees to about 22,500 men since their establishment, and for the last nine years the number of graduates has been nearly constant at 1,500 per year. During this time the amount of business done by electrical engineering concerns has increased 100 per cent and the figure of the gross earnings for the various branches of electrical engineering for the year 1914 was $2,265,000,000.

The failure of the number of men entering the profession of electrical engineering to keep pace with the increase in business is ascribed to the fact that the best positions in the business are filled by men who have not taken the technical course, thereby depriving the technical graduate of the incentive which he should have. The failure of the graduate of engineering courses to attain the position of prominence in business, politics and society that is filled by the lawyer and the business man is probably due to a lack of breadth in engineering training.

The general character of engineering training with its laborious, routine, technical work, is inclined to make a man narrow and to cause him to devote so much attention to the technical details of his work that he loses touch and even interest in general affairs. It should be the object of a course in engineering to counteract this narrowing influence of the technical subjects by cultivating breadth of thought, aggressiveness, originality and a good command of the English language, for without the latter a fine intellectual equipment is liable to be wasted for lack of appreciation.

These points have been emphasized before, but unfortunately only a few of our technical schools have taken steps to improve the old conditions in the preparation which they give to their students. We are glad to see that Columbia University is giving close attention to the matter. Undoubtedly the lengthening of the period of college training will make it more possible to broaden the course of instruction, and will be advantageous at least to the smaller number of students who find it possible to devote additional years to study in a graduate course. To a large number of students this will appear, even if it be not really, impossible, and a broadening of the ordinary four or five-year engineering courses must still be hoped for.

PROTECTION FROM COMPETITION.

A curious case has come up before the Public Utilities Commission of Missouri involving protection from competition. The public-utility laws of most of our states require a new utility corporation to secure a certificate of convenience and necessity before beginning operation. Most of the state commissions have interpreted their authority in this matter with the idea of protecting an existing utility which is giving satisfactory service from the competition of a new company which would merely duplicate existing facilities, since it is recognized that such duplication involves an unnecesasry economic expense. History has shown that while such competition may result in temporarily reducing the rates for service, it eventually saddles a greater cost upon the consumer and in many cases, such as telephone service, involves less convenience to the customer during operation.

In the Missouri case referred to, a city was furnished acetylene for lighting and the utility furnishing this service objected to the introduction of electric service, which would come in competition with it. It would, indeed, be a miscarriage of the intent of the utility law if the people of Browning were deprived for all future time of the benefit of electric service because they happened to have facilities for another type of lighting first. The Commission has taken the only sane view of the situation and explained that, while its policy is to protect the utility from duplication of service, the furnishing of electric energy cannot, in this case, be regarded as a duplication. In a certain sense electricity and any form of gas are competitors in furnishing lighting service, but electric energy can be used for other purposes, such as power, heating and charging storage batteries, and a supply of gas will not make up for what is lost without such service.

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Happenings in the Industry

Illuminating Engineers to Hold Convention in New York—Tufts College Radio Station Has Wide Range—Electric Heating in Idaho High School—New Wireless Station for Massachusetts Institute—Exports for October — Flood Lighting for Construction Work — Miscellaneous Notes

Illuminating Engineering Society to Hold Mid-Winter Convention in New York.

The midwinter convention of the Illuminating Engineering Society, which will be held in New York City on February 10 and 11, at the Engineering Societies' Building, will be the most important convention yet held by the Society and will be marked by several events of more than usual interest. One of these will be the conferring of an honorary membership in the Society upon Thomas A. Edison. This will be the first time that Mr. Edison has been made an honorary member of an engineering body. This convention will also celebrate the tenth anniversary of the Illuminating Engineering Society.

The presentation of the honorary membership to Mr. Edison will be made at a banquet at the Hotel Biltmore, on Thursday evening, February 10, which is the eve of Mr. Edison's birthday. Dr. Charles P. Steinmetz will act as toastmaster at this banquet and among the speakers will be Governor Whitman and Mayor Mitchel. The presentation will be made by John W. Lieb, vice-president of the New York Edison Company.

The convention will be formally opened at 10 o'clock on Friday morning with an address of welcome by Mayor Mitchel. Arthur Williams, general commercial manager of the New York Edison Company, will preside. It is expected that among other speakers at the morning session will be L. B. Marks, Hugo Munsterburg, Cass Gilbert, Park Lewis, and George B. Cortelyou.

Among the papers which will be presented at the convention are: "Lighting and the Panama-Pacific Exposition," by W. D'Arcy Ryan; "Theater Lighting," by Bassett Jones, Jr.; "Colored Glass in Illuminating Engineering," by H. P. Gage; "Illuminating Engineering Photographs," by B. H. Norris; "Lighting of Public Service Buildings in New York," by C. L. Law and Thomas Scofield; "Gas Lighting of a Prominent Building in Philadelphia," by J. D. Lee; "Candlepower Measurements of Series Gas-Filled Incandescent Lamps," by Ralph C. Robertson; "An Interlaboratory Photometric Comparison of Glass Screens and of Tungsten Lamps in Modern Color Differences," by G. W. Middlekauff and J. F. Skogland; "An Average Eye for Heterochromatic Photometry and a Comparison of a Flicker and an Equality-of-Brightness Photometer," by F. K. Richtmyer and E. C. Crittenden; "An Integrating Sphere," by E. B. Rosa and A. H. Taylor.

The Convention Committee consists of an exceptional number of prominent engineers, public officials and others from New York and vicinity. Arthur Williams is chairman and Clarence L. Law is secretary of the committee.

Powerful Radio Station Installed at Tufts College.

One of the most completely equipped wireless plants in the country is at Tufts College, Medford, Mass., recently completed by the American Radio & Research Company, which operates the plant though the latter is available for use by the Tufts Wireless Club. The tower is about 300 feet in height and is held in position by four sets of guys. The antenna is of the umbrella type and consists of 10 wires, each about 450 feet long, radiating from the top of the tower. At a point about 150 feet above the ground these wires are broken by insulators, and the upper ends of the wires are connected by a stranded conductor which in turn is connected to the lead-in. Both tower and guy ropes are insulated from the earth so that when these are used as antennae the capacity is very large.

The ground connection is through a network of copper wires buried about 18 inches in the soil, which is moist and furnishes exceptionally good ground connection.

The building was designed especially for radio work. It consists of two office rooms, a room for the Wireless Club, a large operating room, and a well equipped machine shop in the basement. Power for the latter is obtained from the Boston Edison Company's lines, and it is planned to install a rotary converter to convert alternating into direct current for transmitting both telephonic and telegraphic radio messages.

The receiving apparatus consists of an oscillating audion, loosed-coupled receiving transformer, four variable condensers, a secondary reactance and a pair of amplifying telephone receivers with mica diaphragms. Stations in Germany are readily heard at this station.

Professor Thomson Lectures on Optical Instruments.

On January 5 Prof. Elihu Thomson gave an instructive talk before the Lynn Section of the American Institute of Electrical Engineers. Lens-making for microscopes and telescopes was treated at length, and in place of lantern slides the instruments and lenses themselves were exhibited. The supply of optical glass has been greatly curtailed by the war, as France and Germany are the chief centers of manufacture.

The lecturer showed a 10-inch objective which he ground for his telescope, and uses at his observatory at Swampscott. A recent visit to the workship of Prof. Richie of Pasadena, Cal., was described, mention being made of the work now being conducted on a 100-inch telescope there. The grinding and testing processes were described in detail. In the course of the lecture camera lenses were also treated in a comprehensive way. After the lecture the many exhibits were examined.

Get-Together Luncheon Held at Boston.

Nearly 200 men attended the first of a series of noonday get-together luncheons of New England electrical interests at the American House, Boston, January 6. These gatherings, which were so popular last winter, consist of a 50-cent luncheon, followed by a discussion of matters of vital concern to the industry. They are held under auspices of the New England Section, N. E. L. A.

In the enforced absence of President W. S. Wyman and Vice-President R. W. Rollins, Former President L. D. Gibbs presided. For mutual acquaintance's sake, each man present was called upon to announce his name, business connection and address. Slips of paper were furnished, on which questions were written, to be answered through the Section Secretary's office from information obtained from central-station managers or experts on the particular subject.

Mr. Gibbs announced that the Fall Convention will probably be held in Western Massachusetts. The 15 section

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committees appointed to work in conjunction with kindred committees of the national organization are meeting bimonthly, and each will formulate a report to be presented, in lieu of papers, at the annual Section convention, when parallel sessions, or particular topics, will be held, rather than general sessions in which a large share of the members might find little personal interest.

The next luncheon, which will occur on February 10, will be given to a discussion of the results of Electrical Prosperity Week.

Increased Business Shown by Barstow Utilities.

Among the utility properties reporting good earnings for 1915 is the General Gas & Electric Company, whose properties are operated by W. S. Barstow & Company, New York, N. Y. This company, formed in 1912, controls electric, gas and railway properties at Rutland, Vt., Binghamton, N. Y., Sayre, Pa., Easton, Pa., Sandusky and Port Clinton, O., and railway lines entering Toledo, O. Each of these properties showed an increase in gross earnings over 1914, the aggregate being $227,532.17 or 10.3 per cent. December earnings increased $43,016.44 on the combined properties.

W. S. Barstow & Company, operators of these properties, announce that new power contracts closed last week alone by several of the properties will increase the gross in 1916 by about $75,000. Of the earnings of 1915, 66.2 per cent were from electric light and power receipts; 19.9 per cent from gas; and 13.9 per cent from railway properties. The franchises of the subsidiary companies are perpetual, except in a few minor and unimportant instances.

Municipal Ownership Bill for Massachusetts.

A bill which has been introduced in the 1916 Massachusetts Legislature seeks to make possible the acquisition by the state, city or town, of any public utility on vote of the citizens upon a referendum petitioned for by five per cent of the registered voters. The price at which the utility would be taken would be the actual value of the tangible property without regard to franchise or income value.

A resolve to be considered by the session provides for a constitutional amendment which would enable the General Court to regulate or prohibit advertising signs on either public or private property. This object was aimed at in a measure which was referred last year to a special commission, of which the Gas and Electric Light Commissioners were members, but no action resulted.

Insull Talks to Technology Alumni.

At a banquet of the alumni of the Massachusetts Institute of Technology, held in Boston on the evening of January 8, Samuel Insull, president of the Commonwealth Edison of Chicago, spoke upon the economic advantages of the electrification of steam roads. Mr. Insull advocated gradual or piecemeal electrification rather than complete immediate electrification.

He referred to the great diversity of demand in Chicago and stated that the capacity of his company's plant is 337,000 kilowatts, and of other producers 264,000 kilowatts. If the railroads were electrified they would require 125,000 kilowatts, a total of 728,000 kilowatts. The diversity of the demand is such that all of these requirements could be supplied with a capacity of 377,000 kilowatts. This would result in a saving in investment of $30,000,000 and a saving in coal consumption of 5,900,000 tons.

Telephone in South America.—Argentina leads South America in the total number of telephones, having 75,000 two years ago, but Uruguay has more per capita.

Burley School Is Electrically Heated.

In Burley, Idaho, a new concrete school building which accommodates 2,000 pupils and cost $80,000, is being heated electrically. The heating plant is described by Barry Dibble in *Reclamation Record*, the town being within the area of the Minidoka irrigation project and less than eight years old.

The heating plant in this new school is elaborate and thoroughly modern. Fresh air is drawn from the roof of the building at the rate of 50,000 cubic feet per minute and taken through a shaft to the basement. It then passes through electric tempering coils which heat it to 50 degrees Fahrenheit. Afterwards it is washed and humidified and then reaches the large motor-driven blower. This forces the air into two plenum or pressure chambers. One contains reheating coils which raise the air temperature to about 100 degrees Fahrenheit; the other merely holds the cool air from the washer. Separate ducts are provided to carry the air to each room in the building, and each duct is tapped into both hot-air and cold-air chambers. The amount of air the duct gets from each is controlled by dampers, and these in turn are regulated by a thermostat in the room supplied. In this way every room is maintained at a temperature of 69 degrees and supplied with a constant and ample quantity of pure air.

The heating plant has a capacity of 700 kilowatts. The amount of electricity actually used is automatically regulated to suit the requirement of the weather. Already the system has proved itself an unqualified success.

Hot water for the entire building will be heated electrically. The domestic science department has a complete outfit of electric hot plates for the use of the individual students, as well as a large electric range for baking and for cooking large portions. Children are brought to the Burley schools by wagon from distances as great as six miles out in the country. Practical use of the domestic science department is made in the preparation of hot noon lunches for these youngsters. The food is sold at low prices. Meal tickets can be obtained either for cash or in exchange for such supplies as milk, eggs, butter, etc., which the children can bring from the farm. In this way the cafeteria is easily made self-supporting and the domestic service classes given the very best of experience.

The building is, of course, well lighted throughout and is much used by Burley as a social center.

Another addition to Burley during 1915 is a modern hotel of 50 rooms. This building, of three stories and basement, is electrically heated. In this case small heaters are used in each room, taking the place of steam radiators. The building, including nine stores as well as the hotel, requires a maximum of 250 kilowatts.

Electricity for heating is sold at from $1 to $1.25 per month per kilowatt of capacity. One kilowatt in the southern Idaho climate will heat from 500 to 4,000 or more cubic feet, depending upon the size and construction of the building, the exposure of the room and the temperature to be maintained. An ordinary five-room house can be kept comfortable during the winter at a cost of from $10 to $15 per month. A good grade of western soft coal in these communities costs $8 per ton. Electric heat for domestic use therefore costs but little more than coal and its cleanliness and convenience puts it in a class by itself.

New Power Plan Protects Niagara Falls.

Plans for tripling the power now being derived from Niagara Falls without diverting any water from the crest were placed before the New York Legislative Committee on Water Power by the Thomson-Porter Cataract Company. It is proposed to construct a dam below the rapids, raising the water 90 feet, at an estimated cost of $100,000.

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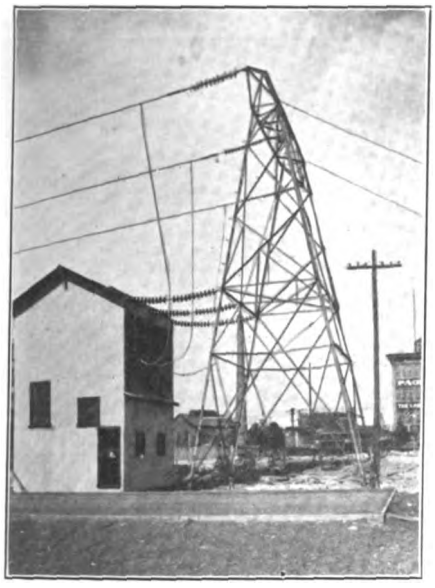
Facilities for High-Tension and Radio Tests at Massachusetts Institute of Technology.

A feature of the equipment of the Electrical Engineering Department in the new buildings of the Massachusetts Institute of Technology at Cambridge, Mass., is a transmission span of three power conductors suspended between two steel towers about 500 feet apart. This is a replica, in mechanical details, of a standard span in the Big Creek line which transmits energy at 150,000 volts from a hydraulic plant in the Sierra National Forest to Los Angeles, 240 miles, and was the gift of Stone & Webster, Boston.

A 15-kilowatt, 100,000-volt transformer, located in a transformer house at the base of one of the towers, enables tests to be made with high voltages. Energy is obtained from the Cambridge Electric Light Company's 1,000-volt line.

Besides being serviceable for high-tension tests, the span makes an excellent antenna for radiotelegraph, and research along these lines is carried on in the transformer



New Wireless Station for Massachusetts Institute.

house when the span is not in use for high-tension tests.

In the electrical laboratory of technology is an artificial power transmission line and an Alexanderson high-frequency generator. The line consists of 27 specially wound inductive units, each occupying a separate shelf or compartment. Each unit corresponds to 30 miles of overhead copper conductor of 250 square millimeter cross section. When all the coils are connected in series they represent one of the three conductors of a transmission line 810 miles long.

Many valuable researches in the field of electrical transmission have been made on this line under the guidance of A. E. Kennelly, professor of electrical engineering.

Governor Urges Reduction in Regulation Costs.

The reduction of the Public Service Commission organization was recommended by Governor Samuel W. McCall of Massachusetts in his inaugural address January 6. The governor asserted that the increase in membership of the Railroad Commission, which was reorganized in 1913 and became the Public Service Board, with salaries aggregating, for its five members, nearly thrice those paid to the Railroad Commission, has not been justified by the increased jurisdiction given the new commission, which now supervises telephone, telegraph, railroad and street railway companies.

Suspension of British Patent-Working Requirements.

Information has been received that the operation of Section 27 of the British Patents and Designs Act of 1907 has been suspended during the continuance of the war and for six months thereafter by an act of Parliament dated November 23, 1915. The section referred to allows the revocation of any patent not worked in the United Kingdom within four years after date of granting, and the practical effect of its suspension is to extend the period within which patents must be put into actual operation in Great Britain.

Power-Plant Costs Discussed by Mechanical Engineers.

In the industrial world of today, power is manufactured, sold and bought just like any other marketed commodity. The cost of production depends on numerous factors—cost of fuel, cost of generators, labor cost, amount produced—and this cost is the chief criterion on which the market price depends. Of interest to the power consumer is (1) what his power costs him, (2) what it should cost, (3) where and why the loss has occurred.

At a meeting of the American Society of Mechanical Engineers, in the Engineering Societies Building, on Tuesday, January 11, Walter N. Polakov, superintendent of power of the New York, New Haven & Hartford Railroad discussed the question of standardization and predetermination of the cost of power. He demonstrated a simple method by which the owner of a power plant of any kind can, without the necessity of study of technical details, determine just how close the cost of his own plant is to the possible minimum cost of such a plant—in other words, how much more he is paying for power than he should pay.

Mr. Polakov has spent several years in cost standardization work. At one time he was expert consulting engineer to the Board of Estimate and Apportionment of the City of New York. He has been in charge of reorganization work and introduction of scientific management in several large industrial plants in this country.

Electrical Exports for October.

The official monthly report issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., covering the foreign commerce of the United States for October, shows that the total value of the electrical exports was somewhat lower than that for last September, but exceeded that for October of 1914 by over 40 per cent. For last October the number of articles shipped in the four classes for which quantities are reported, were as follows: Electric fans, 2,451; arc lamps, 68; carbon-filament lamps, 62,397; metal-filament lamps, 812,368.

The following table gives the detailed figures for October and for the corresponding month of a year ago:

Articles.	October, 1915	October, 1914
Batteries	$ 82,554	$ 69,061
Dynamos or generators	137,445	131,286
Fans	34,042	6,684
Insulated wire and cables	201,856	144,906
Interior wiring supplies, etc. (including fixtures)	63,397	47,551
Lamps—		
Arc	1,219	9,846
Carbon-filament	8,516	4,625
Metal-filament	115,105	42,007
Meters and other measuring instruments	56,272	34,418
Motors	290,623	229,605
Telegraph instruments (including wireless apparatus)	30,171	9,454
Telephones	72,493	64,544
Transformers	31,540	40,655
All others	1,020,361	660,150
Total	$2,145,594	$1,494,792

The total value of all the electrical exports for the first ten months of 1915 was $19,386,325, compared with $16,697,829 for the corresponding period of 1914.

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Pittsburgh Section to Discuss Reflection Laws.

The regular monthly meeting of the Pittsburgh Section of the Illuminating Engineering Society will be held Friday evening, January 21, in the Engineers' Society of Western Pennsylvania rooms, Oliver Building, Pittsburgh.

At this meeting T. W. Rolph, of Cleveland, will present a paper on "The Laws of Reflection and Transmission of Light."

This paper will give a statement of those laws and the foundations on which they rest, illustrating same with examples of the various laws. The proper application and limitations of these laws are also to be given and explained.

The Pittsburgh Section is very energetic, and much interest is being taken in the meeting.

New England Section, N. E. L. A., Outlines Its Activities.

In a letter to every member of the Section, the secretary, Miss O. A. Bursiel, describes the various functions of the organization and urges the fuller use of membership advantages. These include Section convention, monthly luncheons, committee work and the use of publications and the information bureau maintained at headquarters, 149 Tremont Street, Boston.

There will be 15 standing committees in the Section this year. These are: Relations with Kindred Organizations, Accident Prevention, Accounting, Public Policy, Commercial Section, Transportation, Entertainment, Publicity and Advertising, Question Box, Rate Research, Educational, Manufacturers' Section, Heating Research, Membership and Electric Vehicles.

Coming Civil Service Examinations.

Among the civil service examinations to be held in the near future by the United States Civil Service Commission, there have been announced competitive examinations to be held on March 15 for the following positions: aid at the Bureau of Standards; steam engineer, second class, for departmental service; telegraph operator for departmental service. Examinations for the following positions will be held on April 12: electrician for departmental service; steam engineer, first class, for departmental service; laboratory assistant, Bureau of Standards.

On other various dates between March 13 and June 5, there will be held examinations for telephone operators in departmental service.

Particulars regarding the qualifications of the above-named positions and details regarding the examinations therefor can be obtained from the United States Service Commission, Washington, D. C., or from the secretary of the local boards of examiners in the principal cities of the country.

Street Railway Insures Its Employees.

An innovation in street-railway practice in New England was announced New Year's day by the Union Street Railway Company, New Bedford, Mass., when life insurance, running to each of the company's 500 employees, was begun at the expense of the company, which took out a blanket policy for about $500,000 with an eastern company. Under the terms of this policy, employees with more than a year's service to their credit will receive, on death, if occurring during the year:

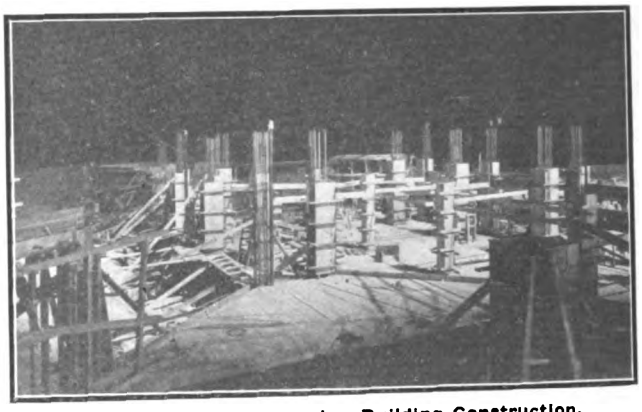
For employees who have been with the company between 1 and 2 years, $250; 2 and 3 years, $350; 3 and 4 years, $450; 4 and 5 years, $550; 5 and 6 years, $750; over 6 years, $1,000. This insurance is in addition to the accident insurance in force.

Flood Lighting Effects Marked Economy in Building Construction.

The decorative and advertising value of flood lighting is rapidly being appreciated as is evidenced by the increasing number of notable installations. Buildings which heretofore refrained from outline lighting or electric signs have become convinced of the effectiveness and dignity of flood lighting, which also has the advantage of low first cost and operation.

Aside from this phase, other uses have been developed which add greatly to the popularity of projector lighting. When the gruesome task of recovering bodies from the ill-fated steamer *Eastland* had to be carried on at night, flood lighting projectors were placed on all buildings fronting the river in the vicinity of the ship and the work carried on as efficiently as by day. In numerous construction jobs, where time was the all-important item, flood lighting has been used with gratifying results.

The accompanying illustration shows an installation of two "Sunbeam" 1,000-watt flood-lighting projectors lighting the construction work of the Edgewater Beach Hotel in Chicago. The two units, each equipped with a 1,000-watt nitrogen filled lamp are installed on a concrete hoist, 175 feet above the working floor and provide ample light for carrying on the work as efficiently and with the same dispatch as during the day.



Flood Lighting Used During Building Construction.

The installation replaced an equipment of several arc lamps which were previously installed about the job. The construction superintendent in referring to the new lamps stated that the efficiency of the men had been increased 25 per cent and the cost of lighting had been decreased 80 per cent over the previous installation.

Two additional units of the same type will be installed by the American Lighting Company for other sections of the work.

Petroleum Production Large.

Preliminary estimates of the total yield of petroleum for 1915 indicate a slight increase over the record-breaking yield in 1914. This condition does not agree with the currently reported reason for the exceptionally high prices now prevailing for motor fuel.

As a result of the overload put on the transporting and refining phases of the petroleum industry, by the excess output of crude petroleum in 1914, the year 1915 may be characterized as a period of readjustment in which production activity was purposely retarded as far as practicable. The small increase therefore is more significant than the simple figures suggest.

According to John D. Northrop, of the United States Geological Survey, the marketed production of petroleum in the United States in 1915 approximated 267,400,000 barrels, and the total yield approximated 291,400,000 barrels.

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CLASSIFICATION OF FARM LIGHTING SYSTEMS.

Increasing Number of Types Being Manufactured Makes Classification Essential.

By C. H. Roth.

At the present time there are probably 100 or more manufacturers and assemblers of farm-lighting plants in the United States, and the number is increasing as the need for such systems becomes more evident.

Most of the plants installed are naturally enough of the simplest type, depending entirely on manual control for their successful operation.

This brings up the thought that we may best start out by dividing these systems into classes and types. I would suggest for the classes the following:

(A) Plants that give light only when the generator and engine are running.

(B) Plants that give light only from the battery, the generator being used only for charging the battery.

(C) Plants that give light from the battery, or from the battery and generator combined.

(D) Plants that give light either from the battery or generator, or from both combined.

The following types are suggested:

Manual.—Plants that are entirely manually started, operated, regulated, and stopped.

Semi-Automatic.—Plants that are partially automatic in some one or more features but not entirely so.

All Automatic.—Plants that are entirely automatic in starting, regulating the voltage, charge to battery, automatically stopping when the charge is complete or no lights used.

Starting with Class "A," manually operated type, we recognize the old established isolated plant. The larger the size of such plants the less necessary is automatic control, because the loads average so well that the regulation is naturally not much interfered with. Class "A" manually operated plants cannot be very successful unless a very good regulating prime mover is used. Therefore, we find systems which are of the Class "A" semi-automatic type—as, the smaller the plant, the more a certain amount of automatic action seems necessary because of the lack of steady prime movers, small amount of and lack of experienced help. These will be of the type that require manual starting, but once started will automatically regulate the voltage by changing the magnetic strength of the generator fields, or by changing the generator speed by throttling the governor of the engine or by similar means, until the last light is turned off, when the plant will be manually shut down.

Further refinements and added electrical devices bring us to the Class "A," all-automatic systems. The action of at least one of these systems is as follows. Upon turning on a light an electrical connection is completed that relays current from a small automobile type of storage battery to an automobile starter, thereby starting the engine and generator. On the last light being turned off the engine and generator automatically stop. These plants find particular favor at season resorts and other places where the plant is in operation for a comparatively short period of the year, because the ordinary care of storing for the off season is all that is required. If a complete storage-battery plant were used, considerable expert care would be necessary in storing it for the off season, and if entirely forgotten the battery would probably be ruined. Furthermore, these plants can use the standard 115-volt lamps and other appliances, their voltage not being dictated by the necessity of keeping battery cost down.

Class "B" using current from the battery only for lights would be of the manual type, or of the semi-automatic type. In these plants the generator would usually be running only during the day when the engine was being used for other work also, and no lights were needed. An attendant would probably be near at hand, who could take care of the voltage regulation. If the load on the engine was such as to often cause the speed of the generator to fall below the critical charging speed, the circuit-breaker would open and would then have to be manually closed, which would be very inconvenient. If a small engine is used to drive the generator only, then the engine does not necessarily need to be very close regulating, as the storage-battery charge, being elastic, will usually take care of such variation in speed.

Certainly the semi-automatic type, with automatic circuit-breaker and automatic voltage regulation would be the better type and perhaps absolutely necessary if the engine and generator varied considerably in speed due to heavy and intermittent load on the engine, or the poor inherent regulation of the engine.

Class "B" all-automatic plants need not be considered as they would really come under the Class "C" classification. In many old Class "B" plants duplicate sets of battery are used so one can be charging while another is being discharged.

Class "C" manually operated plants that give light from the battery, or from the battery and generator combined, can be successfully operated from the ordinary farm engine, because the charge to the battery can accommodate itself to such variations as occur unless they are very violent, in which case an automatic circuit-breaker becomes necessary, thereby bringing such plants into the semi-automatic type.

The Class "C" semi-automatic type having voltage regulation, automatically takes care of the battery charge, giving a charge that is in proper relation to the condition of the battery, gradually tapering or reducing the charge until a balance is obtained at which little or no current will go to the battery, when naturally the engine and generator will be manually shut down. Ordinary farm engines are satisfactory for such a plant.

Class "C" all-automatic plants are made in several forms with varying characteristics. One of these furnishes current from the battery until approximately 10 per cent of the connected load is put on, when the engine and generator automatically start up and the additional load is taken by the generator. When the load gets below the 10 per cent or other point at which the underload circuit-breaker is set, the engine automatically stops.

Others operate on the principle that when the battery voltage gets low, relays operate and the engine and generator automatically start up, continue running until the battery is fully charged as indicated by the voltage when another relay trips and automatically stops the engine.

Recommendations.

Voltage.—Thirty-two volts has become a standard for small plants having lights in a small area; 115 volts is better if the distribution system covers a considerable distance from the plant and if motors other than the small household motors are to be used.

Speed of Generators.—If belt-driven, 2,300 revolutions per minute or less gives general satisfaction. If direct-connected to the engine the speed should be lower, perhaps 800 to 1,000 maximum, although experiments are continually being made to produce higher-speed engines that are not noisy and have a reasonable life.

Capacity of Plants.—It might be well for the manufacturers in conjunction with committees of the American Society of Automobile Engineers and the Electric Power Club to work together toward standardization of sizes.

In view of the improvements that are constantly being made in lamps to reduce their current consumption, it would also be well to get the manufacturers to rate their plants on the fundamental basis of watts output, specifying separately the number of lamps of a particular candlepower, or the total candlepower of the plant.

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Electricity in Paint Manufacturing

An Outline of the Advantages of Electric-Motor Drive with Special Reference to the Manufacturing Process Involved and Horsepower Requirements of Various Machines—Data on a Typical Installation are Given

Industrial Power Series—Article No. 150.

In this industry the nature of the machines and processes are such that there are no severe fluctuations of load other than what might occur by starting and stopping a large number of machines at one time. As there are practically no variable-speed characteristics demanded of the motors, the squirrel-cage-type induction motor lends itself readily to this class of work unless there is a large lighting load on the feeders, when it may be advisable to use an internal-resistance motor. Of course, the direct-current motor is equally applicable but the simplicity of the induction motor naturally recommends it where no variable-speed characteristics are demanded. Both group and individual drive are used and if the groups are well subdivided the former probably will prove the most economical if first cost of installation is considered.

The principal machines used are paint grinders, which consist of revolving plates of steel or stone, screens and conveyors, water and oil lead-grinding mills, shakers and mixers, putty cleaners, packers, lead pulverizers, mixing of "rake" tanks, lead rolls, buckle machines, and large mineral paint grinders.

As to the advantages of electric drive and central-station service for paint manufactories, they may be classed in common with a large number of industries. The constant speed of electric drive adds to production and uniformity of the product and continuity of service is of especial value as a long interruption of power would be liable to deteriorate the product in course of manufacture. As a large amount of inflammable material enters into the manufacture of paint the use of electric drive materially reduces fire risks, and further it is possible to operate any department independently of another without keeping a central source of power in operation. There are, of course, a great many other advantages which, while not applying specifically to paint plants, must be given consideration when the question of electrification is being given consideration.

Process of Manufacture.

The following paragraphs outline the different processes involved in the manufacture of paint, and the principal ingredients and the power requirements of the various machines are given. It is beyond the province of such an article to enter into an extended discussion of the various pigments used and the possible combination of colors and tints. For

Battery of Motor-Driven Paint Mixers.

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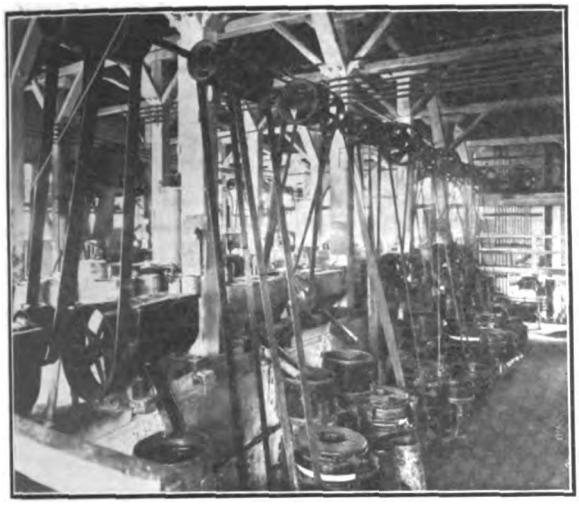


Motor-Driven Mills and Mixers.

Group of Paint Mills and Mixers.

all oil paints the most common vehicle is linseed oil, which is especially valuable on account of the property it possesses of oxidizing to a resinous body, which holds the paint in a firm waterproof varnish. By boiling this oil with litharge and sulphate of zinc it acquires the property of drying very rapidly, although the color is darkened by the operation. For some purposes other oils, as nut and poppy oils, are substituted for linseed oil. The latter being colorless, is preferred for very delicate colors, but it dries very slowly. In the preparation of oil-paints the pigment is mixed with a small quantity of linseed oil and ground in a mill to make the mixture homogeneous. About 8 per cent of oil is added to white lead and 12 or 13 per cent to zinc white. The pigment ground in oil is packed in convenient packages for the trade. When ready for use it is mixed with a further quantity of raw linseed oil which has been boiled, and colored pigments to any desired shade, which are also furnished ground in oil.

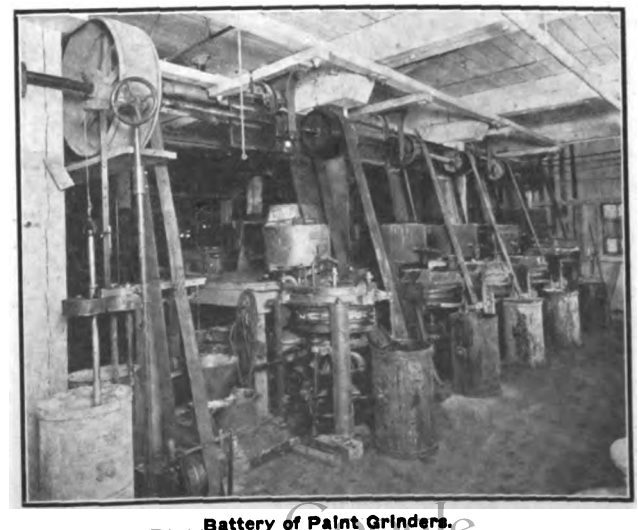
Pigments and oil alone form too thick a mixture for applying, so a third class of agents called thinners are employed in preparing the paint for use. Then are added either turpentine or benzine which mix freely with oil paint and thin it to any desired degree. Driers are also introduced, which consist of sugar of lead, sulphate of zinc, verdigris, binoxide of manganese, red lead, etc.

White lead is one of the most important ingredients of paint and consists of carbonate of lead and hydrate of lead in chemical union. It is a commercial name and is distinctive of a definite product which has been on the market for hundreds of years. During the year 1907 about 130,000 tons of white lead were manufactured in the United States. White lead is made from pure pig lead by a series of chemical and mechanical processes. Corroding gases from refuse tan bark while undergoing fermentation, change the pure lead into white lead. This process is carried on in special buildings where a layer of tan bark about 20 inches thick is first laid on the floor over which a layer of corroding pots is placed leaving space around the edges for packing with tan bark. A solution of weak acetic acid containing about 2.5 per cent of glacial acetic acid is prepared and about one-half pint is placed in each pot which is then filled with lead buckles. The first layer of pots is covered with boards and another layer of tan bark and this is repeated until about ten layers are in place. Suitable ventilation is provided to carry off the moisture from the stack of pots and tan bark.

It requires approximately an average of 115 days to complete the corroding process by which time the fermentation of the tan bark has practically ceased. The tiers of pots are then taken down and the pure lead has turned to white lead of porcelain-like material. The change is not complete, however, as some metallic lead remains which has to be removed and is accomplished by placing the contents of the pots into revolving screens where the white lead passes through the perforations and the metallic lead passes out as tailings and is re-melted for further use. The coarse white lead then undergoes further screening and rolling to prepare it for water grinding which is accomplished by means of high-speed mill stones. After the solution is passed through silk bolting cloth it is floated for some distance to allow coarse particles to settle and then pumped into tanks to settle.

The pulp, which is the thick mixture of white lead and

Motor-Driven Paint Mills.



Battery of Paint Grinders.

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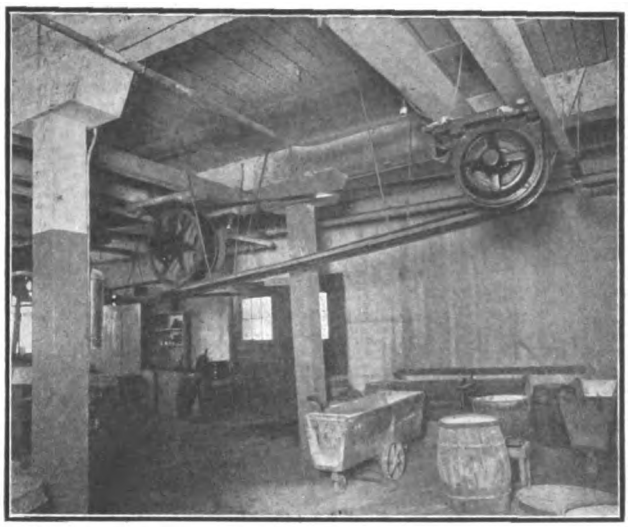


Motor Driving Battery of Paint Grinders.

water that settles in the bottom of the tank, is pumped into steam-heated, copper drying pans. After evaporation has ceased the dry white lead of the market is the result. This dry white lead is mixed with linseed oil and ground through burr mills to produce white lead paste or commercial white lead in oil. By means of special mixers the pulp is sometimes mixed directly with the linseed oil which combines mechanically with the lead excluding the water.

Zinc oxide, or zinc white, is another important ingredient of paint and is made from the ores of zinc. Fine anthracite and the crushed ore are thoroughly mixed and charged in special furnaces with perforated grate bars. An under-grate blast is provided for these furnaces which are built similar to a fire box. The products of combustion and the oxide fumes are discharged into the collecting system through flues aided by a suction fan. In the passage to the collecting system the gases are thoroughly cooled. Connected to the flue there is a system of horizontal pipes to which bags are attached and hang in a vertical position. These bags retain the oxide but allow the gases to escape; the bags are emptied from time to time, the material bolted through silk bolting cloth and packed in containers by machinery.

In the usual factory arrangement for the manufacture of paints the dry pigments are stored on an upper floor with arrangements for weighing and conveying them to the mixers located on the floor below. The liquid ingredients are generally stored in steel tanks outside of the building and pumped or forced by air pressure to the points where they are used. In the manufacture of prepared house paints, the pigments to be used are weighed out in the proper proportions and by means of rotary mixers the linseed oil and pigments are thoroughly mixed. The paste thus formed is treated in the paint grinders, producing a heavy paste which is allowed to drain into storage tanks ready for shipment.

Horsepower Requirements.

From a large number of tests it has been found that the average kilowatt-hour consumption per month per horsepower in paint manufactories is for indivdual drive, 46 kilowatt-hours and for group drive, 65 kilowatt-hours. The load-factors are 17.7 per cent for the former and 25 per cent for the latter. Load-factor here signifies the ratio of the actual energy used in kilowatt-hours to the maximum kilowatt-hours which would be used were the motors to be run at full load for 350 hours a month. From a typical small paint factory using electric drive the following data were obtained: Six small paint grinders group driven by a 15-horsepower, 2,300-volt, squirrel-cage type induction motor operating at 750 revolutions per minute. The accompanying table gives the horsepower requirements of the principal machines used.

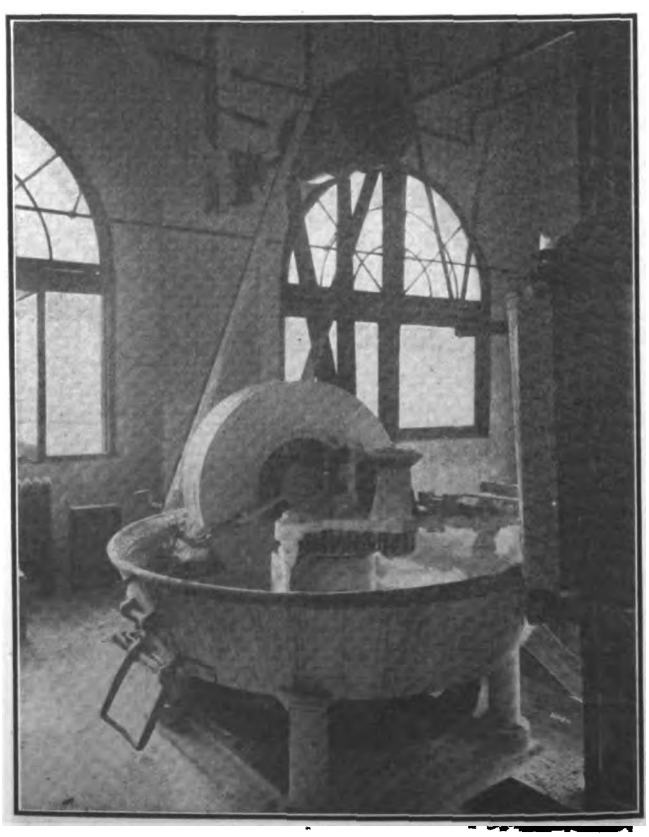
Machine.	Horsepower.
Paint grinder	3 to 15
Screen and conveyor	5
Water mill for lead grinding	35
Oil mill for lead grinding	20
Shaker and mixer	3
Putty cleaner	10
Packer	7.5
Lead pulverizer	2-10
Mixing tanks	3
Lead roll	10
Buckle machine	5
Large mineral paint grinder	20

A brief description of a typical plant devoted to the manufacture of paints and varnish will give a general idea of the motor requirements in this industry. The plant in question has an output of approximately 3,500 gallons of mixed paints and 12 tons of leads per week. There are 16 motors installed, having an aggregate horsepower rating of 262. The average consumption per month covering a period of 12 months is 11,769 kilowatt-hours.

The monthly consumption in kilowatt-hours for the past 12 months was as follows:

January, 13,728; February, 11,568; March, 12,432; April, 11,856; May, 7,536; June, 8,004; July, 11,924; August, 14,544; September, 12,768; October, 9,320; November, 14,928; December, 12,624. The average load-factor of the plant is 10.2 per cent.

The motor installation which is supplied at 220 volts, direct current, comprises a 25-horsepower motor operating at 450 revolutions per minute geared to a line shaft driving five 72-inch chasers. Another 25-horsepower motor operating at 950 revolutions per minute is belted to a line shaft driving four 48-inch mixers and six floor-type mixers. There are two 25-horsepower motors both operating at 450 revolutions per minute, one of which is belted to a line shaft driving six roller mills aind six burr mills, the other being geared to a line shaft driving four 30-inch burr mills and three 20-inch mills. There are five 20-inch burr mills, 11 15-inch burr mills, 11 12-inch iron mills, 30 150-gallon vertical mixers and four 450-gallon horizontal mixers, all driven from a 22-horsepower motor operating at 950 revolutions per minute. In addition, there are two slow-speed 20-horsepower motors belted to putty mills, one 2-horsepower motor for driving printing press, and eight 10-horsepower special elevator motors.



Motor-Driven Chaser.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

EFFICIENCY IN SERVING CUSTOMERS.

Courtesy on the Part of Employees Essential—Meter Readers Should Be Instructed.

In an address recently before a body of Southern central-station men, J. M. Mohl, manager of the Cordele Electric Company, Cordele, Ga., offered some pertinent suggestions relative to gaining the good will of the public through exemplary service.

Efficiency in serving the consumer from a central-station standpoint is a very important and vital issue. No expense should be spared to bring about means that will insure amicable and friendly relations with consumers. The oft-repeated slogan "He profits most who serves best" is worthy of quotation in this respect, and the principle of it should be carried out to the letter.

One of the most disconcerting and disturbing conditions which we have to contend with in the public utility field is "dissatisfied customers." To remedy the various complaints and grievances is indeed a task which is deserving of considerable forethought and study. The ability with which we can adjust complaints or cause them to be adjusted and settled to the customer's satisfaction is dependent upon our attitude towards the complainant. If a customer enters your office in a "grouchy mood" and states that the bill, as rendered, is excessive, the first duty incumbent upon you is to "investigate" why the bill is excessive. Don't "go off the handle" and say that the bill is correct unless you are absolutely sure of your statement. Just so sure as you get into the habit of making statements to your customers, that cannot later be substantiated by facts and reasons, just so sure are you establishing inimical relations, as well as an unreliable reputation for yourself and your company; further you arouse the customer's anger when you say the bill is correct before you have even given thought whereof you speak. Long experience has shown conclusively that it pays to spend a little time investigating the customer's complaint. The fact that you tell your customer that you will investigate, evidences that much more confidence in your willingness to mete out a "square deal."

Another important feature that it is well to bear in mind when dealing with a complaining customer, is to "Keep cool and level headed" at any stage of the game. Don't "fly off the handle" just because your customer is in a state of anger or grouchy attitude, that's just the critical moment when you can display that "Cool and Level Head." That attitude wins for you, superiority over your customer's grouchy attitude, or in other words you have mastered the situation by keeping a cool head. Do not let your customer's attitude be a means for governing yours. You should be in a different frame of mind than your customer otherwise you will have lost your chief aim, that is, to serve your customer efficiently.

Another indispensable feature in efficiency in serving the consumer is that courteous and personal feeling for customers upon their entrance to your office to pay their light bills, make purchases, or for whatever purpose their mission may be. Be acquainted with your customers, address them by name, they will feel complimented, and have a higher regard for you and your company. Again little acts like these are never forgotten, and they tend to make customers forget that they are just coming to your office to pay their bills and that's all. Mix a little "courtesy" and "individuality" in dealing with your customers, don't convey or even have them think for one moment that your company is a "heartless corporation."

Success Depends on Employees' Attitude.

The success and reputation of any public utility is dependent upon the employee's attitude towards the public. Indifferent and inimical feelings towards public utility companies have in a measure been caused by employees failing to recognize, as well as realize, the importance of customer's complaints. Biased and deep-seated prejudice has been allowed to formulate in the minds of customers, as a result of employees' neglect and indifference. The writer recalls reading of a case where the Missouri Public Service Commission ordered the removal of a central-station manager on the grounds of "Inefficiency in Serving the Consumers." The grounds for complaint were reasonable in that he failed to recognize the customer's complaints, as well as the Commission's rules.

The object which should be uppermost in our minds is this, to develop, cultivate, and impart to our employees such standards of efficiency that will mould public opinion in favor of our companies. Be courteous to all: if you have any personal grievances with any of your customers, do not bring such grievances into your business relations with them; always remember that where you are employed by a public utility company you are in the capacity of a servant and as such you are in duty bound to serve the public with fairness.

Efficiency in serving the consumer does not mean that we should only apply it in a case where a customer has made a complaint and afterwards to be remedied. It should be applied with greater force in precluding the possibility of complaints. In other words "an ounce of prevention is worth a pound of cure."

Meter Readers' Attitude Important.

A great deal of success in precluding the possibility of complaints due to excessive bills can be accomplished by meter readers. Their attitude and manner in explaining why their bills increase is of primary importance. Usually the meter reader, if he is wide awake, is thoroughly familiar with the local conditions and can without hesitation tell customers why their bills increase. By observing the social columns in the local papers, the meter reader can keep well informed as to which customers are entertaining and using extra lights. He can also gather good evidence as to why "Mrs. Chronic Kicker's" bills are high by making random inspection visits of the customer's installation.

The writer in managing several small properties has found it a good policy to educate the meter reader to be observing and attentive on his rounds during meter reading periods. The meter reader can assist materially in reducing the number of complaints by applying himself diligently. It matters not how trivial the nature of the complaint may be the meter reader should recognize it, and if he is unable to adjust it at the time, the complaint should be brought to the manager's attention.

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Employees' Commissions on Appliance Sales Successful at Cambridge, Mass.

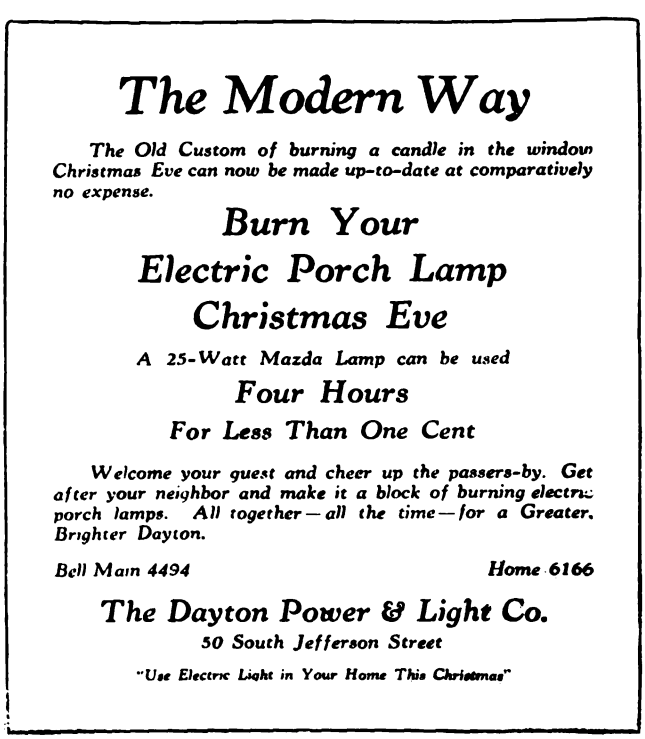
At a hearing before the Massachusetts Gas and Electric Light Commission held in relation to a recent stock increase, Welles E. Holmes, treasurer and general manager of the Cambridge Electric Light Company, said that employees are allowed a 10 per cent commission on the sale of electric appliances, the percentage being figured on the list price of the apparatus. There are usually not less than 88 employees on the payroll, and each of these is encouraged to solicit appliance sales both in and out of office hours. In addition to the commissions above mentioned, the company averages a profit of about $1,000 a month on appliances marketed, although no store is maintained.

Knoxville Street-Lighting Contract to Be Renewed.

Bids for street lighting have been submitted to the city commission of Knoxville, Tenn., by both the Knoxville Railway & Light Company and by the Knoxville Gas Company. The former proposes to provide the 600 6.6-ampere, alternating-current, inclosed arc lamps at $54 each per annum on a ten-year contract, the city being given the right to terminate the contract at any time after five years upon giving of one year's written notice. This is $18.50 per lamp less than the same service is now costing the city. At present the Knoxville Railway & Light Company is supplying the service on the basis of the old contract.

Dayton Campaign Increases Consumption from Porch Lighting.

The accompanying illustration shows an advertisement published by the Dayton (O.) Power & Light Company previous to Christmas in an effort to increase the use of electricity for porch lighting and window lighting in homes. The citizens of Dayton took kindly to the efforts of the company to make Christmas Eve more cheerful, and the company reports that its efforts in this direction were well repaid. The most profitable feature of the campaign, however, is the increased use of porch lighting, which is a permanent result of the holiday experiment.


The Modern Way

The Old Custom of burning a candle in the window Christmas Eve can now be made up-to-date at comparatively no expense.

Burn Your
Electric Porch Lamp
Christmas Eve

A 25-Watt Mazda Lamp can be used
Four Hours
For Less Than One Cent

Welcome your guest and cheer up the passers-by. Get after your neighbor and make it a block of burning electric porch lamps. All together—all the time—for a Greater, Brighter Dayton.

Bell Main 4494 Home 6166

The Dayton Power & Light Co.
50 South Jefferson Street

"Use Electric Light in Your Home This Christmas"

Advertisement of Dayton Company Used in Porch Campaign.

Electric Service for Dixon, Ky.

The city of Dixon, Ky., has sold a 20-year electric light and power franchise to the Clay (Ky.) Light & Power Company, at $1. The franchise provides for rates of $1.25 per month for residence lights and $32 per year for each 500-candlepower street light. Construction of the distribution system is to begin at once and a forfeiture provision is included for unnecessary delays. The current will be transmitted from Clay, where the plant of the purchasing company is located and which is ten miles distant.

Organization of Boston Company's Operating Bureau for Turning Prospects into Customers.

At a dinner-meeting of the maintenance force of the Edison Electric Illuminating Company, of Boston, recently, W. H. Atkins, general superintendent, outlined the manner in which each employee of the Operating Bureau works in conjunction with the whole organization. A drawing showing the force's mutual relations, in the form of a cog wheel, was instituted among those present. On it are represented the relation the bureau bears the prospect and the customer, and below are the various factors which go to make up the "cogs" in the wheels which make a customer out of a prospect and care for the latter when once secured. Each tooth in the wheel refers to the key below the diagram.

"These gears have been grinding away for years, turning prospects into customers," said Mr. Atkins. "The lubrication used is a mixture of devotion and enthusiasm. The wonderful prosperity enjoyed by the company proves the completeness and efficiency of the system.

"Each tooth is an important factor; if one tooth fails, the whole system becomes weakened. The aggregate strength of the gears depends on the efficiency of each individual. The future depends on each individual, the prosperity of the company in turn reflecting in the prosperity of each man connected with it."

PROSPECT TO CUSTOMER	CARE OF A CUSTOMER
1 City Salesmen	1 Stokers
2 District Agents	2 Steam Engineers
3 Special Agents	3 Load Despatchers
4 Service Warrant Agents	4 Electrical Operators
5 Commercial Statistics Agents	5 Sub Station Attendants
6 Commercial Adjustments	6 Battery Engineers
7 Illuminating Engineers	7 Installation Men
8 Power Engineers	8 Meter Men
9 Commercial Engineers	9 Incandescent Lamp Dept.
10 Commercial Wiring Agents	10 Arc Lamp Dept.
11 Electric Vehicle Agents	11 Installation Inspectors
12 New Buildings Agents	12 Maintenance Inspectors
13 Appliance Salesman	13 Trouble Men
14 Electrical Engineers	14 Linemen
15 Advertising Department	15 Underground Repair Men
16	16 Electrical Engineers
17	17
18 } Unclassified Representatives	18 } Unclassified Representatives
19	19
20	20

Chart Showing Graphically Organization of Boston Operating Bureau.

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SUCCESSFUL COMMERCIAL MANAGERS.

W. R. Putnam.

In an organization such as the Utah Power & Light Company, which maintains a network of transmission lines throughout practically the entire state, there are two distinct divisions to the sales work, either of which are in themselves of sufficient importance and extent to tax the capacity and initiative of an experienced central-station executive. The first main problem is the acquisition of customers in the form of entire communities—entailing careful surveys of prospective business—and the second general problem is the development of power business in each of these communities.

The continual extension of lines to new territory, the tying together of these communities into one comprehensive network, and the promotion of profitable business locally in each of these communities, with a view to developing a well-balanced system are but a few of the duties of W. R. Putnam, sales manager of the Utah Power & Light Company, of Salt Lake City.

Aside from the almost phenomenal growth in extension to communities in the territory, under the direction of Mr. Putnam, material extensions have been made into agricultural territory, providing farmers with conveniences enjoyed by their city neighbors. Through these extensions hundreds of new customers have been supplied with service during the past year.

W. R. Putnam,
Sales Manager, Utah Power & Light Company, Salt Lake City.

Electric cooking is another feature of the service of the company which has shown decided increase during the incumbency of Mr. Putnam. Domestic science departments of various schools and colleges in the territory are taking up the subject and instructing students in the art of cooking by electricity.

Another interesting feature of the Utah Power & Light Company's work in educating the public in the advantages of electrically operated appliances is the operation of an electric washing machine by every seventh residence customer connected to the company's lines. Also, practically three-fourths of all the company's customers are using electric irons.

It is interesting to note that 96 per cent of all the residences within 300 feet of the distribution lines of the company are using electric service, and 251 miles of interurban electric lines together with 312 miles of street railway lines secure all of their power from the Utah Power & Light Company.

These increases are due largely to the progressive policies adopted by Mr. Putnam. In regard to domestic appliances, he feels that it is advisable to have regular seasonal campaigns covering in the course of the year all devices and appliances using electricity. These campaigns afford an opportunity for special advertising in newspapers and by means of circulars and for displays at the office. They particularly are of benefit due to the spirit of rivalry which is fostered between the different districts. The standing of the districts in different campaigns is worked out on a basis of results secured in proportion to the number of customers in the districts.

Another important item in the sales work which Mr. Putnam has developed is the participation in this work of all employees of the company. In regard to this feature Mr. Putnam says: "Many of our customers are only seen by the meter reader and the office cashier. Consequently the more that we can interest these employees in sales work the better results we secure. We are pleased to report that sales by this class of employees are materially increasing each year."

Mr. Putnam graduated from the University of Minnesota in 1897 and has had 17 years of central-station experience as manager at Red Wing, Minn., and Rapid City, S. D., and as general superintendent at Menominee, Mich., and Marinette, Wis.

Church Societies Sell 500 Electric Irons for Central Station.

Five hundred irons in 10 days is the record of an unusual selling scheme recently employed by the Lincoln Gas & Electric Light Company in Lincoln, Neb. Five church societies were entered in a contest to sell electric flatirons, the society selling the most to receive a $50 gas range, and the society selling the next highest number to receive a $20 range. To each society was given the use of the company's store for two days, and the company advertised in the newspapers that each society in turn would have the use of its display room for the period. The same announcement was also made from the pulpits and thus received a wide and favorable publicity. In addition to the prizes, each society received 25 cents commission on each iron sold during its two days.

The sales were all made cash, and the company's demonstrator and clerk were kept busy demonstrating and wrapping the irons. The women entered into the contest with great zeal. They used the telephone to advantage, calling up members and friends and urging them to "buy now" while the society had charge of the store. The irons were sold for $2.20, but the company was still enabled to show a slight profit. The contest was suggested by J. E. Shuff, contract agent of the company.

Low Heating and Cooking Rate for Washington, D. C.

Reduced rates which are to apply exclusively to energy used for heating and cooking have been put into effect by the Potomac Electric Power Company, of Washington, D. C., and have been approved by the Public Utilities Commission. The new rates are 10 cents per kilowatt-hour for the first 10 kilowatt-hours monthly with a three-cent charge for energy used in excess of this amount. There is a minimum charge of 50 cents per month providing service is used only for heating and cooking. The minimum charge of $1.00 maintained in connection with the lighting rate is the only minimum required where both services are used.

The existing lighting rates are 10 cents per kilowatt-hour for the first 120 hours consumed each month and 5 cents per kilowatt-hour for all energy used in excess.

Baltimore Signs Must Be Lighted.—All electric signs in front of business establishments in Baltimore must be lighted between sundown and midnight. Building Inspector Byrne was instructed by the council to make an investigation throughout the city and report all signs not lighted.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

IRRIGATION INCREASES LAND VALUE FROM $20 TO $400 PER ACRE.

Installation of Arkansas Valley Railway, Light & Power Company Proves Boon to Farmer.

The Arkansas Valley Railway, Light & Power Company, of Pueblo, Colo., is extending its business throughout southeastern Colorado by encouraging the reclamation of arid land by means of water pumped from wells and reservoirs by electricity. During the past year, the company has installed electrical equipment for pumping purposes in many places and it has not only paid the company a substantial profit but has also contributed to the development of the communities, which, in turn will be further modernized, and, reciprocating, will assist in the growth of the electric company.

The farmer with a few wells and a pumping plant is better established than one using water provided by an irrigation company. In the first place, the cost is usually less and, in the second place, he can obtain water whenever he desires it by simply turning on the power.

Possibly the most unique irrigation project yet developed in the West has been developed one and one-half miles west of Pueblo on what is known as the White-Davis-Stone ranch, owned by Asbury White, S. E. Davis, W. L. Stone and Ben Bergerman. This hitherto practically worthless land has been made productive because of the ingenuity of the owners and the co-operation of the power company.

The West is cut up with arroyos which are apparently dry most of the year and only in flood seasons carry any visible supply of water. Such an arroyo runs through the White-Davis-Stone ranch. Mr. Stone, the prime mover in the adventure, has known this piece of land for 30 years. When he was first acquainted with it, some water ran all year round in the arroyo but only enough to water a few head of stock. Fifteen years ago, it disappeared. Curious to know what had become of the water, Mr. Stone dug a few holes in the dry bed and discovered the water running underneath the surface in the form of an underflow. He watched it for years and ascertained that during the driest seasons water flowed under the dry surface.

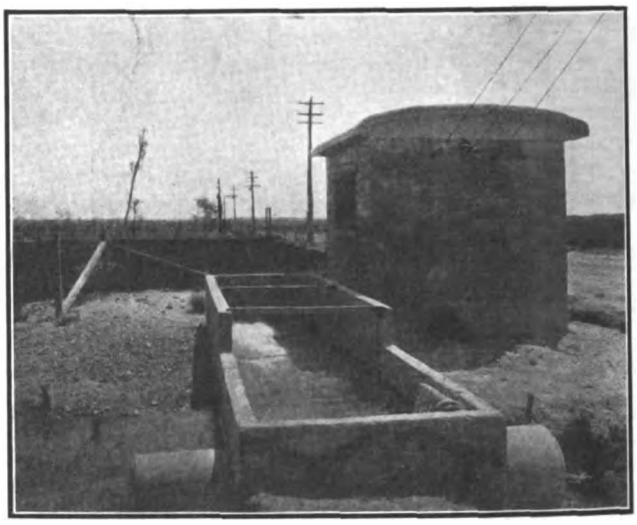
Mr. Stone conceived the idea of confining the water and making it reclaim some of the rich arid land adjoining. He interested his partners in the venture and it was decided to purchase the land, 160 acres, and make an experiment.

It was necessary to erect a dam resting on the bed rock to impound the water. This was done. The dam is of concrete 14 feet high and 232 feet long. It is five feet wide at the bottom and one foot wide at the top. Immediately upon completion, the water filled the reservoir and backed up more than 400 feet. An offset in the dam forms a sump from which the water is pumped.

A power line was extended two miles to the ranch and a 15-horsepower motor installed to operate a five-inch centrifugal pump. The dam was on the lower end of the ranch and it was necessary to pump the water through a ten-inch iron pipe line 1,500 feet long to the highest point on the ranch, which point was 69 feet higher than the dam, and from here distribute the water through laterals to the soil.

The construction work was completed in the middle of June and the power turned on. A surprise awaited the owners and the power company's expert, for, when the pump was started, no impression was made on the amount of water in the reservoir and it continued to run over the spillway. The owners had previously considered that there would be sufficient water to irrigate 50 or 60 acres but quickly saw that there would be enough to irrigate the total 160 acres owned by them and possibly 400 more.

The cost of the raw land was $20 an acre, or $3,200 for the ranch. The cost of the dam, the machinery, and the



Typical Irrigation Pumping Plant on Western Ranch.

power line was $2,500 and the total investment came to $5,700. The land is now worth as much as land a few rods north and which is under the Bessemer irrigation ditch and is valued at $400 an acre. The investment has therefore increased to $64,000 or over 1,000 per cent.

Mr. Stone and his partners consider their water much cheaper than that of their neighbors under the irrigation ditch. Water rights cost their neighbors $100 a share which represents one acre. Had it been necessary to purchase water from the irrigation company it would have cost $16,000 to obtain a sufficient supply for the ranch. But the entire cost of the dam, power line and machinery was only $2,500 so they saved $13,500 on this. Furthermore, the cost of providing the water each year is less than $2.00 an acre for the power necessary to operate the pump. Although their neighbors' annual assessment is $1.00 an acre, they have $100 invested for each acre in irrigation stock and that $100 would draw $6.00 annually in interest at 6 per cent. Through the installation of the pumping plant Stone and his partners figure the interest per acre on their water rights as only 93 cents. Since the annual cost for power per acre is $2.00 and the interest 93 cents, $2.93 represents the annual cost per acre while their neighbors pay $7.00.

The success of the adventure has caused the owners to consider purchasing adjoining land to be irrigated under

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Vertical Motor Driving Centrifugal Pump for Irrigating Western Ranch.

this project and Mr. Stone to decide to develop a tract of 320 acres lying west of the present project, by the same methods, as there is an arroyo running through it also.

The electric company's annual gross revenue from the sale of power to the two projects will amount to $1,500. The land owners will realize each year a handsome return from the crops raised, and this land will be added to the total acreage of the largest body of irrigated land in the world.

There are hundreds of other similar opportunities for reclamation in the west. Mr. Stone states that he knows of at least 50 places within a radius of ten miles of Pueblo where water can be obtained by the same methods he and his partners used with this one. They soon will be reclaimed by enterprising businessmen and co-operating electric companies.

Government Investigating Use of Electric Power in Fertilizer Manufacture.

In a recent report made by the Secretary of Agriculture regarding the disturbed situation in fertilizer manufacture due to some raw materials being cut off by the war and others diverted to more lucrative markets in munitions of war, he says:

"In view of the difficulties in the way of the production and utilization of sulphuric acid for fertilizer purposes, the Bureau of Soils has endeavored to develop a commercial method involving the use of the electric furnace for manufacturing phosphoric acid, which can be used as a substitute. Through this method double super-phosphate, which will contain 40 to 50 per cent of water-soluble phosphoric acid, or the still more concentrated form of ammonium phosphate, could be secured. But the use of the electric furnace for the purpose is commercially feasible only where phosphate rock, coal, and cheap water power are readily available. The department is investigating this matter to ascertain whether there are localities where these conditions exist and where, therefore, double super-phosphate may be made . . .

"The Bureau of Soils is studying also the problem of the fixation of atmospheric nitrogen with a view to developing a method for the production of ammonium phosphate and other forms of concentrated fertilizers. No ammonium phosphate is being made in this country at the present time. If cheap water power, phosphate rock, coal, and limestone can be found in accessible localities, the possibility of making this material on a commercial scale is considered entirely feasible. The greatest difficulty here is to discover cheap water power at points where phosphate rock, coal and limestone are readily available. The department is making every effort to locate available sources of developed water power which can be used in the manufacture of ammonium phosphate and other fertilizers."

Important Electric Furnace Contract for New Jersey Company.

The Eastern Pennsylvania Power Company, a W. S. Barstow & Company property, located at Dover, N. J., on December 31, closed a contract with the International High Speed Steel Company to supply current for a 1,200-kilowatt Heroult type electric furnace which the latter company is to operate at Rockaway, N. J.

The furnace has a capacity for treating 50 tons of steel per day from an open-hearth furnace. The steel plant is ten miles from the power station at Boonton, N. J., from which current is supplied at 33,000 volts, three-phase. A special type of transformer will be used to deliver current to the furnace. This is regarded as one of the best central-station contracts made in this section in a long time, and is probably the forerunner of others of like caliber.

Electric Heating Economical for Shoe Factories.

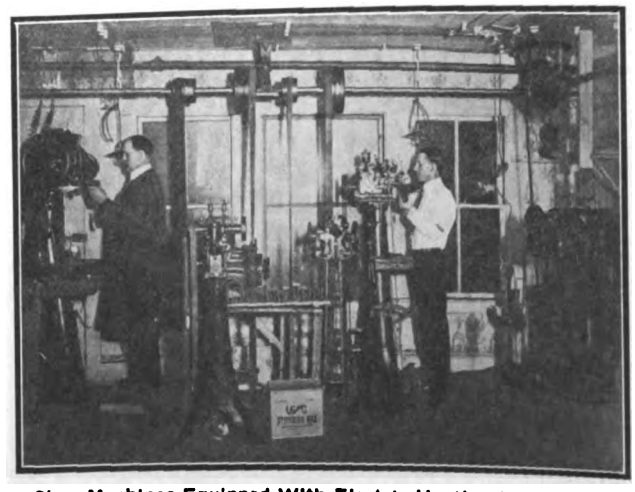
The application of electric heating to shoe stitching, welting and bobbin winding machines is increasing in Massachusetts, where a number of these adaptations have been installed. The United Shoe Machinery Company, Beverly, Mass., has recently placed on the market, for sale or lease, lasting, welting and winding machines with electric heating apparatus for melting wax, creating steam for softening the leather, etc. A shoe factory at Brockton, Mass., which has installed a number of these machines reports marked economies over steam heated apparatus. The introduction of the electric heater in connection with shoe machinery is looked upon as the solution of one hindrance to the motorization of shoe factories, viz., that live steam has heretofore been needed for heating purposes.

A small shoe factory at Lynn, Mass., is completely electrified, using 220-volt, three-phase motors, heating also from the power line and lighting with 110-volt Mazdas.

The equipment comprises: two-horsepower motor driving a Goodyear stitcher, bobbin winder, edge trimmer, heel scourer, finishing shaft, inner sole channeled. A one-horsepower motor drives a Goodyear welter, splitter, welt heater, stitch separator and rough rounder. A 0.5-horsepower motor operates three stitching machines.

The Goodyear stitcher, welter and bobbin winder are all electrically heated. This is found to be a better method, as the heat is more evenly distributed, the necessity for live steam obviated, and space saved. The cost of operation, or energy from the Lynn Gas & Electric Company, is less than $2 per month for the welter and stitcher, and somewhat less for the bobbin winder.

The shop produces about 125 pairs of shoes per week, which are all retailed in the store.



Shoe Machines Equipped With Electric Heating Equipment.

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Facilitating Customers' Developments by Carrying Transformer Losses.

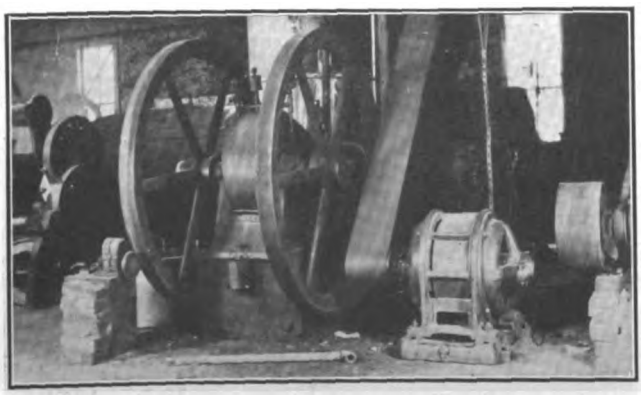
Mutual benefits result from a broad policy in rendering the power customer service of the highest quality, including consideration of his investment requirements as well as his probable energy consumption. In a case decided recently by the Nevada Public Service Commission it was shown that the Nevada-California Power Company in many instances has assisted in the early prospective development of mines by giving customers the benefit of secondary meter readings. The power company has also consented to the purchase by the mining companies of transformers considerably in excess of the capacity needed for immediate purposes in the initial development of the mine in its prospective state, upon the theory that after the development had reached a productive stage, it would, in addition to increased and more constant operation, be necessary to add more electrically operated machinery, mills, etc., thus producing a higher load-factor.

While there are transformer losses in the southern Nevada district ranging from 1.14 per cent to 40 per cent, and averaging 3 per cent, this practice prevents piecemeal investment in transformers, motors and other electrical equipment on the part of the mine operator, and with the hope on the part of the power company that ultimately it will be rewarded for its participation by making the developed mine an exceedingly profitable customer with a good load factor and with only a nominal transformer loss when this is spread over the mine's entire operative period. The wisdom of such a policy and the value of the power company is said to have resulted in bringing forward from time to time large producing mines and mills which thereafter become large and profitable customers.

Trial Motor Installation Gets the Business.

The accompanying illustration shows a vivid contrast between the size of gasoline engine and electric motor required for the same service. This view was taken in a laundry in Brownwood, Tex., where repeated attempts had been made by the Texas Power & Light Company to place electric drive without success. The owner of the laundry was skeptical as to the cost of electric service and finally an offer was made him to put in a motor on trial. He agreed to this proposition and accordingly a 7.5 horsepower motor was belted to the line shaft formerly driven by the gasoline engine. It did not take the owner long to determine which was the best source of power. The 10-horsepower gasoline engine has not been run since the motor was installed and the owner of the laundry has purchased the motor, the trial period having ended.

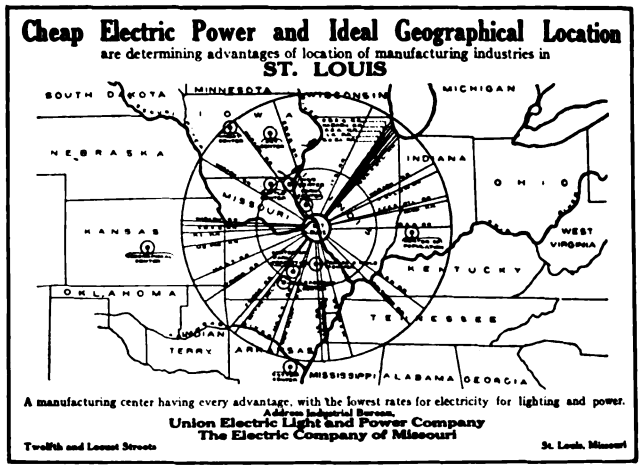
A statement was recently made by one laundry owner in this territory that electric irons saved him 40 per cent over the cost of doing the work by the old method. This saving was made in time and fewer pieces spoiled.



Laundry Installation Showing Motor Alongside of Gasoline Engine Which It Replaced.

National Advertising for Electric Power.

That electric power as an economic asset is rapidly getting away from local limitations is evidenced by an advertisement of the Union Electric Light & Power Company of St. Louis, Mo., in the current number of the *World's Work*. Although the publicity thus prepared features various points of industrial importance pertaining to the company's home city, the part hydroelectric energy is playing in the Mississippi Valley as a result of the Keokuk development makes



Advertisement of St. Louis Company in a National Medium.

such an advertisement of inter-state interest. The radius of effective transmission from many electric plants which have never been more than locally advertised might very well be shown in map form in display matter carried in national magazines, and just as the prosperity of many manufacturers of electrically operated household and shop devices is being enhanced by space purchased in periodicals of nation-wide circulation, so electric power available at low cost throughout large areas is susceptible to similar publicity. The increasing interconnection of central station and transmission networks in the more populous parts of the country point the way toward some very useful publicity for the industry, given a little money plus imagination.

Electric Fire Apparatus Asked for at Springfield, Mass.

Two new motor-driven pumping engines and two ladder trucks, which would complete the motorization of the fire department of Springfield, Mass., displacing 10 horses, are asked for by Fire Chief Daggett in his annual report to the Fire Commissioners. The new apparatus would cost about $36,000.

A large part of Springfield's fire apparatus is electrically driven, the machines being found very efficient. The chief states that the maintenance of horses costs the city $300 each per year, while the upkeep of the electric apparatus, much of which requires three-horse teams, has been brought to an average yearly cost of $230 per piece. The saving which will result from the complete motorization of the department, it is estimated, will amount to $4,500 per year, or about one-half the cost of a new motored machine.

Williston Lighted by Power from Irrigation Project.

Probably the first city to be supplied with electricity by a government irrigation project is Williston, N. D. Rates are 10 cents per kilowatt-hour for lighting and 4 cents for power and electrical appliances. The reclamation department will seek similar contracts at its other projects.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL CONSTRUCTION FEATURES OF HOTEL MORRISON, CHICAGO.

Wiring for Light and Power and Telephone and Signaling System Embodies Many Interesting Features.

Modern hotels, especially those in large cities, are examples of practically all that is new in electrical development. Heating, ventilation and sanitation are some of the paramount considerations aside from conveniences to expedite service demanded from such establishments, and all are more or less dependent upon electric power. The equipment must necessarily be diversified and includes lighting and power apparatus, electrically operated kitchen utensils, telephones and numerous other appliances. The successful installation and operation of all such apparatus demands electrical construction of the highest order and this is found in the New Hotel Morrison, Chicago, the subject of this article, as will be seen from the description and illustrations.

The Morrison is located on the south side of Madison Street, between Clark and Dearborn Streets, in the heart of the city's business, shopping and theatrical center, and has a total of 26 stories, three of which are located below the street level. There are about five hundred guest rooms, mostly with private baths, grill room, banquet halls, ball rooms and the well known Boston Oyster House on the foyer floor immediately under the lobby. Aside from the motor-driven laundry and kitchen machinery there are about 65 motors, aggregating 625 horsepower, distributed throughout the building for driving pumps, ventilating fans, vacuum cleaners and other appliances which will be described later.

Power is furnished by three generating units consisting of Westinghouse direct-current 125/250-volt, three-wire generators driven by reciprocating engines of the Corliss type. Two of the generators are rated at 400 kilowatts each, and the third at 200 kilowatts. The balancer coils are located on raised concrete platforms adjacent to the generators and are connected to the latter by four-pole single-throw switches mounted on the generator frames.

All connections between the generators and the main switchboard are carried in conduits beneath the floor. The board, which was built by the J. Lang Electric Company, Chicago, comprises eleven panels: three generator panels, one totalizing panel, one meter panel, four lighting feeder panels and two power feeder panels. The panels are made from two-inch Monson Maine slate with a 3/8-inch bevel on the four edges. All switches are Cutter "FF" type with draw-file finish. The total height of the board is 95 inches and it has a grille inclosure at the ends. Frink reflectors are used in lighting the panels. Each generator panel contains a four-pole Condit circuit-breaker with overload and reverse-current attachments, and pull-down handles; two Weston ammeters; General Electric pilot light; field rheostat; triple-pole, double-throw generator switch, and double-pole, double-throw equalizer switch. Each of the three generators may be connected to either the light or the power load, or may be operated in multiple on one side and the light and power buses connected by a 2,000-

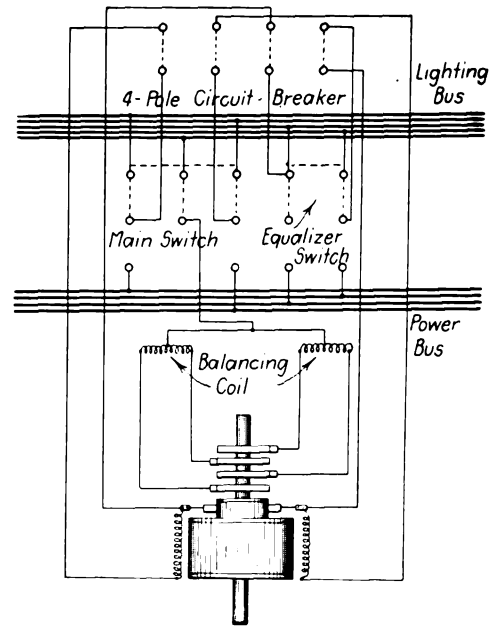

Fig. 1.—Connections of Generator and Switchboard Panel.

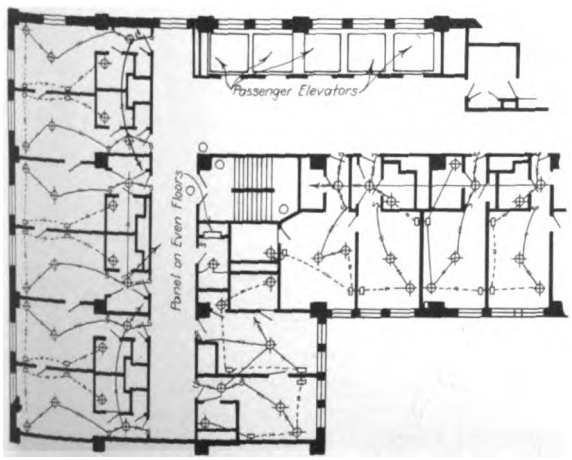

Fig. 2.—Typical Floor Plan of Wiring for Lighting.

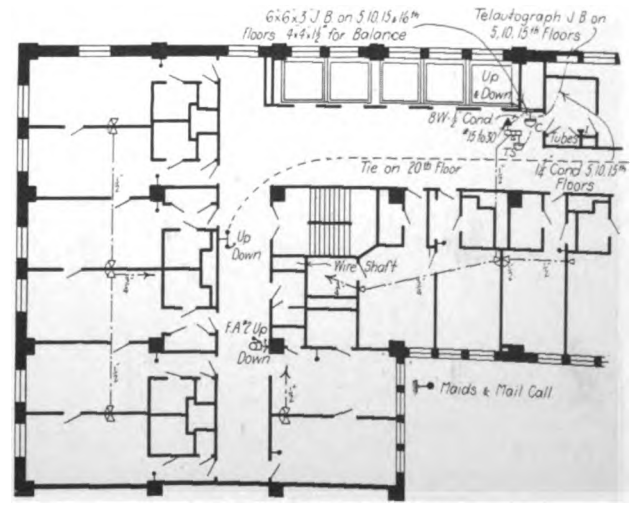

Fig. 3.—Typical Floor Diagram of Telephone Installation.

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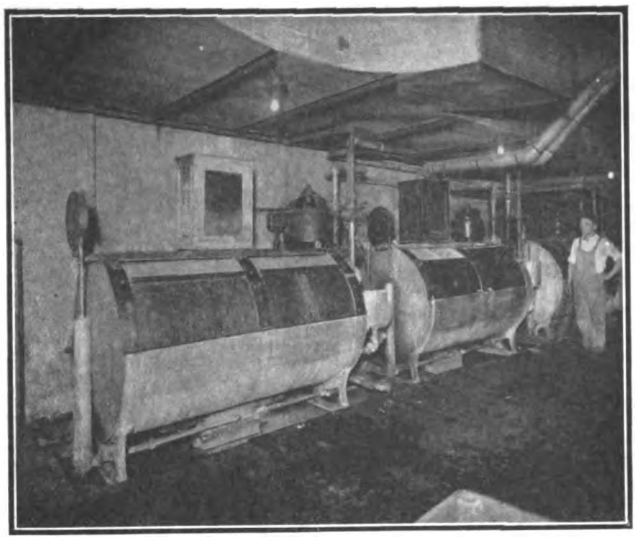

Fig. 4.—Two Motor-Driven Washing Machines.

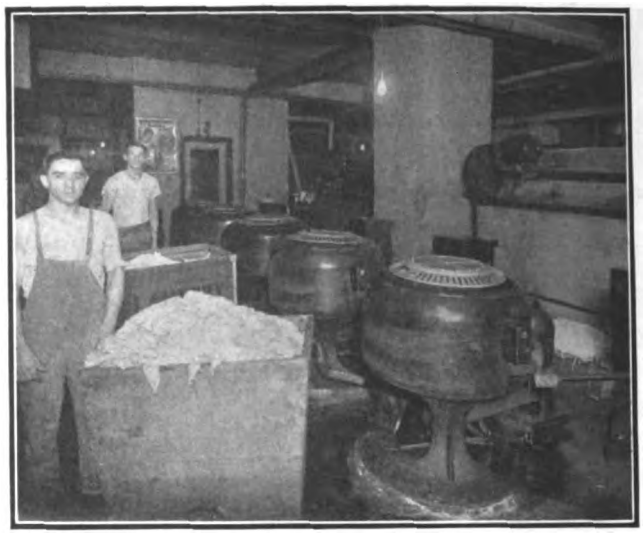

Fig. 5.—A Battery of Centrifugal Extractors.

ampere tie switch on one of the power panels. The totalizing panel contains Esterline graphic recording meters for recording the voltage and for totalizing the lighting and power load. The meter panel contains watt-hour meters connected to the various light and power feeders. Fig. 1 shows the principal connections of one generator panel and one generator.

Light and Power Wiring.

All light and power wiring is carried up from the switchboard in conduits to a sheet-steel trough under the ceiling of the engine room which connects with two wire shafts, one at the north end and one at the south end of the building. The lighting feeders are three-wire, 115-230-volt, and the power feeders two-wire, 230-volt, both systems being carried in the same wire shafts. From the balcony to the twentieth floor inclusive there are two junction boxes on the floors with even numbers, one at the north end and one at the south end, for the lighting circuits. Each box feeds a section of the floor on which it is located and a section of the floor immediately below it. There are also a lighting junction box in the pent house, one on the mezzanine floor and one on the foyer floor. The engine room and laundry lights are fed from the main switchboard. The junction box on the foyer floor feeds the ice barn and wine storage room. The junction box on the mezzanine floor feeds the lights on that floor, the lobby lights, and the canopy lights over the entrance. On the balcony floor the junction box at the north end feeds the front banquet hall and second balcony. The junction box at the south end of the balcony floor feeds the second-floor kitchen and balcony-floor ball room. The general lighting arrangement of the guest room includes one center, two bracket, one hall, one table, one bath and one Somno lamps.

All of the lighting and power circuits are carried in rigid conduits from the main switchboard to the outlets. For the lighting distribution from the junction boxes to the outlets, three-quarter inch conduit is mainly used. One interesting feature in connection with the guest-room lighting is the installation of a Hart switch operated from the door lock, so that the lights cannot be left burning when a guest leaves the room and locks it. Fig. 2 shows part of a typical floor wiring plan from the fifth to the twentieth floor inclusive.

For power service there are two junction boxes in the pent house, one for the ventilating fans and one for the elevators; one at the south end of the foyer floor for the kitchen motors; two boxes on the laundry floor and two in the engine room. Other feeders for lighting are roof sign, Boston Oyster House sign, barber shop and tenants' lights in the space reserved for stores.

Elevators.

Elevator equipment consists of five Otis traction-type passenger cars, two service elevators, one push-button freight elevator, nine short-run dumb elevators, and three high-rise dumb elevators running from the kitchen to the twentieth floor. The elevator signals are supplied with low voltage by seven motor-generator sets.

Laundry Equipment.

In the laundry the equipment is interesting not only because modern and complete, but on account of several special construction features. All machines are individually driven by

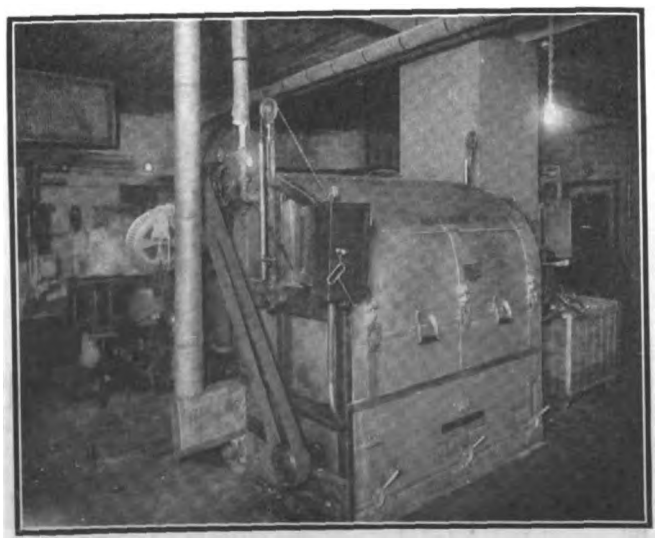

Fig. 6.—Vacuum Dryer Operated by Electric Fan.

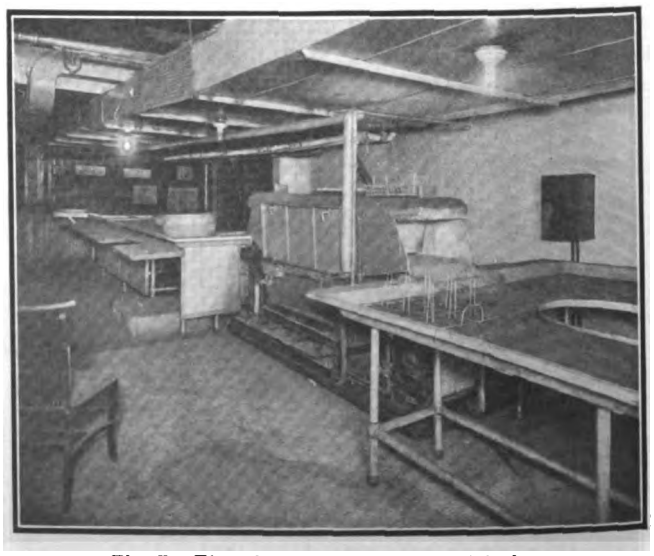

Fig. 7.—Electrically Operated Dish-Washer.

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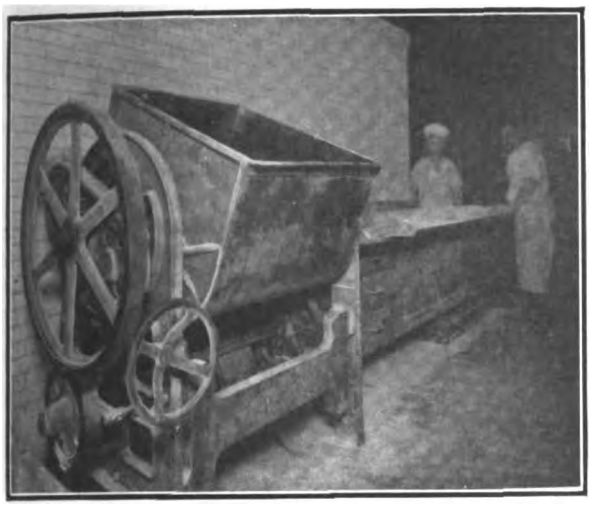

Fig. 8.—Dough Mixer Driven by Motor.

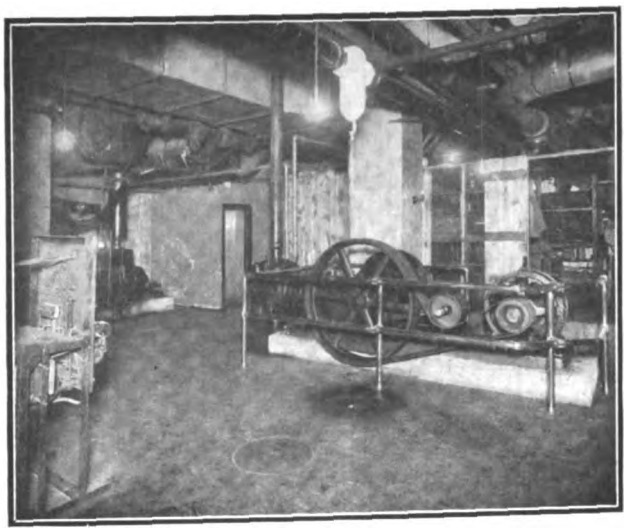

Fig. 9.—Motor-Driven Compressor and Control Apparatus.

motors and there is a complete absence of line shafting with the attendant cleanliness and better lighting, to say nothing of added safety for the operatives. The accompanying illustrations show several of the features. Two Henrici 36-by-60-inch washers, shown in Fig. 4, are driven by six-horsepower vertical reversible motors controlled by a reversing controller, mounted in an iron box with glass front above each washer at the rear. The main switch is located in a steel cabinet on the wall at the right end of the washer. The drive is with gears and a mechanical device is arranged to disconnect the motor mechanically from the washer if desired. One of the modern features of these washers is a dial indicator showing the number of gallons of water in the barrel.

There are three American Laundry Machine Company's 26-inch extractors, shown in Fig. 5, also driven by belted vertical motors. The motor is mounted immediately in the rear of the machine. The switch, fuses, and starting rheostat for each extractor are inclosed in a steel cabinet with a hinged door located at the rear of the extractor and a little on the right-hand side. The cabinet is supported on an angle-iron framework at such a height as to facilitate convenience in starting and stopping the motor.

For the drying of blankets, pillows and heavy work there is an American vacuum dryer, illustrated in Fig. 6, which consists of a large wire-mesh drum, in which the material to be dried is placed, revolving in a galvanized-iron casing in which there is also a motor-driven fan that draws the damp air from the dryer. The motors for revolving the drum and for the fan are rated at three horsepower each, and are located on brackets at the rear of the inclosing case near the top. The motor switch and rheostat for each motor are mounted in similar positions on the front side of the case in convenient reach of the attendant.

At the present time there is a six-roll 120-inch American annihilator driven by a three-horsepower motor for large flat work. Two more similar units are to be installed. For the hand work there are ten ironing boards each equipped with an electric iron and stand. The complete list of motor-driven applications in the laundry follows:

Two 36-by-60-inch Henrici washers each driven by a 6-horsepower motor.

One 36-by-48-inch flat-work tumbler driven by a 2-horsepower motor.

One vacuum tumbler driven by two 3-horsepower motors.

Two American dry rooms each driven by a 1-horsepower motor.

One conveyor dryer driven by a 2-horsepower motor.

One band starcher driven by a 0.25-horsepower motor.

One collar and cuff starcher driven by a 0.25-horsepower motor.

One collar and cuff ironer driven by a 1-horsepower motor.

One collar and cuff finishing table driven by a 2-horsepower motor.

Two body ironers each driven by a 0.75-horsepower motor.

One sleeve ironer driven by a 0.75-horsepower motor.

One bosom press driven by a 0.75-horsepower motor.

One flat-work ironer driven by a 0.75-horsepower motor.

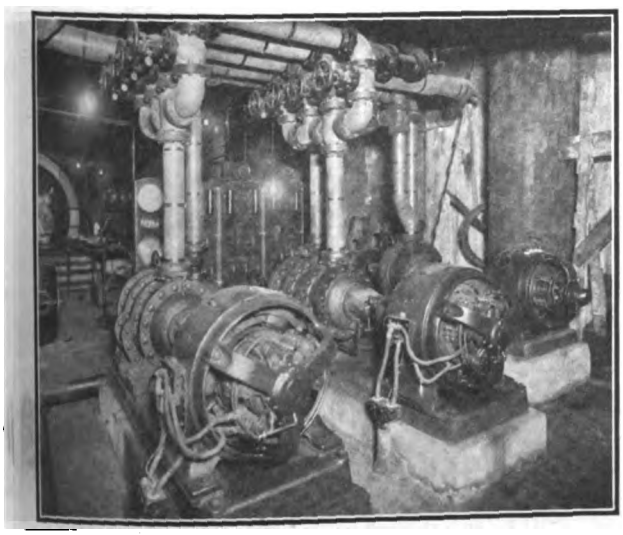

Fig. 10.—A View of the Pump Installation.

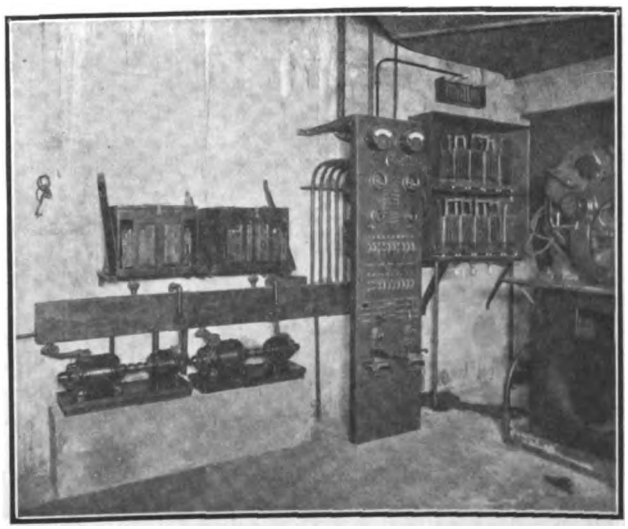

Fig. 11.—Power Board for Signaling System.

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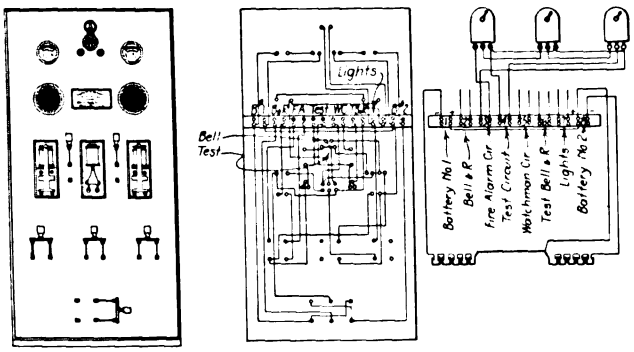

Fig. 12.—Fire-Alarm Switchboard and Wiring Diagram.

One six-roll, 20-inch annihilator driven by a three-horsepower motor.

Five extractors each driven by a 3-horsepower motor.

Three sewing machines each driven by a one-eighth-horsepower motor.

Kitchen.

Similar conditions are encountered in the kitchen as in the laundry in the way of excessive moisture from steam and water. The illustrations of some of the motor-driven appliances will give an idea of the electrical construction. One of the features is the dish washer, Fig. 7, which automatically manufactures the soap it uses from the grease removed from the dishes. Fig. 8 shows the dough troughs. The motor equipment consists of the following applications:

One buffer and polisher driven by a one-quarter-horsepower motor.

Two dough troughs each driven by a 3-horsepower motor.

One potato parer driven by a 1-horsepower motor.

One dishwasher driven by a 4-horsepower motor.

One coffee-mill driven by a one-quarter-horsepower motor.

One buffer driven by a one-quarter-horsepower motor.

One meat chopper driven by a 1.5-horsepower motor .

Miscellaneous Motor Applications.

There are a number of miscellaneous motor applications which are interesting and the outline of the general motor equipment will give an idea of the power requirements of a large hotel. There is a Lamson Miles pneumatic-tube system connecting with various parts of the building, which depends upon direct air pressure for operation instead of a vacuum, as generally employed with similar apparatus. Compressed air is furnished by a Clayton 10-by-16-inch single-cylinder air compressor driven by means of a short belt and an idler from a Westinghouse 30-horsepower motor operating at 725 revolutions per minute. The particularly interesting feature is the manner of controlling the motor, which operates only when the air pressure has reached a predetermined minimum pressure, by means of a Cutler-Hammer electric gauge set for a minimum pressure of 5 pounds and a maximum pressure of 15 pounds. The contacts of the gauge are connected to an electrically controlled motor switch on a panelboard which also contains the main switch, fuses and automatic motor-starter. The panel is supported on an angle-iron frame and all wiring is brought up at the back of the panel in conduits. Fig. 9 illustrates the motor drive, compressor and control apparatus.

As stated before, there are 29 ventilating fans driven by motors, 19 of which are located in the pent house. The balance of the fans are distributed on the mezzanine, balcony and basement floors. Four of the motor-driven fans are used in connection with air washers for supplying fresh and clean air to parts of the building. The balance of the principal motor applications are as follows:

One Palm system vacuum cleaner driven by a 15-horsepower motor.

Two brine pumps each driven by a 20-horsepower motor.

One brine pump driven by a 75-horsepower motor.

One ice-water pump driven by a 12.5-horsepower motor.

One incinerator garbage burner driven by a 3-horsepower motor.

One coal-weighing hopper driven by a 2-horsepower motor.

Automatic stokers in boiler room driven by 7.5-horsepower motor.

Condenser-water pump driven by a 5-horsepower motor.

Printing office driven by two 5-horsepower motors.

The controlling apparatus for these motors are contained in steel panel boxes, either mounted on the wall or supported upon angle-iron frame work as shown in some of the illustrations. Fig. 10 shows a group of motor-driven pumps and control apparatus.

Telephone and Signaling Systems.

Under this heading comes an important part of the electrical installation of a hotel or public building, which must be provided with every possible appliance to insure against accidents due to fire and other causes. First in importance from the latter standpoint is the fire-alarm and watchman's service. The manner of installing the wiring is also of importance. In the Morrison Hotel, the telephone and signal-system wires and cables employ a complete conduit system which utilizes the main wire shafts for most of the risers. A typical floor plan of the wiring is shown in Fig. 3.

The fire alarm and watchman's system consists of 55 stations with the necessary auxiliary apparatus, and was supplied by the McFell Signal Company, of Chicago. The system operates on open circuit, is non-interfering and will register an alarm sent from any box with a part of the wires broken or short-circuited. Such an occurrence would be immediately indicated at the switchboard and the trouble can be repaired later. All branch wires connecting to the boxes are run in conduit securely screwed into the box, therefore broken connections are practically impossible and a moisture-proof system results. The watchman's clock used in connection with the system has a double spring lever movement which with a clock checking attachment is mounted in a polished wood case with a glass front.

The switchboard for the system is located in the engine room, and consists of a slate panel mounted on an angle-iron frame. Mounted on the panel are the switches, test coils, relays and automatic cutout. The board is arranged with two sets of double-throw battery switches, independent switches for all circuits, and separate high-resistance coils, also an automatic relay to cut out the high-resistance coils whenever an alarm is turned in. Two voltmeters are provided which show the voltage at all times. If a break or short-circuit in the line wires, or defects in gongs, registers, etc., should occur, such defects will be indicated on the board by two miniature ruby lamps, placed behind Holophane globes, and a Schwartz electric bell.

The watchman's calls are made by inserting a key in the combination box which registers on the watchman's clock.

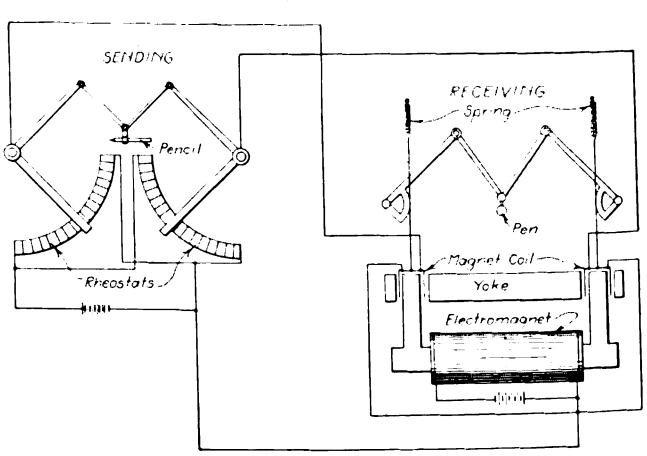

Fig. 13.—Diagram of Sending and Receiving Stations of Telautograph System.

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Fire alarms are recorded on a punching register and a gong. In connection with the fire-alarm system there are a number of push buttons mounted on the signal power board, shown in Fig. 11, which connect with fire-alarm gongs throughout the building, two on each floor. Another button connects with a gong for notifying the elevator operators in case of fire, and a master button can be used to ring all of the gongs if the conflagration is serious enough to warrant it. A diagram of the system and alarm switchboard are shown in Fig. 12.

The signal power board is arranged to furnish low-voltage current to other applications and is provided with battery switches, circuit switches, and the necessary controlling devices for two one-horsepower motor-generator sets. The latter are used in connection with two storage batteries and the combination of connections is so arranged that the batteries may be floated across the line, or may be charged and discharged separately.

There is a complete Musolaphone system for paging guests, having 64 stations, with the sending station in the telephone room. The stations are somewhat on the order of a dictaphone and are audible for some distance, so that a call can be picked up in almost any part of the building. Bell telephones are located in every guest room and near every motor or group of motors. There are also two sets of intercommunicating telephones used in connection with the dumb-elevator service.

A Sohm system of synchronous clocks and time stamps connects with all of the principal departments of the building.

To complete the electrical equipment there is an 18-station telautograph system. The principal writing part of the telautograph consists of sending and receiving stations shown diagrammatically in Fig. 13. The person sending the message writes on a paper tape with a pencil so linked with rheostat arms that the motions are split into two components, and the resistance varied in proportion to the components. Each rheostat is connected to a magnet coil located in a magnetic field of constant value. Variations of current in the magnet coils cause corresponding movements between the coil and the constant field. The magnet coils are connected mechanically to arms carrying a pen and the motions are opposed by coiled springs. The pen follows the movement of the pencil and reproduces the motions the latter makes.

When not writing, the receiving pen does not rest on the paper but is made to press against it in the following manner: At the sending end there is an induction coil with two secondary windings connected to each line circuit; pressing on the writing slip changes the strength of the pulsating current that is superposed on the receiver line current to such an extent that a special pen-lifting relay at the receiving station is operated and the pen is held against the paper. The pulsating current produces a slight variation which assists in reducing the friction of the pen on the paper. The paper is moved at the sending station by turning a crank that also operates a master switch and a corresponding movement of the paper is provided at the receiving end.

"Don'ts" for Line Patrolmen When Using Portable Phones.

The San Joaquin Light & Power Corporation, operating at Fresno, Cal., and vicinity, has issued the following interesting and instructive series of "Don'ts" for its line patrolmen when using portable telephones along the company's system:

Don't lose patience when your bell fails to ring. Look for poor connections to line or open in ringing circuits.

Don't "think hard" when your telephone receives or transmits a weak ring. You may have low resistance coils or poor contacts in the ringing circuit.

Don't blame the dispatcher when your telephone rings other bells and your bell is weak. Look for poor adjustments in the bell armature. There may be a high resistance contact in the ringing circuit.

Don't swear when you receive calls on your telephone and cannot talk. Look for a broken cord on receiver, poor contacts in talking circuit, weak battery, if the receiver hook does not go to proper place, or there may be a high resistance ground connected in gap of broken line.

Don't say all you think. When you cannot ring or talk, there may be an open circuit in the telephone or a shorted line.

Don't think the other fellow is chewing gum when the speech is indistinct and has a buzzing sound. Look for loose connections in the battery and transmitter.

Don't think you are dumb when you can hear but cannot be heard. Look for an opening in the primary circuit.

Don't forget that a patrolman should understand his telephone. He may be in need of assistance.

Among the Contractors.

The Richardson Electric Company, Duluth, Minn., has received a contract for the electrical work on the extension of the Reiss Coal Company's Dock No. 1, at Superior, Wis. This contract includes considerable high-tension work and is unique in that one portion of the work alone will require over 5,000 pounds of copper bus-bar three-eighths inch by two inches. The same company has also secured the wiring contract for the M. I. Stewart residence at Crescent View Park and has just completed the electrical wiring at the new Minnesota National Guard armory, Duluth, one of the best equipped buildings of its kind in the western states.

The Blumenthal-Kahn Electric Company, Baltimore, Md., was awarded the contract for the electrical work in the building of Frensdorf & Brown Distilling Company, of Canton, Md. This firm has also been awarded the contract for the electrical installation in the Drovers & Mechanics National Bank. This contract, the largest of the past week, includes wiring for lighting, call bells, vault protection, Turner Dictophone system, etc. C. L. Reeder was the consulting engineer.

W. S. Rosenfeld, Baltimore, Md., has been awarded contract for wiring for the National Yeast Company, at Colgate, Md. About 25 motors were installed which will aggregate about 350 horsepower.

The Electro Mechanical Company, Baltimore, Md., has been awarded the contract for the electrical installation for the Poole Engineering & Machine Company plant now in the course of erection at Texas, Md. The contract calls for wiring for light and power. This plant will cover an area of 25 acres and will be used for the making of munitions of war.

The United Electric Construction Company, Philadelphia, Pa., has been awarded the contract for the electrical equipment for the office building at Sixteenth and Walnut Streets, Philadelphia, at $10,000 and also that of the St. Charles Hotel, Atlantic City, N. J., at $5,000.

Walker & Kepler, Philadelphia, were awarded the contract for the electrical work in the new buildings to be erected at the Pennsylvania Institution for the Feeble Minded at Spring City, Pa.

W. R. Sorgel has severed his connections with the Trester-Sorgel Electric Company and is now located at 138 West Water Street, Milwaukee, Wis., as manager of the Sorgel Electric Company. The business of this firm will be electrical construction, machinery, supplies and repairs.

E. A. Braseth of Grand Forks, N. D., has secured the contracts for wiring the Grand Forks Deaconess Hospital addition, the Hallock, Minn., Co-Operative Store building, the Cando, N. D., City Auditorium, and the buildings of the Grafton, N. D., Roller Mills.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

HOUSE AND DEPARTMENT CONFERENCES ESSENTIAL TO SUCCESSFUL MERCHANDISING.

By C. H. Minor.

In giving this subject proper consideration, it might be well to trace briefly the development in commerce that has brought us to the point where the house and department conference has become such as important factor in the conduct of modern business.

When business was young, man was self-independent, his horizon was limited and his field of activity very small. Production and manufacture were the results of individual work. With the development of transportation, the telegraph and telephone, these individual operations have become more centralized. Industry as we know it was born with these modern means of communication. The growth has been so rapid that within the memory of men now living it has reached its present manifold and complex form. With this development the individual trader disappears. He becomes a part of a big business, no longer the whole of a small business. A group of men now replaces the individual. The reason for such a development seems clear for the following reasons:

Individual action always fluctuates between the extremes of perfection and imperfection. Man alone is influenced by habit, education, environment, temperament and passion. It is a fair statement that the best individual effort is erratic, but the decision of a group of men is reliable. The individual may be a dreamer, he may prophesy and theorize, but seldom are a group of men given to dreaming.

So with our modern business we have developed organization, system and business efficiency. How can we secure the greatest success? There will always be differences of opinion and the only way to "understanding" is through frank discussion with a spirit prepared to make concessions. This is therefore the reason for the house and department conference.

A standard organization should be so arranged that the lines of authority are clearly delegated and the activities of the several departments strictly defined. My idea of such an organization is one in which there is an executive head, charged with administration, surrounded by an executive committee consisting of the heads of the departments for sales, finance, stores, production and engineering work. It is the duty of this committee to outline the general company policy and the broad lines to be followed in carrying out this policy.

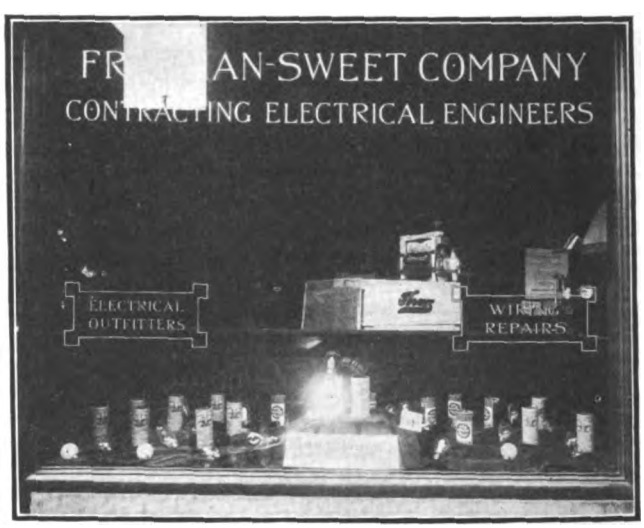
The house conference presents the best means for accomplishing this work because it instills enthusiasm and co-ordinates all parts of the business. The greatest danger of all is lack of a proper recognition of the close interdependent relations between departments. The house conference is primarily educational. No firm ever impressed the world with its slogan "Service First," "Every Customer a Satisfied One," etc., without first selling its policy and program to its own employees through house conferences.

We may well say that the idea of the house conference is to emphasize the importance of the idea of "co-operative house protection." We may summarize the advantages of the house conference in these words: It educates, co-ordinates, harmonizes, humanizes and stabilizes modern business. As we follow the expansion and development of business, the problems arising in the various departments make the need for department conferences just as great and the results to be obtained just as important.

Now, if the conference is the most efficient way of handling modern business, it is also the most expensive. Therefore, the need of a definite policy, a specific and clearly outlined program for conducting the conferences. Finally, make the effort co-operative and constructive.

A Suggestion for a Battery Display Window.

Realizing the unappealing character of the ordinary window display of dry cells, the Freeman-Sweet Company, Chicago, Ill., recently decided upon the display



A Battery Display Window That Attracted Attention.

shown in the accompanying illustration. In the center of the window, surrounded by rows of dry cells of various manufacture, was placed a platform, slightly raised, upon which was mounted two ordinary dry cells apparently supplying a 250-watt incandescent lamp. Under the display was placed a card bearing the following inscription: "Some Batteries, highest efficiency at all times."

The display attracted considerable attention and it is stated resulted in boosting battery sales during the week it was maintained.

Sicilian Buys American Electric-Light Carbons.

The Catania Street Railway & Lighting Company, of Catania, Italy, has placed an order for 19,400 American carbons as the result of a foreign trade opportunity published in *Commerce Reports,* the daily publication of the Bureau of Foreign and Domestic Commerce. This initial purchase of American lighting supplies for Catania is important in that subsequent orders will follow, in all probability, for other cities and towns in the district. As a rule, the difficulty lies in securing the initial order.

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Business Hints for the Electrical Dealer

Care Necessary in Estimating Repair Work—Economy Results in Providing Repair Men with Complete Equipment for a Specific Job —Big Opportunities for Sales to Office and Apartment Buildings

By G. D. Crain, Jr.

The Hasty Estimator.

Not long ago a customer walked into the establishment of a leading contractor, who makes a business of repairing motors and other electrical equipment.

"I've got a motor out here on the wagon," he said, "and I want you to put it in shape. How much will it cost?"

The electrical expert had the machine brought in, looked it over, as he thought, carefully, yet with a certain amount of haste, and finally said, "I guess we can put this in good running order for $10."

"All right, go ahead," replied the owner of the motor, walking out.

A little later on, when the shop got to work on the job, it was found that the bearings of the motor were burned out, and that to put it in first-class condition these would have to be replaced. The repair man telephoned the customer and called his attention to this feature of the proposition, asking whether he should renew the bearings as well as the other defective parts.

"Sure," was the reply. "You agreed to put it in good running order for $10, so go ahead and do it!"

And though the contractor, amazed that he should be taken so literally, pointed out that he had not intended to include the bearings in his estimate of the cost of the job, the customer was just unreasonable enough—and there are many like him—to take advantage of the agreement and to insist that the bearings be replaced at the original estimate. The work was finally done for $10, and the concern which did it lost money, of course. But its head has learned a lesson, and that is not to make a binding estimate without knowing every detail of the work which is being figured on.

"After we open up a motor we can tell what will have to be done to it," he said recently. "But to attempt, without a thorough knowledge of the entire proposition, to make a binding estimate, is to gamble; and the customer usually gets the benefit. Be sure you're right and then go ahead is an old-time proverb, but it's the correct dope in this business."

What About the Demonstrator?

Should demonstrators be furnished without charge to the dealer who is handling an electrical specialty?

This question is suggested by the experience of a well-known member of the trade, who took the agency for a certain advertised machine some time ago, paying the regular price for one to use as a demonstrator. He tied up about $60 in the specialty. After working on his local field for some time, and finding it more or less difficult to sell it, with his limited opportunities for getting out and doing personal solicitation, he decided to let the agency go to somebody else.

Now he has a second-hand machine on his hands, and will have to sell it at a good deal less than it cost him. The manufacturer got the benefit of his efforts, and made a profit on the machines which were sold. True, the number was not satisfactory, either to the maker or the dealer; but certainly the latter did not make an excessive margin on the goods he disposed of, and it took a good deal of effort to get them going. Should he be penalized to the extent of having to absorb the loss involved in the reduction of a new machine, used for demonstration purposes, to a second-hand condition?

This is one of the numerous problems involved in getting relationships between manufacturer and dealer on a basis which will be fair to everybody, and will encourage, rather than discourage, the local distributor who is trying to develop the merchandising end of his business.

Find Out What Is Needed.

The average electrical shop is crowded with work of a minor nature. At this time of the year, especially, when new construction jobs are few in number, the crews are kept busy chiefly on repair work. Most of the calls are of an emergency nature, the customer wanting quick service, and being willing to pay more than the job is worth intrinsically for the sake of having the matter attended to without loss of time.

These are conditions which emphasize the necessity of finding out from the customer just what the work is, so as to take along the necessary materials. Ordinarily a workman cannot carry in his kit a great enough assortment to cover the requirements of any given job, for the obvious reason that there are too many kinds of each item. He has some things, but they are not expected to cover the requirements of the job.

If the person who takes the order for the work gets merely a hazy notion of what is to be done, there is a possibility of the workman having to return to the shop for the materials needed, or to wait while they are sent out. Either development not only delays the completion of the work, but tends to irritate the customer and to give the impression that the electrical business is run as the cartoonists insist the plumbers run theirs. The latter have had a hard time living down the reputation which has been handed them, and without attempting to decide whether or not it is deserved, it is certain that no electrical contractor wants his customers to get the idea that he doesn't know enough about the business to have his men take with them to every job the materials which they will need on that job.

If all of the items are ascertained in advance, the electrician can handle the work in short order, and the customer, as suggested, will pay the bill, even though it involves a charge based on the emergency character of the work, rather than the actual cost in labor and materials, with much more grace than if he had an idea that delays caused by waiting for material had been figured into the bill.

Is This Good Business?

A certain electrical dealer is now handling a specialty line on a 20 per cent margin. That is to say, the manufacturer has fixed the retail price, which is widely advertised in the magazines, and the dealer's discount is one-fifth of that.

This specialty is not well known enough as yet to sell without effort. On the other hand, the dealer has got to do considerable advertising work on his own account. He is spending money in circularizing, he is giving up window space to it, and he has used some newspaper advertising. In addition, he sends out solicitors whenever a

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good prospect is turned up, either by his own or the manufacturer's publicity work, and makes an aggressive effort to put the sale over.

The question is, is a 20-per-cent margn sufficient?

The writer, without desiring to criticise the sales policy of the manufacturer, is firmly of the opinion that it is not only too little, but that the dealer is losing money on the business which he is handling.

In the first place, few retail stores can be run with an overhead expense of less than 20 per cent of sales. Groceries, with a rapid turnover and relatively cheap locations, manage to sell for less, but they are exceptions and not the rule. The ordinary store, where the goods are put in stock and sold over the counter without any special effort, cannot get out without paying out 20 per cent of its receipts in the necessary expenses of running the business.

Now, when there is added to the regular cost of doing business the additional special expense of exploiting some particular line, it is only fair that this line be charged with it. If this were done in the case noted, it is evident that the dealer would have to pocket a loss measured by the amount of development work which he did. Of course, if a big volume of business were put on, this would help to reduce the overhead, and thus would create a somewhat bigger margin; but it is doubtful if the reduction in the percentage of overhead would be sufficient to absorb the extra expense.

Now, these statements are made not for the purpose of making any dealer who is satisfied with 20 per cent discontented with the situation. On the other hand, most electrical merchandise dealers appreciate the fact that they need a bigger margin, and they are far from enthusiastic over a line which does not give them enough to justify hearty and aggressive co-operation with the manufacturer.

It would be good business for the latter, good business for the dealer and good business all around if the fact were recognized that it costs money to sell at retail, and that the dealer is entitled to a net profit. He cannot be expected to hew the wood and draw the water without any recompense, and asking him to do a lot of special work for a new line without getting a reasonable return on his investment of time and money is not calculated to get the best results for anybody.

Study Big Buildings.

The average electrical contractor gets a good deal of work, first and last, from the big office buildings in his community. Changing lighting fixtures to suit the requirements of individual tenants is one kind of work which results in frequent calls, for while some of the buildings have their own electricians, who are available for this sort of thing, most of them are so operated that the tenants usually call in contractors from the outside.

All this suggests not only that it is good business to keep the numerous office people in mind in advertising, and that an occasional circular sent to every concern in every large building would be a good thing; but also that it would be a splendid idea to have specific data at hand regarding the electrical equipment of each building. Such a simple proposition as the kind of receptacle provided in the various rooms would indicate the type of plug to send out on such jobs; and the description of the switches and fixtures, which would have to be matched in any new work, would also help. This information would enable work to be done much more economically and readily than if it had to be looked up every time anything was to be handled in a given building.

Gene Cashman, for four years connected with the city electric light plant, has opened an electric shop for the sale of fixtures and lamps and for contracting at Elm and Webster Streets, Chillicothe, Mo.

Fixture Sale Predicated on Satisfactory Lighting Installation.

General lighting for offices, rather than individual desk fixtures, is coming to be recognized as the more efficient and desirable mode of illumination. An installation of this type which is regarded as one of the most attractive in New England, is that of the accounting department of the Manufacturers' Outlet Company, located at Providence, R. I.

This installation consists of 49 fixtures for this floor, which is 70 by 72 feet square, besides which 24 similar fixtures have been installed for another department. The single-chain old brass fixtures are employed, with 14-inch Alba non-roughed Macbeth-Evans Glass Company hemispheric glass, burning 150-watt type B Mazda lamps. The ceiling is 11 feet high, and the total length of fixtures is 42 inches.

A remarkable feature of the installation, which was done by the Boss Electrical Supply Company, of Providence, was the fact that the office was about completed at a busy time of year, when the manager of the bookkeeping department thought that time would have to be sacrificed in placing all the desks with reference to individual illumination, with the running of iron conduits along the floor and the equipment of each desk with condulet fittings, and outlets for desk lamps. The contractors' plan for a general scheme of lighting, by which the desks might be located anywhere on the floor and receive about equal illumination, met with the company's ready acceptance.

The outlets in the ceiling are spaced 5 feet 6 inches from the back wall and 6 feet from the side walls, and those apart from the outside rows are 10 feet apart on the square. A line of four units is directly over a corridor petition and single fixtures are over the center of each of four private office rooms. Energy is furnished by the Narragansett Electric Lighting Company.

Lamp Sale in Chicago.

A special sale of portable lamps is being held by the two Electric Shops of the Commonwealth Edison Company. Special prices are being offered during the sale with the idea of clearing out the remaining holiday stock to make room for spring goods.

One of the most attractive displays recently shown in the Edison Building Electric Shop may now be seen in the south window of the Clark Street entrance. The background of the window is draped with Chinese cretonne and the entire window is filled with a very choice display of imported Chinese bronzes and porcelains, which were picked up by the manager of the Shop in New York studios and importers' salesrooms and brought to Chicago, where they were wired and fitted from special designs and equipped with specially designed silk shades, the fabrics of which were selected to match the bases. This is probably one of the most complete and unique displays of Chinese-pattern portable lamps ever displayed in Chicago.

New Electrical Store for Gary, Ind.

The Lighthouse Electric Company, of which A. B. Harris is president, has purchased the stock and fixtures of the A. B. Harris Electric Company, 570 Washington Street, Gary, Ind. The store will open again with a complete stock of electrical goods, lamps, etc. The Lighthouse Electric Company was recently incorporated for $10,000, the incorporators being A. B. Harris, W. P. Cottingham, assistant city engineer; Frieda E. Cottingham and F. B. Shain. The business will be under the management of Mr. Harris and Mr. Shain.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Grounding of Secondaries.

To the Editor:

I have read with a greal deal of interest Terrell Croft's article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 1, on Transformer Wiring Practice. That part of the article relating to the grounding of secondaries is particularly interesting, for the reason that it agrees absolutely with a growing opinion that while such grounding reduces somewhat the life risk, it automatically increases the fire hazard. But it might be said further in this connection that risk to life is always attendant in fires of any consequence.

It must be taken into consideration that on grounded systems there is an extremely dangerous element commonly found upon reinspections of older equipments, especially in dwellings, but not present in ungrounded systems, which may not have occurred to Mr. Croft. It frequently occurs that a fuse will be blown in a cutout on a grounded secondary system and the repairman or the owner of the equipment, for the purpose of continuing service temporarily, "bridges" the terminals of the cutout on the open side. This in the majority of cases becomes permanent through neglect to repair. The general presumption on the part of the average electrician or repairman is that the remaining fuses will protect the circuit in the event of trouble recurring until the blown fuse is replaced, and the "bridge" removed. It will not only be appreciated that automatic protection on such a circuit has been absolutely eliminated, but what the result will be in the event of a ground occurring or reoccurring on the clear side.

Herein exists the potential hazard in the concentric and similar one-wire systems, where but a single fuse is originally provided and a fire loss is inevitable where this fuse is bridged.

We have found in practice, where the secondary ground is effectual (and it must be if considered of any value) and where the clear side has been bridged, that by an accidental ground on the bridged side, the remaining fuse does not operate for the reason that the current finds an easier path by the way of the secondary ground wire and even though the fuse should operate, the results would not be altered.

After conducting an inquiry it was learned that the breaking down or collapse of transformers annually is surprisingly low, it being estimated at less than one-half of one per cent. It was further learned that accidents due to crosses between primary and secondary lines are remarkably small, this being probably due to a more rugged grade of line and service construction, than was obtained in former years. It is not my intention, of course, to take issue with any part of the very able article by Mr. Croft, but for the purpose of bringing out more clearly some of the points passed upon, I should like to have an expression from him as to whether he does not believe that the fire and life risk are abnormally increased due to the grounding of secondaries on 100 per cent of transformers for the purpose of anticipating accidents to less than one-half of one per cent of actual failures or collapses. It is noted further the excellent suggestion by Mr. Croft that the secondary ground conductors and connections should be thoroughly inspected at least once per year and it would be interesting to have a general expression from those interested as to whom the responsibility should rest upon in making such periodical inspections, that the users of the appliances who feel immune from accidents due to the knowledge of having the secondaries grounded may not meet with an accident or fatality by being deceived as to its effectiveness.

C. H. Hill,
Chief electrical inspector, Underwriters' Association of the Middle Department.

Philadelphia, Pa.

Timeliness in Electric Vehicle Sales.

To the Editor:

I have read the editorial, "Timeliness in Electric Vehicle Sales," in your issue of December 18, 1915, with much interest.

Much of the street traffic congestion which invariably follows the arrival of heavy snow in our larger cities is unquestionably due, as you suggest, to the horse getting in the way. He is out of his element under snow conditions in a city and those who use him must pay a high premium in the premises.

In this connection one of the New York newspapers has announced, recently, that its publishers will use their influence to have a state law enacted to compel all horse owners to keep their animals caulk-shod during the winter months. "A poor winded animal, straining and slipping in the effort to drag a heavy load over an icy surface upon which smooth shoes give him no foothold," states a recent editorial, "is a sight as painful as it is frequent." Probably such an ordinance would be a step in the right direction but it would not materially relieve traffic congestion. Such a congestion comes from horse-drawn vehicles blocking each other in narrow cross-streets, or at corners and when street cars get into the center of such a jam, hours of delay and inconvenience frequently result. That traction companies are continually seeking some remedy, legal or otherwise, to prevent heavily loaded (mostly horse) vehicles from monopolizing their tracks when the snow is piled high on each side is well known. The motor truck can at least turn out for a street car and the electric truck is particularly dependable under such adverse weather conditions, as you have intimated. If properly charged it will give splendid results. It is easier handled, needs practically no adjustments while on the road and because of its simplicity of construction, especially as to driving mechanism, it does not need the repair shop at the end of the run. Here in New York some of our electrics are worked 20 and 22 hours a day during stormy weather just because they can be kept on the road.

I quite agree with you that it would be helpful to the industry if some means could be found for consistently emphasizing the merits of the electric at a time when so many delivery systems are crippled, but I am afraid it is not feasible to place a truck in the service of a "July prospect" at the first heavy fall of snow. The demonstrating plan is something which we nearly all agree is an

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evil to be avoided. To properly demonstrate the relative efficiency of the electric at such a time would require in Chicago alone from 50 to 100 of our trucks and then we would risk offending several hundred other prospects whose "problem" could not be covered in view of the time element involved. Blizzards, zero weather and icy streets carry their own indirect appeal to the prospect. One wholesale grocer using horses sees a competitor who uses electrics making deliveries on schedule while his whole system is demoralized and he cannot help asking himself if electrics are not what he should have. It requires a lot of patience to wait for the sheer merit of the electric as developed by contrast to bring one a large percentage of his business but it seems to be, if not the best way, then at present the surest way.

Your editorial but emphasizes in a new way a question which is bothering scores of friends of the electric, viz.: to what extent will aggressiveness in introductory methods increase the sale of electric trucks? If merchants knew or could be convinced, readily, what horse equipment cost them it would be easier to *force* the electric truck market. It seems to be a question of evolution with most team owners—a matter of education, in which salesmanship, often of the very highest kind, avails little so far as cutting down the period of deliberation is concerned. I rather feel that motorization must take its time—must await both education and the available resources to make the turnover from one method to another.

The situation is very interesting, many-sided and at times confusing, but I am confident that the electric will be well represented at the finish.

P. D. Wagoner,
President, General Vehicle Company.

Long Island City, N. Y.

To the Editor:

I read the editorial on "Timeliness in Electric Vehicle Sales" in your December 18 issue and think it very pertinent. The operator of an electric truck, however, dreads snow storms probably as much as the man who has a horse-drawn vehicle.

I saw an item in the newspaper a few days ago saying that a party in New Jersey used oxen in place of gasoline autos for delivering goods during a recent snow storm.

The electric car can go through the snow better than the gasoline or horse-drawn vehicle while the battery holds out, but the mileage is cut down very much and at present there is not a sufficient number of charging stations available.

Arthur Williams, a former president of the Electric Vehicle Association of America, said some time ago "that there was a dearth of garaging facilities," but the industry does not yet realize the truth of this statement.

At present we have garages that take care of pleasure vehicles on a flat-rate basis but such an arrangement is altogether unsuited to the needs of the commercial vehicle.

R. Macrae,
Vehicle engineer,
Commonwealth Edison Company.

Chicago, Ill.

Need for Electrical Clearing House.

To the Editor:

Your editorial on "Organization," in the issue of November 27, 1915, appealed very forcibly to the writer who is a strong believer in "organization" in any kind of work or play. In a recent bulletin of the Electrical Credit Association of Chicago the following Elbert Hubbard story was given:

"Not long ago Hubbard had occasion to visit a hospital for the insane. Walking over the grounds one morning he came across an attendant in charge of 25 patients. The attendant was a little chap, a sort of half portion. Many of the patients looked and weighed twice as much. Hubbard's curiosity was aroused. He joined the attendant in his stroll. Hubbard was all questions and asked, 'What is to hinder half a dozen of these big fellows getting together and fleeing to the woods. You wouldn't stand a ghost of a show. There is no help within half a mile at least and you are not armed.' The attendant looked at his questioner severely, then smiled, and replied, 'You belong right here yourself; what is to hinder these men getting together and setting up a job on me? Why, the fact is, if they could get together with anybody or anything, they would not be here. That is their trouble.'"

The bulletin then goes on to make the point that "organization is the badge of sanity."

Most people in the electrical industry now recognize the value of a well organized factory or sales force but there are a good many who cannot yet see the value of an organization made up of people or companies in any branch of the electrical industry. This is perhaps partly due to the independent spirit of us liberty-loving Americans but it is nevertheless a mistaken idea. Several different branches of the industry have organized and are doing some real good such as the National Electric Light Association, the Electric Power Club, National Electrical Contractors' Association, the Associated Manufacturers of Electrical Supplies, etc. These are composed of men or companies in some particular branch such as central-station men, wiring contractors, motor and generator manufacturers, manufacturers of wire, insulators, etc. These associations have met and the members have had a chance to discuss the particular problems of their line informally with each other, besides finding out that the other man was a pretty good fellow after all and didn't have horns hidden under his hat. They have formally discussed the vexing questions of their business and slowly matters are taking a much better shape. There is still much to be accomplished and these organizations should have the support of all companies instead of a few hanging out and reaping the benefits of the work done by the organizations without sharing any of the expense.

Because there are so many organizations in this big electrical industry of ours, they sometimes lap over in their activities in a more or less serious manner. This is a point which as time goes by the organizations are slowly remedying by reaching agreements as to just what line of work each shall take up. This is only fairly started but a great deal along that line remains to be accomplished to make these organizations efficient and it will be accomplished to an increasingly large extent in the next few years.

The leaders in these organizations are beginning to feel very strongly that something more is needed to help and hasten the efficient solution of this question. There are many subjects that are of vital interest to the whole industry and so do not come in the province of any one organization alone. There seems to be the need of some sort of federation, clearing house, or whatever you want to call it, composed of representatives from all organizations in the electrical industry to which these bigger, broader, national questions can be referred for solution and action. Something similar to the national chamber of commerce is perhaps what is wanted.

Such an organization working along lines morally just and right and not trying to put over deals for the selfish interests of any man or group of men can do the electrical industry an inestimable amount of good. This organization within organizations or rather organization on top of organizations is coming and will be a tremendous force for right and justice in the industry.

Harry N. Gilbert,
Roth Brothers & Company.

Chicago, Ill.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

No. 325.—Capacity-Factor of Central Station.—In a town of 10,000 or less, having a fair day load, the peak being composed of store and residence lighting, what is the proper ratio between peak load and rated capacity of the station? I am supposing that the central station makes little or no effort to increase the power load and absolutely no effort to push appliances.—F. H. G., Columbus, Neb.

No. 326.—Automatic Electric Humidification.—Are any automatic means available through which an electric water-heater could be controlled from a humidity instrument so as to cause the heater to boil water when the relative humidity has dropped to, say, 30 per cent and be cut off when the humidity has been raised to 40 per cent? Would such a device be practical and reliable?—M. T., Lansing, Mich.

No. 327.—Reducing Glare from Table Lamps.—I have observed that practically all table lamps cause eye strain to children reading or playing on the table by shining glaringly directly into their eyes, if the children are not sufficiently tall to have their eyes screened by the shade or dome. Can anything be done to reduce this glare, aside from using full-frosted lamps?—P. M. C., Lockport, N. Y.

No. 328.—Flame Arcs.—Where series flame arc lamps, such as those used for Chicago street lighting, feed at intervals much less than one minute is it due to poor adjustment of the lamps or to some inherent characteristic?—B. D., Chicago, Ill.

Answers.

No. 321.—Co-operative Meter Reading.—In one of the large cities I have observed that both the gas company and the electric company send out their inspectors to read meters in several districts on identically the same day. Both these companies are active competitors, although there is a community of interest among them. The electric company has been proclaiming that it practically serves its residence customers at a loss, due to the high cost of meters, meter reading, billing, etc. It seems to me that by uniting the meter-reading work in a single crew the cost of meter reading would be materially reduced. Now what I would like to know is whether any state utility commission has passed on this point, namely, allowing competing utility companies to co-operate on meter reading for the joint benefit of both the companies and of their customers, most of which are in common.—A. Z., Spokane, Wash.

A direct answer to this question is no, or at least not to my knowledge. I have followed the decisions of the state commissions quite closely without coming upon this point. It may be seriously questioned whether it is a matter within the province of commission regulation. The companies furnish utility service of entirely different character, one supplying gas and the other electricity. The very fact that the majority of their customers are patrons of both companies indicates that with these customers it is not a question of gas in competition with electricity, but that they want both, doubtless for different purposes. If it were a case of two gas companies competing or trying to compete for the same business, or of two electric companies doing likewise, it would be a matter for consideration by the commissions in those states where the commission can prohibit or regulate competition in the same class of utility service. Many of the state commissions do not possess this power.

Whether any commission with authority to regulate competition between like utilities would prohibit the proposed co-operation, even in the case of two electric companies, for instance, is doubtful. The more advanced utility commissions are aware of the folly of utility competition and are trying to replace it with either regulated monopoly or co-operation.

Although I have never heard of the proposed plan being used except by combination gas and electric companies, in which case it is a source of considerable economy, the only objection I can see to it is the possibility that a careless or unscrupulous meter reader might favor one or the other company. This could be avoided by care in selecting competent and trustworthy men. It seems to me that the co-operative scheme might easily be extended to the delivery of the bills by a single group of men so as to avoid duplicate labor and cost in this item also. The division of the cost of all the co-operative work could be based on the relative numbers of bills delivered and meters read per day.—L. R. F., La Crosse, Wis.

No. 323.—Electric House-Heating in the South.—Where electric radiators are especially suitable for taking the chill off rooms on some cool mornings, as is the case in the South, is the expense of the special heating circuits required by some inspectors warranted by the comparatively little use these radiators would receive?—L. S. M., Galveston, Tex.

From the way this question is put it is evident that L. S. M. does not think this additional expense is warranted. In this case he should not attempt to use any radiator load on the circuits installed in excess of their allowed rating, 660 watts. A 660-watt radiator will not heat a very large area in the large rooms customary in many southern homes, although if local warmth only is needed it will provide that satisfactorily. If larger radiators are to be used, it should be remembered that the special circuits they will require will be of service for other electrical purposes also. In the South electric cooking should meet with favor because of the fact that it does not appreciably heat the kitchen or other room where it is carried on. The convenience and comfort resulting from the liberal use of electric fans and other electrical appliances should make a special appeal in the Southland. To permit the use of such devices on a generous scale requires that the wiring be of liberal size and provided with numerous outlets.—E. P. K., Cincinnati, O.

No. 324.—Circuit-Breakers for Motors.—In some cities the use of circuit-breakers in place of fuses, or without auxiliary fuses, is permitted where there is efficient supervision. What constitutes "efficient supervision" under these circumstances?—C. E. U., Chicago, Ill.

The exact shade of meaning of "efficient supervision" must be determined by the inspection department having jurisdiction over the motor installation. In general it involves frequent and regular supervision by a competent electrician. The inspector can easily satisfy himself by questioning whether the electrician in charge understands the general functions of circuit-breakers, starters, fuses, etc., and the operation and proper care of the circuit-breakers installed; he should ascertain what the duties of the electrician are and whether they include the regular inspection of the motor equipment. By observation he should see whether the electrician acts as though he could easily take care of all his duties without shirking regular inspection of the motor circuit-breakers. If the inspector is satisfied on these points and on the character of the circuit-breakers used, he can safely permit the omission of auxiliary fuses.—H. D. Y., Harrisburg, Pa.

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PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

CALIFORNIA.

Great Western Power Company. The Railroad Commission has issued an order authorizing the Great Western Power Company of California to issue $5,000,000 10-year 6-per-cent convertible gold debentures. The proceeds are to be used as follows: For the purchase of the stock of the City Electric Company, $3,000,000, providing the City Electric Company invests this sum in additions and extensions to the properties belonging to it and the Great Western Power Company; $1,500,000 for construction of a second transmission line from the hydroelectric installation at Big Bend, Butte County, to Oakland; $250,000 for the construction of two cable lines across San Francisco Bay from Alameda County to San Francisco.

The United Railroads of San Francisco has filed with the Commission an application for an order confirming the issue by the United Railroads of coupons on 400 bonds of the Ferries & Cliff House Railway Company, remaining unpaid December 31, 1914. The bonds have a par value of $1,000.

Pacific Gas & Electric Company. On complaint of the city of San Jose and in connection with proceedings initiated upon its own motion the Commission established a schedule of rates and rules for electric service in the city of San Jose and adjacent territory. The company subsequently applied for a rehearing and the effective date of the original order was suspended pending a review of the additional evidence offered in support of such petition. The Commission ordered the following schedule of rates established for the city of San Jose and adjacent territory, including the towns of Los Gatos, Mountain View, Sunnyvale, Santa Clara, and Alviso and unincorporated territory, to become effective December 20, 1915: For domestic and commercial lighting, 7 cents per kilowatt-hour for first 20 kilowatt-hours; 4 cents per kilowatt-hour for next 330 kilowatt-hours; 3 cents per kilowatt-hour for amounts over 350 kilowatt-hours; minimum per meter per month, $1. Schedule also established for various forms of street lighting and certain changes made in rules governing agricultural and power service. The company was also directed to make all extensions and connections within the cities of San Jose, Los Gatos and Mountain View at its own expense, within thirty days from receipt of a written request for service, and also construct extensions, at its own expense, to six certain individuals named who have filed informal complaints with the Commission alleging the refusal of respondent to extend service.

It was also held that a fair allowance for overhead percentages on estimated reproduction cost of hydroelectric, steam and transmission construction is as follows: 1 year's construction period, 20 per cent; 2 years', 23.5 per cent; 3 years', 27 per cent; that an allowance of two months' operating expenses for working capital is a just and reasonable amount.

As regards the apportionment of investment in individual steam plants it was held that though on the face it would appear that such investment is more or less assignable to the immediate locality in which the plant is located, it is more proper to consider such plants as feeding the system as a whole, particularly as in times of low production at the hydroelectric production centers, the steam plants are called upon to develop considerable energy for consumption throughout the system as a whole.

MASSACHUSETTS.

The Massachusetts Gas and Electric Light Commission has recommended a bill to the Legislature which would permit a hydroelectric company to issue preferred stock to twice the amount of its common stock, and a bill ratifying the regulations established by the Commission for the installation of electric fixtures and wiring, which were printed in a recent number of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN.

MISSOURI.

Protection from Competition. Percy W. Markham has asked the Commission for a certificate of convenience and necessity permitting the furnishing of electric service in the city of Browning in accordance with franchises granted by the city and the county of Linn. The Browning Light & Plumbing Company, a utility furnishing acetylene lighting service in the city of Browning, was granted leave to intervene and the intervener contends that the applicant should not be permitted to establish electric service in competition with the lighting service from its acetylene gas plant. The Commission says: "It is the policy of the Commission where a utility has the occupancy of a field and is giving adequate service at reasonable rates to protect that utility from encroachment by a utility undertaking to furnish the same kind of service. However, in this case that rule cannot be said to apply. The applicant does not propose to install an acetylene plant in competition with the intervener, but proposes to install an electric plant. The intervener, as now engaged, only undertakes to furnish lighting service. The applicant proposes to furnish electric energy for light, heat and power. The testimony tends to show there would be some demand for power service from the applicant at Browning. Applicant further proposes to furnish continuous night and day service. The public at Browning should not be denied the many advantages afforded by electric service because intervener is already there engaged in furnishing lights with acetylene."

NEW YORK—First District.

Henry W. Hodge, a well known engineer of New York City, became a member of the Public Service Commission for the First District during the last week. On January 3, 1916, Commissioner R. C. Wood resigned, and Governor Whitman appointed Mr. Hodge in his place. Mr. Wood was appointed by former Governor Glynn in 1914 to a term that will expire February 1, 1919. Mr. Hodge was appointed to fill out the unexpired part of the term.

The Commission has prepared a summary of the accidents reported each month by the light and power companies of the First District, for the year 1915 as compared with the previous year. The total number of such accidents was 418 in 1915, an increase of five over the previous year. The number of serious injuries was 420 as against 413 in 1914, but the number killed was only one as compared with 13 in the previous year.

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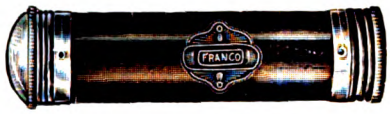
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Non-Short-Circuiting, Fiber-Covered Flashlight.

Manufacturers of flashlights for many years have been trying to get a fiber-covered flashlight that would not short-circuit when brought into contact with metal. The advantages of a non-short-circuiting flashlight to motorists, engineers, mechanics, and everybody else whose work brings them into contact with metal objects, are apparent.

The Interstate Electric Novelty Company, 29 Park Place, New York City, has just been awarded letters patent on a fiber-covered, non-short-circuiting flashlight which, it is said, cannot be short-circuited under any conditions, thus



New Fiber-Covered Flashlight.

saving the battery as well as the flashlight itself. These non-short-circuiting flashlights are now being made in eight different sizes, ranging from the "baby" tubular, illustrated herewith, which can easily be slipped into the pocket, to big, powerful miners' lights for hard usage.

Parker Expansion Bolts.

In electrical construction work the problem often presents itself of securing conduit, insulators or other circuit supports to masonry or concrete walls or ceilings. To accomplish this various types of expansion bolts and anchoring devices have been on the market for some time and these permit securing the results desired in a more or less satisfactory manner. One of the difficulties connected with the use of expansion shells, however, is that they are likely to turn while the bolt or lag screw is being drawn up.

To overcome this difficulty there has been placed on the market by the Parker Supply Company, 517 West Forty-fifth Street, New York City, an extensive line of expansion bolts and screw anchors. These are made in several types to be adapted to the use of a variety of forms of lag screws

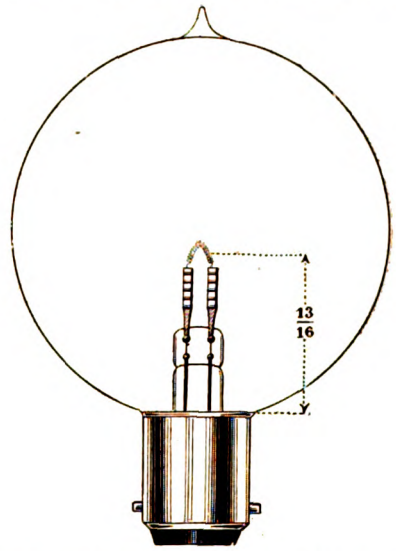
Parker Expansion Shield—Lag-Screw Type.

and also to be suitable for use with machine bolts. The characteristic feature of all of these Parker expansion devices is that each half of the expansion shield has a row of projections which are reversibly directed. This gives a sort of cam-like section to the shields, consequently when the bolt is drawn up to tighten the device and the shields attemp to turn, the projections thereon take a firm hold in the masonry or concrete hole and are wedged into the hole in the opposite direction so securely as to give an absolutely immovable grip. The two halves of the shield are held together by means of steel spring bands; these keep the parts in place until the bolt is to be expanded, but do not prevent the free and complete expansion of the shield while it is being expanded in the hole. All parts of the Parker bolts are made of a high quality of malleable iron, thus giving maximum strength and eliminating the liability to fracture. The machine-bolt type of expansion device is made for either single or double expansion and includes either one or two corresponding tapering wedges.

Jaeger Gas-Filled Lamps for Automobile Headlights.

For some years the H. J. Jaeger Company, of Hoboken, N. J., has been manufacturing gas-filled tungsten lamps for use in automobile headlights. These lamps have full-filled the requirements so satisfactorily that the company has recently found it necessary to build a large new factory at Weehawken, N. J., in order to supply the increased demand.

The company has also developed a new type of these lamps with filament of much more concentrated form than



Concentrated-Filament Gas-Filled Lamp.

has been heretofore available. This new construction meets the only objection heretofore raised against the nitrogen-filled lamp. A sectional view of the new lamp is shown in the accompanying illustration. With this new condensed form of filament a perfect focus can be obtained. These lamps all operate at an efficiency of one-half watt per candlepower and they are made in sizes ranging from 15 to 50 candlepower and voltages from 6 to 21 volts. On account of the very white color and extraordinary penetrating power of the light from these lamps, together with their very low energy consumption, they are particularly suitable for use in headlights of automobiles used in country touring or for driving on dark streets or roads.

Cochrane Metering Heater.

The combined open feed-water heater and hot-water meter, known as the "Cochrane metering heater," that was exhibited at the Panama-Pacific International Exposition

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by the Harrison Safety Boiler Works, Seventeenth Street and Allegheny Avenue, Philadelphia, Pa., was awarded the gold medal. This apparatus is designed to heat boiler-feed water by means of exhaust steam from engines, pumps, etc., and simultaneously to meter the water and record the rate of flow, and to integrate the total flow in any elapsed period. This enables the engineer or plant owner to determine how many pounds of steam are being evaporated per pound of fuel burned under the boilers, and hence to compare the different fuels, different methods of firing, etc., that are employed, thus leading to the adoption of the most efficient. It also shows the effect upon boiler efficiency of cleaning soot and scale off heating surfaces, stopping up air leaks in furnace and settings, and other improvements in operation, and furnishes the means whereby the methods of obtaining high efficiency may be discovered, standardized and maintained. The equipment is designed on the most scientific principles and is built very ruggedly, thus combining high accuracy with low maintenance.

Black-Glazed Porcelain.

In response to a demand for a porcelain with a black glaze, there has been produced by the Cook Pottery Company, Trenton, N. J., a black glaze which permits the production of porcelain articles in exact imitation of those of hard rubber. The accompanying illustration shows a telephone mouthpiece made of this new material, in which

Mouthpiece Made of Black-Glazed Porcelain.

all but the threaded end is given the black glaze. This new material has, of course, all the well known insulating properties of porcelain, is impervious to moisture and will withstand extremes of heat, particularly high temperatures, very much better than hard rubber. It is very easily kept clean and is entirely non-absorbent. Another important advantage it possesses over hard rubber is that it can be produced at a much lower cost. It is believed this new material will find many uses in the electrical arts where its properties will be appreciated.

Curve-Recording and Analyzing Devices.

Among the recent developments of instruments for the solution of engineering problems are a curve-recording device and a curve-analyzing device, known as a "Polar Oscillograph Attachment" and a "Harmonic Analyzer," respectively. These devices are extremely useful to obtain a quick and accurate analysis of any periodic wave, such as the current or voltage wave of a motor, generator, or power system.

It has been customary for a long time to regard current and voltage values as vector quantities, and use these trigonometric relations to express the various phase relations. This, however, is only correct when the waves of current or voltage are pure sine values. When these waves are distorted, large errors may result by making these assumptions. So the only positive method of solving such problems is to obtain an actual analysis of the wave by means of an adequate analyzing device, such as the harmonic analyzer previously referred to.

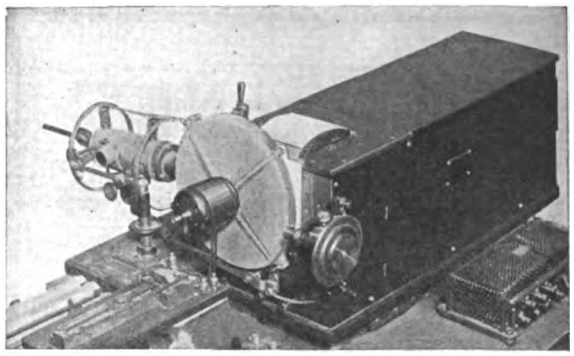

Fig. 1.—Polar Oscillograph Attachment.

Fig. 1 shows the polar oscillograph attachment used to obtain a polar oscillogram of the wave which is to be analyzed. This attachment can be used interchangeably with the regular rectangular film holder on the standard oscillograph. The oscillogram is made on a photographic film about ten inches in diameter, and is then printed on a sensitized piece of bristol board, from which a template is cut for use on the analyzer.

Fig. 2 shows the analyzer, which has been designed to give any one harmonic at a time, odd or even, as high as the fiftieth. The procedure for analyzing is extremely simple and entirely mechanical. Although the operation of the machine is based on the Fourier theorem, the actual procedure for analyzing can be performed by a person without any knowledge of the mathematics involved. Selecting the proper gears, turning the crank, and reading the planimeter are the only operations required.

This device can be applied to electrical problems of wave shapes of generators, and problems arising from the paralleling of generators, or cross currents in machines or transformer connections. The use of the analyzer, however, is

Fig. 2.—Harmonic Analyzer.

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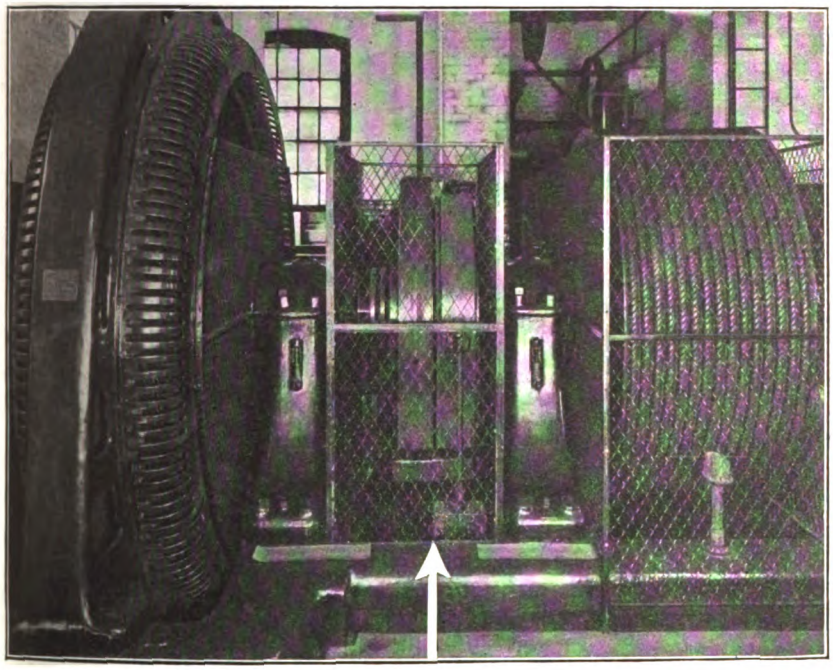
not limited to electrical problems. Any periodic wave, such as sound waves, waves of magnetic flux, torque curves of gas engines, can be analyzed and the related waves derived by simple mathematical transformation.

These new devices will prove to be valuable additions to any standard oscillograph equipment. The case and the metal parts of the analyzer are nicely finished, so that the instrument has a most attractive appearance and fits in very well with other instruments in a well-equipped laboratory. They are manufactured by the Westinghouse Electric & Manufacturing Company, and received a bronze medal at the Panama-Pacific International Exposition.

AN INTERESTING INSTALLATION OF A LARGE MAGNETIC CLUTCH-BRAKE.

By C. B. Ferguson.

In the mill room of the Boston Woven Hose & Rubber Company, the rubber mills are driven in groups from a single shaft by a 650-horsepower synchronous motor. The synchronous motor was used to raise the power-factor of the supply system. Two problems were presented; one, the safety-stop feature of every rubber mill; the other, the starting of the synchronous motor.



Magnetic Clutch-Brake on Synchronous-Motor Mill Drive.

The safety-stop feature is an important one in the rubber-mill room of today. The easy means of throwing off the driving power and applying a powerful brake has saved many hands, arms and even lives. This feature is provided by the Cutler-Hammer clutch-brake installed which is indicated by the arrow in the illustration above.

The starting of the synchronous motor is another problem. With this type of motor means of easy and gradual acceleration of a considerable load must be provided to prevent the load from being thrown on the motor too suddenly and thus pulling the motor out of step. Since the station supplying power for this synchronous motor was already loaded up to its capacity it was important to provide means for properly accelerating the motor. This means consisted of the magnetic clutch-brake referred to above.

The equipment consists of a synchrouous motor mounted on a common subbase with a rope sheave, the magnetic clutch-brake furnishing the connection between the motor and the sheave. The motor is rated at 650 horsepower, runs at 240 revolutions per minute and under normal conditions carries practically full load when the mill line is operating. Safety switches are installed in the mill room and a slack-cable switch in the motor room to stop the motor and lineshaft in case of the driving rope breaking.

The chief points of this installation are, therefore, as follows: safety in the mill room provided by safety switches which stop the mills in case of accident; gradual acceleration of the synchronous motor by means of an automatic rheostat and clutch-brake; prevention of accidents because motor can not be started by closing one of the safety switches—station operator must do it by closing panel switch; slack-cable switch in motor room automatically disengages clutch and causes brake to be applied in case the driving ropes break; stopping push-button provided on control panel for ordinary stops when clutch is simply released but brakes not applied, thus saving unnecessary wear.

With reference to details of the clutch-brake or clutch-brake accelerator, as sometimes called, it should be noted that the clutch portion consists of a solid circular steel casting, mounted on the driving or motor end of the shaft. This member of the clutch carries imbedded in its periphery a single cylindrical magnetizing coil, the terminals of which are brought out to an ordinary pair of slip rings. Mounted concentrically with the coil and the outer periphery, is supplied an adjustable friction ring so that the metal faces of the driving and driven member do not come directly in contact with each other. This also serves the purpose of providing a permanent air-gap in the magnetic circuit. The other member of the clutch, keyed to the driven or rope-pulley side of the shaft, consists of a circular steel armature secured to the hub by means of a flat circular spring plate, so that when the magnetizing coil is energized, this circular armature is drawn towards the driving member of the clutch, the motion along the shaft being accomplished by a slight dishing of the spring plate upon which it is mounted. It will be noted from the description just given of the clutch portion of this equipment, that this particular form of clutch possesses the advantage of instant disconnection in case of interruption of the magnetizing current and does not require a portion of a revolution for its disengagement. Another feature easily understood from the above description is that with this form of clutch there is no tendency for it to either release itself or to lock itself due to the mechanical forces exerted as it comes up to speed and while it is running at full speed.

Secured to the hub of the driven member is an ordinary brake pulley, over which there is carried a band brake of the locking type, automatically released by a solenoid mounted on a separate stand in proper relation to the brake beam. The clutch itself is 54 inches in diameter.

Throughout the mill room numerous safety switches are installed and these are arranged in series electrically so that the clutch will be disengaged and the brake simultaneously applied if a safety bar, one of which is provided for each mill, is tripped. In the motor room there is provided a single push-button for engaging the clutch and the clutch is energized by means of an automatic rheostat in such a way as to make it pick up the load gradually and at the same rate of speed for each start. One novel feature of the electric control system is that if the clutch is

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disengaged by the operation of any one of the safety stations located throughout the mill, as stated above, the brake is simultaneously applied. If, however, the clutch is disengaged by means of a stopping button on the motor control panel, the brake is not applied but the load is allowed to coast to rest. Consequently, the quick stop is obtained only in case of an accident. Another feature of the control system is that when the safety stations have once been tripped, they can be reset immediately, but power can not be put back on the mill line until the single starting button located on the motor control panel has been operated. A slack-cable switch is also provided so that in case of breakage of the rope drive the clutch is automatically disengaged and the brake applied.

Checking over the conditions noted in the opening paragraph it will be seen that all have been provided for, and a half year's operation since installation has been successful.

Leader Air-Supply Outfit.

Autoists like to be able to inflate their tires while buying gasoline or accessories, and the station that is best equipped and most convenient will get their business.

An economical portable air-supply outfit, which is shown in the illustration, is manufactured by the Leader Iron Works, of Decatur, Ill. The complete outfit consists of a motor, air compressor, automatic controller, air tank and fixtures.

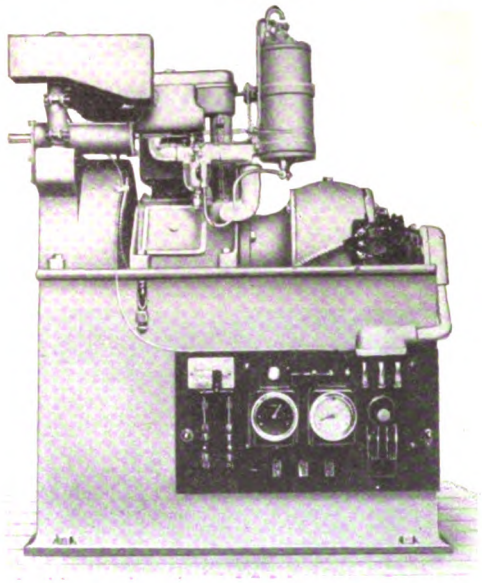
The motor is of the Westinghouse one-horsepower repulsion-induction type, having a high starting torque and low starting current. Frequent starting and stopping of the motor is eliminated by the use of a 14 by 36-inch welded air tank, which is of sufficient capacity to inflate several tires. The air pressure in the tank is maintained at a value between 110 and 150 pounds by an automatic controller on the motor. Thus air at the desired pressure is always available.

The compressor has a 2.5 by 3-inch cylinder, which is air cooled and provided with a hand unloader. Fittings for connection are furnished, as well as five-inch pressure gauge, pop valve, drain cock and other convenient accessories.

Motor-Driven Tire-Inflating Outfit.

Matthews Self-Contained Automatic Lighting Plant.

During its 20 years' experience in building the highest types of cruising motor boats, the Matthews Boat Company, Port Clinton, O., found the need for a reliable and sturdy lighting equipment suitable for the severe service aboard ship. A large number of lighting plants had been tried out for this purpose without entire success. Consequently the company's engineers



Matthews 50-Light, Full-Automatic Lighting Plant.

set about to develop a plant that would meet all of the requirements. This was done and the resulting equipment proved so satisfactory that it was decided to build it also in modified form to adapt it for country lighting and similar isolated-plant service.

These plants are built in several types, of which the one illustrated herewith is self-contained with the exception of the storage battery and is completely automatic. In the design of this type of plant it was determined to produce an equipment suitable for the farming district or rural community that would eliminate the need for electrical or mechanical knowledge, in other words, one that would enable the housewife or maid to turn on the current at any lamp or for any flatiron, cream separator, washing machine or other appliance without previously starting the engine, adjusting the apparatus and watching the storage battery. This ideal was achieved so successfully that this automatic plant provides as reliable service instantly available at all times as the average central station in the small town.

As shown in the illustration, the plant is very compactly and ruggedly built. The whole outfit is mounted on a substantial iron base about 3 feet by 2 feet in area. Driving power is obtained from a Matthews four-cycle gasoline engine that is designed for efficient, reliable and quiet operation; this engine costs nearly three times as much to build as the selling price of the types of engine usually supplied with country lighting plants. The generator is a one-kilowatt, 32-volt, General Electric multipolar type. Separately mounted is a 16-cell, 80-ampere-hour Willard storage battery of the inclosed-jar type. An automatic switchboard is mounted in the base of the generating set, which is rated as a 50-light set, assuming 20-watt tungsten lamps as the lamps to be used.

The principle of operation of the plant is both simple and ingenious. The storage battery is depended on chiefly as a regulator of voltage and as a source of current for electrically starting the engine; it also serves as current source for small currents, but only in emergency is it discharged very completely. As soon as about 15 per cent of the battery capacity has

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been discharged, the engine is automatically started through the generator acting as a motor fed from the battery. When the engine has attained full speed the generator begins charging the battery as well as supplying any load there may be on the system. When the battery is again fully charged and there is no longer load on the plant, or only a very small load, the engine is automatically shut down. From this it will be seen that the battery is always kept at or near to full charge, a condition favorable to long life and economical operation. The generator carries all loads directly, except when the small load of only a few lights is on. Voltage regulation and all features of the electrical control are entirely automatic, being carefully adjusted once for all times. The electrical part of the equipment, like the rest of the plant, is of sturdy design and not more likely to get out of order than the electric ignition, starting and lighting equipment of the modern automobile.

The same type of plant is also made of double capacity, that is two kilowatts or 100 20-watt lights. The Matthews Boat Company also makes hand-controlled plants of 50 and 100 lights rated capacity and several special marine lighting plants, both of the full automatic and hand-control types.

The Goheen Pole-Hole Digger.

In digging holes for the poles of any overhead electric lines much time is lost and useless effort expended in changing from cutting to shoveling or dirt-lifting tools or spoons. Various special digging outfits have been devised, but these are complicated and not always convenient. To overcome the disadvantages of former equipments, the Triple Tool Company, Jacksonville, Ill., has placed on the market a simple and reliable patented combination tool, known as the Goheen pole-hole digger. By easy adjustment of the blade the tool is readily converted from a straight cutting tool or spade, to a shovel or large spoon. It serves also for ditching or tunneling work, as well as hole digging.

The tool consists in the main of a straight wooden handle with ferrule, one leaf spring and a steel blade. Near the upper end of the blade is attached a case-hardened eye so constructed that it has three flat surfaces for the pressure of the spring which rests in the ferrule and bears upon this eye, thus holding the blade in various positions a few of which are illustrated. Close to the upper end of the spring the ferrule is pierced by a set-screw which is used in giving the desired tension. From this it is evident that the tool is very simple.

Goheen Pole-Hole Digger With Rectangular Scoop Blade in Three Different Adjustments of Blade Position.

Single-Phase Motor Development.

"The demand on the part of central-station operators in the past few years," says R. J. Russell, secretary of the Century Electric Company, St. Louis, Mo., "for a single-phase motor that would require less starting current than the split-phase motor, and thus make it possible to maintain good voltage regulation on secondary circuits without the installation of an abnormal amount of copper, prompted the company to commence some years ago to develop smaller sizes of Century repulsion-induction motors than hitherto manufactured.

"The beginning of the year 1915 witnessed the first real introduction of these motors to the market, and the commencement of their application in fair quantities to various classes of machinery, with the result that they are now being used in sizes of one-sixth, one-eighth and one-tenth horsepower as regular equipment by a large number of manufacturers of such apparatus as is called upon to start frequently; viz., carbonators, beer pumps, coffee-mills, house pumps, etc.

"The real advantage in their use which is found in the small Century motor is the fact that the starting torque is more than three times full-load torque, and starting current less than three times full-load current, making it possible to start so quickly the majority of the apparatus generally driven by such small motors that a fuse of such size as will properly protect the motor while running and carrying its full load is of ample size to carry the starting current. The use of ring oil bearings is another feature which is appreciated by practically all who have anything to do with such small motors.

"The radial type of commutator is used, brushes bearing on this commutator only during the period of starting. When the motor is accelerated to a speed closely approaching the full-load speed of the motor, the governor acts, taking the tension off the brushes, and short-circuiting the commutator after the manner characteristic of the larger Century motors."

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INDUSTRY ACTIVITIES

Import Sales Company, importer and manufacturer, announces its removal, on February 1, to larger quarters at 318-324 East Thirty-second Street, New York City.

Julius Andrae & Sons Company.—The annual conference of the sales organization of Julius Andrae & Sons Company was held in Milwaukee, January 7. Following a busy conference day a banquet was held at the Hotel Pfister.

General Lead Batteries Company, Chapel Street and Lister Avenue, Newark, N. J., has issued bulletin No. 15 describing Isolite storage batteries in glass jars. These are particularly suited for farm lighting and other small isolated plants, fire-alarm and burglar-alarm systems, signaling work, etc.

Diehl Manufacturing Company, Elizabeth, N. J., has moved its Chicago office to 1641 Edison Building, 72 West Adams Street. The Chicago storeroom and repair department has been moved to 730-734 West Monroe Street. These changes provide better facilities and permit taking care of the increased business of the Chicago office.

Samson Cordage Works, Boston, Mass., has sent to its many customers and friends a neat desk calendar which calls attention to its extended line of braided cord and cotton twine. Samson spot sash cord is briefly referred to; this and other Samson cords are much used for mounting street lamps and interior lamps that are to be lowered.

The Electro-Dynamic Company, maker of the well known Interpole motors, is to increase its present plant at Bayonne, N. J., by an addition which will be approximately 100 feet square. The contract has already been placed with the John W. Ferguson Company, of New York City and Paterson, N. J. The addition will be built on regular mill-construction lines with brick walls and a felt and slag roof.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued through its Automobile Department circular No. 1532-B dealing with 1916 starting, lighting and ignition equipment. The different details entering into the electrical equipment of an automobile are explained in detail; diagrams are given on the mountngs and views are shown of the equipment mounted on several different types of automobile engine.

General Radio Company, 11 Windsor Street, Cambridge, Mass., has issued catalog A dealing with Radio laboratory apparatus. Among the instruments and equipment particularly illustrated and described is the variable air condenser, a universal wave meter, sensitive high-frequency meter, standard and variable inductances, oil and air condensers, spark indicator, etc.

The Estate Stove Company, Hamilton, O., has issued catalog No. 10 on "Estate Electrics." This describes the line of electric stoves and ranges which has recently been placed on the market by the company. Several types are illustrated and their construction and operation explained in detail. The Estate company has been making stoves since 1845 and, although the electric line is new, it has been developed as the result of ripened experience in stove building.

The American Rotary Valve Company, Anderson, Ind., announces that it had discontinued the manufacture of electric motors, press drives and its present line of vacuum cleaners. The company will fill orders at present in hand and continue to provide repair service on all of these lines. This modification of the company's line is the result of unexpectedly rapid development of the business on the "Arvac" universal joint, to which the company will now devote its entire effort. The change does not involve any modification in the company's ownership or management.

Prizes for Articles on Mechanical Soot Blowers.—The Diamond Power Specialty Company, Detroit, Mich., has offered $100 in four prizes for the best articles submitted by operating and consulting engineers on the use of mechanical soot blowers in improving the economy and efficiency of power plants. Particulars regarding this contest are obtained from the company. The articles must be between 1,000 and 5,000 words in length and must be submitted before March 1.

The Doehler Die Casting Company, Brooklyn, N. Y., and Toledo, O., has placed contracts for its new Toledo factory buildings to contain 70,000 square feet of floor space, consisting of foundry, machine shops and offices. With these buildings which are to be ready for occupancy May 1, completed, this company will be in a better position to give its western patrons prompt and efficient service, which they have heretofore received from the Brooklyn plant.

The National Conduit & Cable Company, 41 Park Row, New York City, is continuing the monthly publication of its "Copper Gossip," which for many years has thrown a great deal of light on the status of the copper market both in New York and London. Pertinent comments are made on the general business outlook, which is found to be most favorable at present. Notes on copper mining activities and developments and on the exports and imports of copper, also on copper stocks, always prove of interest.

The Globe Stove & Range Company, Kokomo, Ind., has discontinued the electric stove sales office which it has maintained for some time in the Edison Building, Chicago, Ill. The entire organization, comprising both the manufacturing and sales branches of the electrical department, is now united at the home office in Kokomo. P. L. Miles, sales manager, and J. H. Risser, manager of the central-station department, have moved their headquarters to Kokomo. It is believed this change will facilitate the business of the electrical department.

The Diamond State Fibre Company through its Chicago manager, Theodore Herkert, has just secured from the Beckley-Ralston Company, of Chicago, dealers in automobile supplies, a contract for a half million speedometer gears. This is said to be one of the largest orders of its kind ever placed. The Chicago office of the Diamond State Fibre Company has exceptional facilities for turning out fiber specialties. It possesses a well equipped machine shop and claims to carry the largest stock of fiber in the West. At the present time the Chicago office has a stock of over one hundred thousand pounds of fiber. The company states that business is exceptionally good.

Spec Engineering Company, Pontiac, Mich., is calling to the attention of the owners of steam-boiler plants the manner in which its Craig system of smoke prevention eliminates the heavy smoke output at each firing, minimizes the deposit of soot on the boiler and results in decided fuel economy and improved boiler efficiency. The system is entirely automatic in action and introduces the proper mixture of steam and air to completely burn the gases distilled from the fresh coal added. The company has available the results of numerous tests to show the

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improved economy resulting from use of the Craig system, which is installed on a 30-days' trial proposition backed by a strong guarantee. The system has been approved generally by city smoke-inspection departments.

The Richardson-Phenix Company, lubrication engineer and manufacturer, Milwaukee, Wis., has recently opened a branch office at 141 Milk Street, Boston, Mass., in order to take care of its increasing business in New England. This office will be in charge of Charles E. Blake, who has had many years' experience with the company in the design and installation of power-plant lubricating systems. The Richardson-Phenix Company also announces the removal of its New York City office to 30 East Forty-second Street; E. M. May, manager of this office, now has associated with him J. J. May, who will devote his energies to the Richardson-Phenix NoKut Valve Department.

Central Electric Holds Sales Conference.—The first week in January was devoted by the Central Electric Company, of Chicago, to a general sales conference, the first one which this company has held for a number of years. Twenty-five outside salesmen devoted the entire time to a study of the company's specialties, many of which through consistent advertising in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN and other papers have acquired a national reputation. Among them are the well-known Okonite products, Alexalite indirect lighting units, Ralco indestructible plugs and receptacles, Columbia incandescent lamps, D. & W. fuses, Deltabeston wire.

Superior Electric Manufacturing Company, 2414 University Avenue S. E., Minneapolis, Minn., has issued bulletins Nos. 1 and 2 dealing with types A and B steel cabinets. These cabinets are made in a large range of sizes. Very complete data are given of the various sizes, also brief descriptions of general features. The type B cabinets listed in bulletin No. 2 are designed particularly for single-pole, double-pole and triple-pole service switches. Other tables give approximate dimensions of porcelain cutout blocks with and without switches in the branches and the necessary widths and depths of cabinets for containing the same.

Information Desired Regarding Effect of Vibration of Structures.—Recognizing that practically everyone is certain that higher speed, better work, and greater human efficiency are possible in a stable as compared with a vibrating building, but that exact data proving this fact are difficult to obtain, the Aberthaw Construction Company of Boston, is undertaking an exhaustive investigation in the effort to bring together conclusive evidence. They will greatly appreciate any suggestions or reports of experience that our readers may be able to send to them. These may have to do with any aspect of the case that will assist in the collection of facts or the reaching of conclusions.

The Bell Lumber Company, Minneapolis, Minn., has been awarded the cedar on all the tribal lands on the Odanah Indian Reservation on its bid to the Indian Department. The company had already secured all of the other timber on this reservation three years ago, and as this tribal timber covers a number of years' operation, taken together with its previous holdings on the reservation and at other points, it insures the company timber for white cedar pole operations for at least ten to twelve years to come. The company has started to operate camps on the reservation and at other points producing poles to supply its next spring and summer trade.

Ivanhoe-Regent Works of General Electric Company, Cleveland, O., has issued catalog No. 108, which is a very attractively illustrated book dealing with Regent semi-indirect bowls for decorative and commercial lighting. A very large number of designs of these bowls made in Veluria, Druid and Sudan glass are illustrated; dimension diagrams and full data for each type are given. Colored views are shown to give an idea of the proper tint and a better conception of the etching of these bowls. Much valuable information is also included in the catalog regarding the methods of suspension of semi-indirect bowls and the best spacing and mounting height, etc., thereof. Other illumination data are also included.

The Bailey Meter Company has been incorporated under the laws of Massachusetts and has opened headquarters at 141 Milk Street, Boston. The company will manufacture and sell a very complete line of recording meters and instruments for power plants and other similar uses. These instruments have been developed during the past six years in the mechanical engineering department of the Fuel Testing Company of Boston. At the head of the company is E. G. Bailey, who will devote his entire time to its interests. The Bailey meters are adapted to the accurate measurements of steam, water, air and gases under all conditions of pressure, temperature and capacity. The Bailey Meter Company is prepared to take up all problems related to the flow of fluids.

The Electric Storage Battery Company, Philadelphia, Pa., manufacturers of the "Exide" battery, the "Chloride Accumulator" and "Tudor Accumulator" and the "Ironclad-Exide" battery, announces a change in the handling of its Pacific Coast business to take effect January 1, 1916. Due to changes in the organization of Pierson, Roeding & Company, who have acted as the Electric Storage Battery Company's sales agents on the Coast since 1910, the Battery Company will hereafter conduct its business on the Coast through George R. Murphy, soliciting agent, with offices in the Rialto Building, 118 New Montgomery Street, San Francisco, Cal. The Exide Battery Depot, which was opened in San Francisco a number of years ago and where a large amount of stock is carried, will give Mr. Murphy a base of supplies that will insure prompt shipments of batteries and parts. The Electric Storage Battery Company's business on the Coast has been very satisfactory in batteries for use in electric commercial and pleasure vehicles, mine locomotives, industrial trucks, for automobile starting and lighting service and in other fields of storage battery application.

New Western Electric Year Book.—The second edition of the Western Electric Company's Year Book is out. It is known as the "Electrical Supply Year Book for 1916" and is similar to its predecessor which, it will be remembered, caused such a favorable impression in the electrical supply business when it made its appearance last year. The current book contains the practice of a simple series of list prices upon which a basic discount applies, such a discount indicating to the holder of the catalog his approximate price for all of the articles listed. This method of pricing was received enthusiastically by the trade. The 1916 book has a stiff, light blue, artistically designed cover and differs from the 1915 issue only in that its listings are more complete and comprehensive, the number of pages being 1504 as compared with 1296 last year. Nearly 50,000 copies were printed. One feature of the present book is a section in which are listed all the sales helps that the company furnishes its agent gratuitously; herein are illustrated all these helps in reduced size, together with reference numbers by which any or all may be ordered: electrotypes, window displays, booklets and lantern slides are among the helps listed. The continuance of the year book proves the Western Electric Company's theory that a catalog issued yearly is better all around than the old catalog that made its appearance every three years, also that a simple system of list prices is far better from every angle than the old jumbled system of discounts that nobody understood. The new catalog deserves a place on every electrical supply man's shelf; its completion again establishes the Western Electric Company among the most progressive jobbing houses and manufacturers of the country.

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CURRENT ELECTRICAL NEWS

ATLANTIC STATES.

PRATTSBURG, N. Y.—Plans are being considered for electric lights and for an electric railway to Kanona and possibly to Stanley or Branchport. John Kimmel of Wayland has an option on the Kanona and Prattsburg railroad and the Town Board at special meeting granted him a franchise to operate such a railroad and furnish light and power for this village.

WAPPINGERS FALLS, N. Y.—Deering, Milliken & Company, who own the local electric railway system, are planning to make an extension to New Hamburgh at a cost of about $100,000. An electric locomotive and other equipment will be purchased.

PHILADELPHIA, PA.—Hafleigh & Company will erect a brick, concrete and steel power house. W. E. S. Dyer, Philadelphia, is the architect.

DELAWARE WATER GAP, PA.—J. P. Cope, Atlantic City, N. J., will erect a $200,000 hotel here. Plans are in progress by J. H. Vaughn, Atlantic City, N. J., architect.

PHILADELPHIA, PA.—Bids will soon be advertised for a power house at the Institution for the Feeble-Minded at Byberry, Pa. Address Dr. Krusen.

LE RAYSVILLE, PA.—An electric lighting system for the town and community, including the streets, is to be installed in the near future. H. G. Newell, corresponding secretary of the Community Welfare Association, will receive communications and proposals.

WASHINGTON, D. C.—The capacity of the Bennings steam power plant of The Potomac Electric Power Company, Washington, D. C., is to be increased by the installation of an additional 15,000 kilowatt generator. The power-plant building will be enlarged by the construction of necessary extensions to accommodate the new machinery, and a contract for the engineering and construction work has been closed with the J. G. White Engineering Corporation, of New York.

CLEARWATER, FLA.—The Tampa Clearwater & Island City Railroad Company has been incorporated with a capital of $100,000 by G. R. Smoyer, and others to build an electric railway between Clearwater and Clearwater Key, a distance of three miles.

JACKSONVILLE, FLA.—The city will enlarge its electric plant.

NORTH CENTRAL STATES.

CINCINNATI, O.—Boilers and other power and electrical equipment will be required in the construction of the proposed new home of the Business Men's Club, which will cost about $600,000. The site for the building and other details will be determined upon at an early date by the building committee.

ZANESVILLE, O.—The Public Utilities Commission has authorized the Southeastern Ohio Railway Company to issue $800,000 common stock and use the proceeds for buying the electric line running between Zanesville and Crooksville, now owned by the Southeastern Ohio Railway, Light & Power Company. The sum of $758,000 is to be paid for the property and $42,000 for improvements, according to the commission's order. The company plans to extend the line to New Lexington.

SPRINGFIELD, O.—The power capacity of the Springfield Light, Heat & Power Company is to be increased from 600 to 1,300 horsepower, Manager Wears Parsons announcing that work will begin in March. Increased facilities will be provided in every department. L.

ZANESVILLE, O.—The Southeastern Ohio Railway Company, organized to take over the plant and business of the Southeastern Ohio Railway, Light & Power Company, is considering various extensions, including an additional power plant. The company operates a line of electric railway and furnishes current for various purposes to towns along its line.

SALEM, O.—The Salem Lighting Company, with a capital stock of $15,000, will construct a power and distributing plant, according to plans recently announced by its organizers.

DRESDEN, O.—The Dresden Electric Light Company, incorporated with a capital stock of $10,000, is preparing to equip a plant.

DAYTON, O.—At a meeting of the board of directors of the Dayton Power & Light Company, it was decided to spend $1,000,000 in the construction of a power plant at Miller's Ford, south of the city. The new power house will have a maximum capacity of 165,000 horsepower. Increased service will be furnished in Dayton, Xenia, Piqua, and other neighboring cities.

SOUTH BEND, IND.—Mayor F. W. Keller has appointed a committee to investigate the plausibility of a municipal lighting plant.

COLUMBIA CITY, IND.—Engineer Charles Brossman, of Indianapolis, has prepared plans and specifications for a new unit to be installed in the local power plant. Address city clerk.

INDIANAPOLIS, IND.—The Public Service Commission has approved the petition of the Merchants' Heat & Light Company to issue $70,000 in common stock and $280,000 in bonds. The company will use the money to pay for improvements. Address Eleazor Darrow, general manager, 33 South Meridian Street.

BYRON, ILL.—The Byron Electric Light & Power Company has been incorporated with a capital stock of $10,000 to furnish electric light and power. William H. Vanston, Thomas M. Henck and others are the incorporators.

AURORA, ILL.—The city council is considering an amendment to the 1916 appropriation ordinance providing an appropriation of $100,000 for pumping and power-plant improvements.

MACOMB, ILL.—The council has taken favorable action towards installing a number of cluster lights. Address George Allison.

WAUKEGAN, ILL.—The Wilder Tanning Company has petitioned the council to place additional electric lights. Address Mayor Pearce.

GAYLORD, MICH.—The plant of the Vanderbilt Electric Light & Power Company has been sold to Fred King, of this place. The new plant will probably be equipped with crude-oil engines and the intention is to make it a duplicate plant in order that a more efficient service can be rendered the village. Mr. King will make extensive improvements.

ADRIAN, MICH.—George F. Avis, Oren Howes, F. D. Avis and C. J. Avis, all of Hudson, Mich., announce the formation of the Southern Michigan Light & Power Company, which is to absorb the Hudson Light & Power Company and the Morenci & Fayette Light Company. The company will extend its power transmission to towns in Southern Michigan and Northern Ohio.

CASCADE, MICH.—The Cascade Electric Company, owners of water power rights at Cascade, about 1,200 horsepower, and at Alaska, near Grand Rapids, 400 horsepower, will develop this power during the coming summer.

MAUSTON, WIS.—The Railroad Commission has granted the Farmers Inter-State Telephone Company its application for a physical connection with the Mauston Electric Service Company to the village of Lyndon. The Mauston Company is ordered to construct a metal toll line and to bear the expense of this construction.

MERTON, WIS.—An electric line will be built from Rewaukee to Merton via Lake Five, Washington County, by the Milwaukee Electric Railway & Light Company. Address James D. Mortimer, Syracuse and Second Streets, Milwaukee, Wis.

MARSHALL, WIS.—The Marshall Electric Light & Power Company has been incorporated with a capital of $10,000 by R. J. Buss, J. D. Meyers and others.

HILLSBORO, WIS.—The Hillsboro & Northeastern Railway Company has increased its capital stock from $100,000 to $250,000 and will extend its electric line from Hillsboro to Richland Center.

VIRGINIA, MINN.—Plans are being considered for extending the electric lighting system to Parkville.

HAZLETON, IOWA.—H. C. Clar, manager of the Fayette Country Utilities Company of Oelwein is making arrangements for the legal publication of the notice in regard to the company extending its electric line from Oelwein to Hazleton to furnish light for that town.

ALBION, IOWA.—February 1 an election is to be held to vote on a proposal to grant to the Iowa Railway & Light Company of Marshalltown,

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and Cedar Rapids a 25-year franchise for electric light and power.

WATERLOO, IOWA.—The Citizens' Gas & Electric Company has submitted to City Council the proposition of asking for new 25-year franchise nullifying the present franchise, which expires in 10 years. The company proposes to erect a large electric power station costing $800,000. Address Austin Burt, manager.

VINTON, IOWA.—The town plans installing about April 1 two 300-kilovoltampere steam turbogenerators, also new switchboards, and new pumps for water works, to be operated in connection with lighting plant. Address W. E. Kingman, superintendent.

MANNING, IOWA.—The Manning Electric Lighting Company plans to install in March or April one 150-kilowatt, 250-volt, direct-current generator, switchboard equipment, etc. Address A. J. Rusenberg.

CUMBERLAND, IOWA.—The installation of a municipal electric light plant is under construction. Address city clerk.

LOCKBRIDGE, IOWA.—The people of this town have voted on the proposition granting an electric franchise to R. M. Burtis and associates. The current is to come from the plant of the Fairfield Public Service Company at Oakland Mills.

WELLSBURG, IOWA. — The Iowa Falls Electric Company has filed its petition with the Board of Railroad Commissioners of the State of Iowa for a franchise for the construction of a transmission line for the conducting and transmitting of electricity to be used for lighting, power and heating purposes from the town of Wellsburg, Iowa, to the town of Morrison.

CEDAR RAPIDS, IOWA. — The Iowa Falls Electric Company has increased its capital from $100,000 to $300,000. This company has purchased the Dows, Iowa, electric light plant.

MARSHALLTOWN, IOWA.—The Iowa Railway & Light Company has purchased the power plant at Zearing, owned by Belden & Son, and plans to connect the plant with a high-tension line to be built to Ames, Iowa, next summer.

THORNTON, IOWA.—The Thornton Light & Power Company has been incorporated with a capital of $10,000 by H. O. Chase and others.

WARRENSBURG, MO.—The Council favors the establishment of a municipal lighting system. Address town clerk.

DEARBORN, MO.—The proposition of granting a franchise for electric light plant has been carried. Address mayor.

ELKHART, KANS.—The Council is planning to establish a municipal lighting system. Address Edgar Roberts, city attorney.

VALLEY, NEB. — The municipal electric plant has been leased by the Central Station Engineering Company, City National Bank Building, Omaha. Improvements will be a new generator and boiler and new street lighting system, consisting of 42 series tungsten lamps.

CORTLAND, NEB.—A. J. Goodban is contemplating the installation of an electric lighting plant.

PIERRE, S. D.—A power and light company to supply electric light and power to portions of Douglas, Charles Mix, Hutchinson and Bon Homme counties is covered in the articles of incorporation filed for the South Dakota Light & Power Company, with headquarters at Armour. It is capitalized at $1,250,000 and the incorporators are E. P. Wanzer, John T. Cameron, Percy H. Munson of Armour.

MARION, S. D.—A 20-year franchise was granted to John Heib and assignees to install an electric light plant in this city.

NEWELL, S. D.—The Board of Trustees are negotiating for the installation of an electric lighting plant.

BISMARCK, N. D.—The Woodruff Electric Light & Power Company has been incorporated with a capital of $25,000 by W. G. Woodruff and others.

RYDER, N. D.—A franchise has been granted to E. E. Fredeen, for the installation of electric lighting plant.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The Louisville Home Telephone Company has announced its plans to construct a new branch exchange to serve the Highlands of Louisville. The improvement, which will be an attractive building to occupy a site in a high class residence district, will cost, together with the switchboards, conduit construction, etc., between $100,000 and $125,000. It will be equipped to take care of 2,500 lines at the outset, although the ultimate capacity will be 7,500 wires. This improvement will take care of one of the important residence districts of the city, which is growing rapidly. Conduit construction was completed last summer. G.

LOUISVILLE, KY.—The Sandy Valley Light & Power Company, L. L. Stone, manager, will build a power plant at this place. G.

MORGANFIELD, KY.—S. B. Anderson of Memphis, Tenn., and G. L. Drury of this city, propose, if right of way is granted by the court to construct and maintain an electric standard-gauge, trunk railroad between Morganfield and Uniontown, to be in operation within 12 months.

SHARON, TENN.—The citizens have voted $25,000 in bonds for an electric light and waterworks system. Address mayor.

ASHDOWN, ARK. — R. M. Warmack has purchased the Ashdown Light & Power Company, valued at $15,000. Improvements will be made.

NEWPORT, ARK.—The Newport Water, Light and Power Company will erect a three-story building, to be used for offices and demonstration rooms.

FRANCIS, OKLA.—The Francis Gas & Electric Company has been incorporated with a capital of $10,000 by James Mascho of Ada, Gus Howerton of Oklahoma City and others.

TEMPLE, TEX.—The City Water Commissioners voted to adopt electricity to replace steam for motive power at municipal waterworks pumping station. A new pump will be purchased. Address mayor.

CLAUDE, TEX.—The city is prepared to grant a franchise for electric lighting plant and waterworks. Address Board of City Development, A. Whaley, secretary Amarillo, Tex.

BEEVILLE, TEX.—The Texas Southern Electric Company plans to make improvements to include a 125-kilowatt engine and generator, etc. Address F. C. Greer, manager.

COLUMBUS, TEX.—Sam Hamburger and Leo Steiner have purchased the Columbus light plant, which will be remodeled. Service will be extended to Glidden and other nearby towns and an ice plant and cold storage will be added.

BEEVILLE, TEX.—The City Commission has under consideration the proposition of constructing a municipal electric light plant here. D.

BRYAN, TEX.—The City Council has ordered an extension of the municipal lighting system. D.

WESTERN STATES.

BILLINGS, MONT.—The proposition of replacing with a more modern lighting system the one now in use is being considered by the City Council.

SIMMS, MONT.—According to authentic reports, the Montana Power Company, maintaining head offices in Great Falls, will construct transmission lines from their main power lines at Sun River and distribute current to this and other cities in the Sun River Valley. It is understood the proposed improvements will be made as soon as weather conditions permit. O.

STERLING, COLO.—J. F. Symes and L. P. Hammond of Denver and H. L. Titus have purchased control of the Sterling Consolidated Electric Company. Improvements will be made.

SANTA FE, N. M.—F. C. Baker is preparing to install an electric plant at Ft. Sumner.

SOLOMONVILLE, ARIZ.—The City Council has appointed a committee to investigate the matter of a municipal lighting system.

NOGALES, ARIZ.—The International Gas Company is building an electric power transmission line from its central station here to Duquesne for the purpose of furnishing power to the Duquesne Mining & Reduction Company. It will also make other extensions of its power system. D.

WEST JORDAN, UTAH.—A franchise has been granted to H. S. Joseph to construct an electric railway between West Jordan and Bingham, to connect with the Salt Lake City & Utah Interurban Railway Company at West Jordan.

ARCO, IDAHO.—R. W. Ferris has been granted a franchise to install an electric light and power plant, to be completed May 1.

COEUR D'ALENE, IDAHO.—The City Council has under consideration the matter of submitting a bond issue for unicipal ownership of the water, light and telephone systems.

WENATCHEE, WASH.—The Wenatchee Valley Gas & Electric Company will construct a new 33,000-volt power line from the Dryden power plant to Wenatchee at an estimated cost of $20,000.

CATHLAMET, WASH. — James West and D. Ewart of Astoria, Ore., were here recently looking over the field with a view of installing an electric lighting system.

PORT TOWNSEND, WASH.—The City Council has taken definite steps toward acquiring the lighting and power plant owned and operated in this city by the Key City Light & Power Company. O.

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RUSTON, WASH.—The Puget Sound Traction, Light & Power Company, Tacoma, Wash., division, has been granted a franchise by the City Council of Ruston to construct electric transmission lines and to sell light and power to Ruston. The extension will be made at an early date. O.

CLE ELUM, WASH.—Providing a favorable decision on rate reductions cannot be obtained from the Northwestern Improvement Company, which supplies this city with current for lighting, the council will take immediate steps, according to reports, toward the construction of a municipal lighting and power plant. O.

FOSSIL, ORE.—The Council has been petitioned by M. Ramey for a renewal of his lighting franchise and for permission to construct a crude oil-burning plant to cost between $4,000 and $5,000. O.

SUMPTER, ORE.—It is understood the Eastern Oregon Light & Power Company will construct transmission lines into the Olive Lake district, where a new pumping station and other improvements are being added. O.

LOS ANGELES, CAL.—The Board of Harbor Commissioners will receive bids up to January 19 for the electric installation for Warehouse No. 1, the work to be done in accordance with plans and specifications on file with the harbor engineer.

SAN PEDRO, CAL.—An application for a franchise to build a steam and electric railroad from some point on the Santa Fe main line to Oatman has been filed with the Mohave County Board of Supervisors.

LOS ANGELES, CAL.—The City Engineer has been directed to prepare specifications for additional lights in the Sherman Lighting District.

SAN BERNARDINO, CAL.—Property owners have signed an agreement to pay for the installation of boulevard lights on Fourth Street between D and E, and on E Street between Third and Fifth.

NEEDLES, CAL.—The Needles Gas & Electric Company has been granted a 50-year franchise to install and operate utility systems in this city.

FINANCIAL NOTES.

Baltimore financial districts learned that the Consolidated Gas, Electric Light & Power Company has arranged to issue quarterly statements of earnings, the first report to be issued in January showing the revenues of the corporation for the last quarter of the year ended in December. The fact that the company would make public its earnings quarterly was revealed through the application to list the common stock of the corporation on the New York Stock Exchange. Heretofore, the company has only issued annual reports covering operations ports covering operations for the fiscal for the fiscal year. The last annual report of the company made its appearance in October, which covered the company's business for the fiscal year ended June 30 last. It is understood that the earnings have shown steady increases each month since the new fiscal year was ushered in, and the report about to be issued will show what progress the company has made for the last three months as compared with the corresponding period of 1914.

Dividends.

	Term	Rate	Payable
Am. Lt. & Trac. com.	Q	2.5%	Feb. 1
Am. Lt. & Trac. com.	—	2.5%	Feb. 1
Am. Lt. & Trac. pf.	Q	1.5%	Feb. 1
Brooklyn City R. R.	Q	2 %	Jan. 15
Commonwealth Edison	Q	2 %	Feb. 1
Com. Pw., Ry. & Lt. pf.	Q	1.5%	Feb. 1
Com. Pw., Ry. & Lt. com.	Q	1 %	Feb. 1
Edison Co. of Boston	Q	3 %	Feb. 1
Puget Sound Trac., Lt. & Pw. pf.	Q	0.75%	Jan. 15
United Rys. & Elec., Balti. com.	Q	1 %	Jan. 15
Winnipeg Elec. Ry.	Q	2 %	——

Reports of Earnings.

DETROIT UNITED RAILWAY SYSTEM.

	1915	1914
November gross	$ 1,145,361	$ 994,244
Net earnings	315,312	265,761
Total income	344,990	288,741
Surplus after charges and taxation	154,228	106,466
Eleven months' gross	12,041,366	11,250,114
Net earnings	3,529,871	3,277,000
Total income	3,791,366	3,529,723
Surplus after charges and taxation	1,740,625	1,540,957

PACIFIC LIGHT & POWER CORPORATION.

	1915	1914
November gross	$ 250,389	$ 236,666
Net after taxes	164,638	153,104
Total income	175,344	160,462
Surplus after charges	67,802	48,178
Eleven months' gross	2,668,047	2,429,831
Net after taxes	1,776,883	1,482,656
Total income	1,889,749	1,635,692
Surplus after charges	707,485	483,227

COLUMBUS RAILWAY, POWER & LIGHT.

	1915	1914
November gross	$ 277,008	$ 261,656
Net after taxes	122,049	111,199
Surplus after charges	80,852	72,029
Twelve months' gross	3,091,422	3,063,753
Net after taxes	1,258,085	1,159,943
Surplus after charges	782,943	689,635
Balance after preferred dividends	497,820	404,512

NORTHERN OHIO TRACTION & LIGHT.

	1915	1914
November gross	$ 341,974	$ 286,732
Net after taxes	14,911	100,723
Surplus after charges	87,670	50,463
Balance after preferred dividends	70,761	35,358
Eleven months' gross	3,510,934	3,319,704
Net after taxes	1,355,889	1,279,691
Surplus after charges	780,620	723,336
Balance after preferred dividends	600,226	557,683

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 10	Jan. 3
American Tel. & Tel. (New York)	127⅞	*127¼
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	247	246¾
Electric Storage Battery common (Philadelphia)	66½	66½
Electric Storage Battery preferred (Philadelphia)	66½	66½
General Electric (New York)	173⅞	174½
Kings County Electric (New York)	128	126
Massachusetts Electric common (Boston)	5½	5½
Massachusetts Electric preferred (Boston)	34	34
National Carbon common (Chicago)	165	165
National Carbon preferred (Chicago)	121	121
New England Telephone (Boston)	132	132
Philadelphia Electric (Philadelphia)	28⅝	28⅝
Postal Telegraph and Cables common (New York)	78½	78½
Postal Telegraph and Cables preferred (New York)	66¼	65½
Western Union (New York)	88⅛	87¾
Westinghouse common (New York)	68	*80
Westinghouse preferred (New York)	77	*69¾

*Ex-dividends.

PERSONAL MENTION.

MR. CHARLES L. BENJAMIN, secretary of Klaw-Van Pietersom-Dunlap, Inc., Milwaukee, Wis., formerly advertising manager of Cutler-Hammer Manufacturing Company, delivered a notable address on Monday evening, January 10, before the Chicago Trade Press Association. Mr. Benjamin spoke upon the subject of improving the service of business papers, and drew from his rich experience as editor, advertising manager and publicity counselor many splendid suggestions for increasing the value of the business journal to the reader and the advertiser. Earlier in the day Mr. Benjamin was the guest of the Advertising Association of Chicago at luncheon, when he made a brief address on the influence of the advertising club movement in the promotion of business.

MR. J. HARRY PIEPER, of the Southern California Edison Company, was presented with a gold watch, chain and knife on the recent occasion of his retirement as president of the Los Angeles Advertising Club. The presents, contributions for which were received from every member of the organization, were made in appreciation of his work during the past year, which has added largely to the success of the culb. Mr. Pieper is Reigning Comus, The Jovian Order, Los Angeles.

MR. F. H. GOLDING, for the past two years general manager of Atlantic City Electric Company, Atlantic City, N. J., and previous to that for a number of years general manager of the Rockford (Ill.) Electric Company has been appointed general manager of the Canton (O.) Electric Company, succeeding Mr. W. C. Anderson, late vice-president and general manager of that company.

OBITUARY.

MRS. JULIA M. BENNETT, mother of Ell C. Bennett, secretary of the Jovian Order, one of Missouri's foremost women journalists, died in St. Louis on December 26, 1915. Mrs. Bennett, who was 73 years old, was for six years a member of the St. Louis *Republic* staff, and later editor and proprietor of the Hannibal-Missouri *Courier*. Mrs. Bennett was born in Belleville, Ill., August 31, 1842. In addition to her editorial work she was a prolific contributor of both prose and poetry to the leading magazines of the country for nearly half a century. In addition to Ell C., who is well known in the electrical industry, she is survived by a daughter, Mrs. Fred H. Behring, and two others sons, Robert W. Bennett, of St. Louis, and A. R. Afflect, of Milwaukee. Mrs. Bennett was married twice, her first husband being Charles D. Afflect, a founder of St. Louis, who died many years ago. Mr. Bennett died in St. Louis several years ago.

MR. W. C. ANDERSON, manager of the Canton Electric Company, died at Canton, O., on December 23 after an illness of seven days. Mr. Anderson was born November 12, 1865, at Mill Creek, Pa. As a boy he started to work for the West Hoboken, N. J., Electric Company, and continued with that concern for 15 years before coming to Canton as manager of the Canton Heat, Light & Power Company, which later became the Canton Electric Company. He did much to build up the present Canton Electric Company, a subsidiary of the American Gas & Electric Company, a firm with which he had been connected

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for fifteen years. During that time he had greatly enlarged the business of the concern, and in addition to building a new power plant and a new system for city distribution, Mr. Anderson took the first step in the move for the erection of a new power station along

W. C. Anderson.

the Ohio River to feed the Canton district.

He was second vice-president and a director of the Canton Chamber of Commerce. A few years ago he was president and before that vice-president of the Ohio Electric Light Association. He was a member of the Rotary Club, Canton Club, Lakeside Country Club, Elks, Y. M. C. A., and McKinley lodge, A. F. & A. M. Mr. Anderson was married 22 years ago, and is survived by his wife, one son and one daughter

MR. O. T. TROOIEN of Brookings, S. D., who died recently, at the age of 35, attracted considerable attention by his thesis on "Steam Engine Investigations," which was written at the University of Wisconsin and which is included in many mechanical engineering handbooks. The illness which caused his death was contracted while he was employed as an engineer in the construction of the Pennsylvania Hudson River terminals.

MR. C. J. WOLLASTON, known for his pioneer work in submarine telegraphy, died recently, aged 95 years.

DATES AHEAD.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, January 17-19. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Minnesota Electrical Contractors' Association. Next meeting, St. Paul, Minn., January 20. Secretary, G. M. Jones, 14 Seventh Street North, Minneapolis, Minn.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, January 25-27. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

Electrical Contractors' Association of the State of Illinois. Semi-annual convention, Hotel Sherman, Chicago, Ill., January 28 and 29. Secretaary, M. Blumenthal, 179 West Washington Street, Chicago, Ill.

American Electric Railway Association. Midyear meeting, Congress Hotel, Chicago, Ill., February 4. Secretary, E. R. Burritt, 8 West Fortieth Street, New York City.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Detroit, Mich., February 15-17. Secretary, F. Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

Record of Electrical Patents

Issued by the United States Patent Office, January 4, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,166,426. Electrical Testing Standard. C. B. Beck and J. M. Beck, Philadelphia, Pa. Resistance standard.

1,166,432. Conduit for Electric Wires. R. S. Case, Unionville, Conn. Flexible conduit.

1,166,441, 1,166,442 and 1,166,443. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Newark, N. J. First patent: Circuit regulator may be made inoperative without interfering with circuit. Second patent: Voltage and current regulation of axle-drivers, car-lighting generator. Third patent: In storage battery, axle-driven generator system.

1,166,464. Method of Maintaining the Efficiency of Metallic-Filament Lamps. A. J. Leibmann, assignor to N. Hofheimer, New York, N. Y. Manner of treating tungsten filaments.

1,166,466. Automatic Telephone System. A. E. Lundell, assignor to Western Electric Co., New York, N. Y. Semi-automatic system.

1,166,504. Typographical Composing Machine. H. M. Webster, Chicago, Ill. Electrically controlled machine for successively photographing characters on a sheet.

1,166,517. Distant Accounting Mechanism. M. M. Goldberg, assignor to National Cash Register Co., Dayton, O. Electro-magnetically controlled.

1,166,524. Process of Purifying Electrolytic Chlorin. U. Ishikawa, Tokyo, Japan. Process of removing hydrogen.

1,166,526. Electrically-Operated Saw. F. Kazlow, Schenectady, N. Y. Motor and saw suspended and laterally guided.

1,166,582. Wireless Apparatus for Producing and Transmitting Musical Sounds. G. Desilets, Nicolet, Quebec, Can. Controlling keys produce sparks of different frequencies.

1,166,596. Speed Indicating and Recording Apparatus of the Periodic Counter Type. F. G. L. Johnson, Chelsea, London, Eng. Electromagnetically controlled.

1,166,605. Automatic Electric Winding Clock. U. S. Kreider, Arcanum, O. Contact mechanism for closing winding circuit.

1,166,611. Magnetic Sun-Dial. J. H. L. Lund, Christiania, Norway. Glass cover of compass case has non-transparent line for throwing shadow.

1,166,617. Holder for Trolley-Poles. H. E. Mattox, Sherman, Cal. Structure on car roof.

1,166,618. Method of Making Perforated Music-Sheets. P. J. Meahl, Summit, N. J. Making of master copy for use in electrical duplicating machines.

1,166,620. Telephone Calling Mechanism and System. J. H. Melvin, assignor to Automatic Electric Co., Chicago, Ill. Rotary impulse transmitter.

1,166,624. Alarm Device for Valves. J. D. Nelson, Cincinnati, O. Alarm circuit controlled by position of valve through clock mechanism.

1,166,637. Collector for Electric Traction. R. C. Sayer, Redland, Eng. Two-conductor system.

1,166,645. Lock-Out Party-Line Telephone System. B. D. Willis, assignor to Automatic Electric Co. Arrangement of relays for locking out other subscribers when line is busy.

1,166,648. Electric Welding-Machine. C. M. Agnew, Milwaukee, Wis. Arrangement of work holders and automatic control of circuit by clamping lever.

1,166,650. Automatic Circuit-Breaker. C. C. Badeau, assignor to General Electric Co., Schenectady, N. Y. Laminated brush has stiff leaf acting as stop.

1,166,679. Safety Device for Conveyors. A. E. Handy, assignor to Otis Elevator Co., Jersey City, N. J. Electrically operated buffer device prevents running away of inclined, electrically driven, reversible conveyor.

1,166,682. Electromagnetic Separator. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Arrangement of magnetic elements in separator pulley.

1,166,685. Automobile-Headlight. W. W. Holland and G. H. Snyder, Baltimore, Md. Arrangement of reflectors.

1,166, 699. Alternating Current Magnet. W. D. Lutz, assignor to Otis Elevator Co., Jersey City, N. J. Electromagnet immersed in oil with arrangement for having dash-pot effect on plunger.

1,166,704. Mechanism for Operating a Typewriter from a Calculating Machine. J. F. Mays, assignor to Mays Accounting Machine Co., Asheville, N. C. Electromagnetic operating connections formed by placing the machines side by side.

1,166,706. Electromagnet. T. W. Morgan, assignor to W. W. Marsh, Waterloo, Iowa. Core structure.

1,166,752. Ball-Joint for Lamp Supports and the Like. T. D. Finizio, assignor to Kurtz Electrical Co., New York, N. Y. For securing lamp socket to end of tubular support.

1,166,753. Bracket for Electric Lamps and the Like. T. D. Finizio, assignor to Kurtz Electrical Co. Comprises special arrangement of conductors and reel therefor.

1,166,765. Apparatus for Indicating at a Distance the Speed of Shafts or the Like. P. Kaminski, assignor to Siemens & Halske, A. G., Berlin, Germany. Synchronous motor element of indicator moves with armature of generator displaced, according to speed of shaft with which it is connected through magnetic coupling.

1,166,792. Evacuation Process. H. C. Snook, Cynwyd, Pa. Manner of exhausting bulbs, etc.

1,166,797. Photographic-Plate Holder for Use with X-Rays. G. W. White, Haverford, Pa. Details of holder structure.

1,166,815. Electric-Lamp Fixture. O. E. Cook, assignor to Cluett, Peabody & Co., Troy, N. Y. Combined lamp support and spool stand for sewing machine tables.

1,166,826. Rail-Joint Bond. H. Ethridge, Zelienople, Pa. Beneath rails with terminals embracing and brazed to bases.

1,166,852. Phonograph System for Revolving Auditorium. L. E. Myers, Chicago, Ill. Announcements by phonograph telephonically transmitted to series of cars on endless track.

1,166,871. Dry Battery-Cell. H. W. and H. Olaneta, Brooklyn, N. Y. Manner of assembling.

1,166,878. Lighting-Fixture. H. C. Adam, St. Louis, Mo. Manner of supporting bowl for indirect and semi-indirect lighting.

1,166,892. Apparatus for Producing High-Frequency Oscillations. R. A. Fessenden, assignor to S. M. Kintner, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. One of spark-gap electrodes is disk moving at high frequency to prevent arcing.

1,166,893. Method for Producing High-Frequency Oscillations. R. A. Fessenden, assignor to S .M. Kintner, and H. M. Barrett. One of spark-gap electrodes rapidly moved, whereby discharge takes place on

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continually cooled surface at every alteration of current.

1,166,898. Frog for Trolley Wires. C. E. Gierding, assignor to The Ohio Brass Co., Mansfield, Ohio. Details of cast structure.

1,166,908. Globe-Holder. E. K. Hill, assignor to A. & W. Electric Sign Co., Cleveland, O. Telescoped over incandescent bulb, is held by wire cage between bulb and globe.

1,166,912. Trolley-Wire Apparatus. W. H. Kempton, assignor to Ohio Brass Co., Mansfield, O. Details of trolley wire frog.

1,166,915. Railway Signaling. C. H. Lay, assignor to Union Switch & Signal Co., Swissvale, Pa. Block system having manually and automatically operated stop.

1,166,919. Electro-Traction-Control System. S. D. McCaleb, Louisville, Ky. Protects from head-on or rear-end collisions on single track electric road with turnouts.

1,166,923. Commutator Brush. G. S. Neeley, St. Louis, Mo., assignor of one-half to T. O. Moloney, St. Louis, Mo. Spring-pressed, pivoted brush roller on shaft bears against interior of commutator.

1,166,925. Apparatus for Recording and Reproducing Sound. F. S. Ober, New York, N. Y. For manipulating magnetized wire records.

1,166,928. Insulator-Supporting Bracket. C. L. Pierce, Jr., Pittsburgh, Pa. For attachment to pole.

1,166,930. Telescopic Combined Portable Flash-Light and Writing-Pad. J. A. Petrie, Westville, Conn. Telescopic cover for flash-light has transparent writing-plate.

1,166,948. Winding Machine. C. R. Underhill, assignor to Acme Wire Co., New Haven, Conn. Winding mandrel with regulation of speed and tension of strand.

1,166,950. Electrical Hot Water Apparatus. J. von Hantzel, New York, N. Y. Compact attachment for faucets; heats by passing current through water.

1,166,951. Resonating Relay. H. V. Kramer and G. Knapp, Edgbaston, Birmington, Eng. For operation by feeble alternating currents to establish local circuit.

1,166,974. Machine-Tool Control. A. L. DeLeeuw, assignor to Cincinnati Milling Machine Co., Oakley, Cincinnati, O. Electric control of milling machines, etc.

1,166,979. Stretching Device for Driving Chains from Magnetos or Lighting Dynamos in Internal Combustion Engine. H. Gallet, assignor to Establissements De Dion-Bouton, Puteaux, France. Magneto supporting bracket adjustably pivoted to engine.

1,167,020. Magnetic Display Device. W. G. Reuter, Cincinnati, O. Mechanism on advertising device for moving magnet beneath table; follower on table traces magnet movement.

1,167,026. Electric Furnace. F. T. Snyder, Oak Park, Ill. Relates to water cooling and electrode-supporting crane in tilting furnace. (See cut.)

1,167,034. Advertising-Sign. A. E. Whitcomb, Rochester, N. Y. Opaque sign element with arrangement of lights, prism glasses, etc.

1,167,037. Socket-Shell. L. W. Andersen, Waterbury, Conn. Special structure of cap secured to shell by clamping ring.

1,167,038. Circuit Controller Switch and Casing Therefor. V. G. Apple, assignor to Apple Electric Co., Dayton, O. Concentric controller drums covered by hood and one of the drums has removable handle which disables locking means for hood and other controller.

1,167,039. Electric Conduit Fitting and Electrical Appliance. C. H. Bissell and D. C. Gidley, assignors to Crouse-Hinds Co., Syracuse, N. Y. Body receiving conduit ends has opening at side and resilient supporting arms into which socket may be snapped.

1,167,041 and 1,167,042. Insulator Support. R. C. Boozer, assignor to Joslyn Mfg. & Supply Co., Chicago, Ill. First patent: Threaded pin split axially and secured to channeled post. Second patent: Special form of pin supporting arm pole attachment.

1,167,045. Electrical Operating and Indicating Means. H. E. Cade and W. F. Cochrane, assignors to Pioneer Smoke Indicator Co., Wilmington, Del. For indicating density of smoke in stack.

1,167,053. Telephone System. A. H. Dyson, assignor to Western Electric Co., New York, N. Y. Automatic system; arrangement of selector relays, subscriber's interrupter, etc.

1,167,067. Electromagnetic Device. R. N. Hill, assignor to Western Electric Co. Details of electromagnet having pivoted armature moving in plane transverse to coil axes.

1,167,085. Automatic Door-Releasing Device. C. E. Lindig, New York, N. Y. Circuit of release controlled by spring motor set in operation by ringing call bell.

1,167,087. Magnetic Tracking Device. F. G. Lynde, assignor to Lauter Co., Newark, N. J. For player piano; magnet draws fingers controlling music sheet shift against sides of sheet.

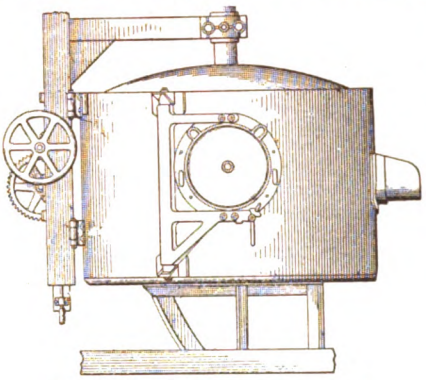
1,167,095. Electric Heater. J. B. Murray, Brooklyn, N. Y. Manner of supporting wire resistor in containing box.

1,167,115. Signal for Automobiles. H. Rose, Shreveport, La. Lamp carrying arm extensible from or retractible in a casing and controls circuit of audible signal.

1,167,119. Buffer Machine for Alternating Current Systems. A. Scherbius, assignor to General Electric Co. Fly wheel arrangement for equalizing load on system of distribution.

1,167,125. Method of Manufacturing Strain Insulators. T. Sloper, Devizes, Eng. Details of making from rubbered thread.

1,167,132. Attachment for Calculating Machines. M. Teetor, assignor to Teetor Co., Des Moines, Ia. Switch for driving electric motor operated by treadle through



No. 1,167,026.—Electric Furnace.

fluid cylinder connection which retards operation of switch on release of treadle.

1,167,138. Block System Switchboard. R. L. Turk, Minneapolis, Kans. Structure of connecting plugs, contact plate, etc.

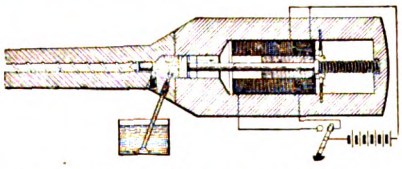
1,167,139. Engine for the Propulsion of Vessels. J. Williams, Canfield, Ohio. Particular arrangement of spark plug in special engine for direct connection to reciprocating propeller.

1,167,157. Maximum Indicator. C. G. Durfee, assignor to General Electric Co. Details of apparatus comprising non-return pointer actuated from rotating meter shaft.

1,167,158. Method of and Apparatus for Generating Power. W. L. R. Emmet, assignor to General Electric Co. Heat converted into electrical energy through medium of mercury vapor.

1,167,163. Coherer. C. F. Frank, assignor to General Electric Co. Special tube has magnetically controlled particles between electrodes.

1,167,176. Smelting of Ores and Apparatus Therefor. F. W. Highfield, Caversham, Eng. Furnace for reduction of



No. 1,167,178.—Electrohydraulic Gun.

complex sulfied ores has second class conductors molded on lining for heating charge.

1,167,178. Electrohydraulic Gun. R. C. Hill, Memphis, Tenn. Electromagnetically operated piston forces out projectile by hydraulic pressure. (See cut.)

1,167,185. Telephone-Protector. O. W. Kurth, Berlin, N. D. Combined heat coil and switch.

1,167,190. Bath Apparatus. W. Lippincott, Kalispell, Mont., assignor of one-half to J. K. Lang, Kalispell, Mont. Portable tank has cold-water compartment and electrically heated hot-water compartment.

1,167,208. Insulator. W. Oppelt, Metuchen, N. J., assignor of one-third to H. K. Gamber, Harrisburg, Pa. Two-part, pin type grips wire.

1,167,232. Attachment-Plug. S. Trood, assignor to Bryant Electric Co., Bridgeport, Conn. Details of swiveling plug.

1,167,247. System and Apparatus of Automatic Elevation and Lateral Direction of One or More Guns. F. Andersen, Haaogen, near Tonsber, Norway. Guns follow sighting telescope, being related through synchronous motors.

1,167,256. Vibrator. C. Bergman, Los Angeles, Cal. Details of massage instrument comprising electromagnetic vibrator.

1,167,266. Music-Lyre. F. A. Bua, Lodi, N. J. Lighting arrangement for music rack.

1,167,294. Railway Block-Signaling System. W. Grunow, New York, N. Y. Particular electromagnetic operating means for danger and permissive signals.

1,167,304. Automatic Lighting Attachment for Phonograph Cabinets. F. B. Johnson, Detroit, Mich. Special mounting of lamp having circuit controlled by cover.

1,167,308. Signaling Device. N. J. Mandelbaum, New York, N. Y. For automobiles; comprises adjustable signs in electric lighted casing.

1,167,309. Lubricated Bearing for Electric Fans. G. C. Marx, assignor to Diehl Mfg. Co., Elizabeth, N. J. For vertical shaft of ceiling fan.

1,167,310. Interrupter Mechanism for Ignition Dynamos. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Separate unit comprising condenser.

1,167,314. Automatic Photographing Apparatus. G. N. Pifer, assignor to Auto Portrait Co., Cleveland, O. Electrically operated.

1,167,318. Magnetic Latch. F. A. Schoenle, Buffalo, N. Y. Pivoted latch thrown into securing and released positions by two sets of electromagnets.

1,167,325. Combined Central-Energy Telephone and Watchman's Clock System. L. Airhart, West Reading, Pa., assignor of one-half to The Textile Machine Works, Wyomissing, Pa. Watchman's clock device thrown in operative relation to telephone operated signal relay by operation of signal cut-out switch.

1,167,329. Folding Machine. W. J. Beattie, assignor to Beattie Mfg. Co., Cohoes, N. Y. Folding devices electromagnetically operated.

1,167,344. Automatic Organ. M. C. Beman and F. A. Pilcher, assignors to Beman Symphonie Organ Co., Binghamton, N. Y. Stops electrically controlled by tracker bar.

1,167,366. Dynamo-Electric Machinery. R. A. Fessenden, assignor to Submarine Signal Co., Boston, Mass. Oscillating dynamo.

1,167,368. Head Support for Telephone Receivers. C. A. Randall, assignor to F. G. Davison, Boston, Mass. Receivers adjustable on head band.

1,167,370. Rail-Bond. J. Lindley, Providence, R. I., assignor of one-half to J. H. Lindley, Providence, R. I. Details of plate structure.

Reissue. 14,040. Metallic Cross-Arm. L. L. Crabtree and T. C. Ripley, Sulphur Springs, Texas. Original number 1,047,176. Dec. 17, 1912. Structural details of pin supporting arm.

Reissue. 14,041. Rear-End Signal for Vehicles. C. F. Marston, Cedarhurst, N. Y. Original No. 1,095,902. May 5, 1914. Electrically operated direction indicator controlled by switches associated with vehicle control foot pedal.

Patents Expired.

The following United States electrical patents expired on January 10, 1916:

617,314. Telephone. W. E. Byrns, Adams, Ind.

617,325. Railway Signal System. F. C. Esmond, New York, N. Y.

617,375. Electrical Resistance. J. F. H. Voight and J. A. Haeffner, Bockenheim, Germany.

617,381. Electric Transformer. D. H. Wilson, Chicago, Ill.

617,382. Telephone System. D. H. Wilson.

617,418. Electrical Measuring Instrument. G. T. Hanchett and F. B. Sage, Hackensack, N. Y.

617,433. Telephone. T. Berdell, Summit, N. J.

617,503. Circuit-Breaker. P. R. Goldey, Philadelphia, Pa.

617,526. Apparatus for Electrodeposition of Metals. E. Emerson, Buffalo, N. Y.

617,540. Electric Signal. C. A. Parrish, Jackson, Mich.

617,543. Electrotherapeutic and Massage Apparatus. O. Schneider, New York, N. Y.

617,546. Controlling Electric Motors and Trains. E. Thomson, Swampscott, Mass.

617,598. Automatic Regulator. G. S. Neeley, Pacific, Mo.

617,601. System of Control for Electric Motors and Railway Trains. W. B. Potter, Schenectady, N. Y.

617,608. Electrical Cutout. A. P. Seymour, Syracuse, N. Y.

617,621. Electric Headlight Lamp. H. P. Wellman, Ashland, Ky.

617,664. Automatic Alarm Mechanism for Electric Motors. R. W. Taylor, Richmond, Va.

617,691 and 617,692. Telephone Switchboard. J. M. Overshiner, Elwood, Ind.

617,702. Annunciator-Drop Device. W. O. Meissner, Chicago, Ill.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

TENDENCIES IN LARGE GENERATING UNITS.

A few years ago an electrical generating unit of 10,000 kilowatts was regarded as extremely large and one does not have to go back a great many years to find a 5,000-kilowatt unit the largest in operation. The first mentioned unit was, however, soon followed by one having a capacity of 20,000 kilowatts and in recent years the increase quickly stepped up to 30,000 and 35,000 kilowatts, the latter representing the largest unit which is now in operation anywhere in the world. Consideration is being given, however, to units as large as 50,000 kilowatts and it is not unlikely that a machine of this rating will become a realization in the near future. It must be remembered, however, that better steam consumption can be secured by an arrangement utilizing two machines running at different speeds and using in succession the same steam flow. A combination of two turbine generating units of this type aggregating in capacity 47,000 kilowatts is already under construction.

The possibilities of short-circuits in machines of such large capacities require very serious consideration and the greatest protection which can be secured must be provided. The armature reaction is run as high as is feasible and the coils are sunk deep in the slots. The result is a large internal reactance in the generator and this tends to reduce the instantaneous current in case of short-circuit. Means must also be taken to secure the stator coils, so they will not be distorted in case a short-circuit should occur.

In connection with the electrification of steam railroads, there has been a demand for large single-phase turbogenerators operating at 25 cycles. In spite of the difficult problem of building a machine of large rating with two poles and supplying suitable conducting material in the rotor to damp out the pulsation of flux which arises from the pulsation of armature reaction, a number of such machines of large capacity have been constructed. Among these are the machines supplying the Norfolk and Western Railway, which has an electrified section over the mountains at Bluefield, W. Va. The largest units of this type which have yet been constructed are those which were installed last fall by the New York Edison Company for supplying power to the western end of the New York, New Haven and Hartford Railroad. These units are really 20,000-kilowatt, three-phase machines, but single-phase current is used from them. The single-phase capacity of each of the two units, operating at 70-per-cent power-factor, is 14,300 kilovolt-amperes. As the size of the generator increases it becomes an exceedingly difficult matter to laminate conductors in the stator sufficiently well to prevent excessive loss from the eddy currents.

The designers of large machines have had a number of difficult problems to work out in this connection, and those who are unfamiliar with developments in this line will hardly realize or properly appraise the genius of the men who have been responsible for these developments.

ELECTROLYSIS FROM STRAY CURRENTS.

The electrolysis of underground metal structures, such as pipe systems and cable sheaths, has led to serious damage in many cases, and greater trouble seems to have been experienced in this country than elsewhere from this cause. The trouble has been attributed largely to the use in this country very generally of the overhead trolley with direct current for street-railway propulsion, and the lack of measures for preventing the return currents, which are supposed to flow to the power house through the tracks, from taking a path through the earth or conducting bodies embedded in it. For several years the Bureau of Standards has been making a study of this problem and its officials have been called upon to make investigations and give advice in many cities where trouble has been encountered. Several publications have been issued by the Bureau on different phases of this subject, and another has been lately issued summarizing the entire subject of electrolysis and its mitigation.

The conclusions given in this report are worthy of consideration in detail by electric utilities and others concerned with such cases of electrolysis. The study of the subject has been extensive and the conclusions reached are based upon observations in a large number of cases, experimental investigations carried on at the laboratories of the Bureau, and an exhaustive study of previous publications concerned with this important subject.

Of the various remedies which have been proposed for electrolysis mitigation it is found that few can be depended upon to give satisfactory results and that none can be used indiscriminately if the best results are to be secured. The use of pipe coatings, such as paint or wrappings, in protecting a metal structure, is found not to be dependable in giving protection. This practice is likely to concentrate electrolytic action at particular points where it may reach serious proportions. Wrappings have been found better than paint for this purpose, but it is recommended that this remedy be applied only in areas where the current is entering the pipes, commonly designated as negative areas.

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The insulation of pipe joints is often a useful auxiliary of other methods of preventing electrolysis, but should not be depended upon alone to entirely obviate trouble.

Systems of pipe drainage, by which is meant the provision of a metallic conductor between the pipe system and the power house, have been widely used and are also valuable as accessories. The method has, however, a number of objections, as the protection is not likely to be permanent, it is likely to increase the amount of current carried by the pipes, and its application to one pipe system may endanger others. The draining of lead-covered cables is found to be more advantageous than the draining of pipe systems. All such methods, however, are an attack upon the symptoms of the disease and are not aimed at the source of the trouble. The trouble in most cases is due to the provision of an insufficient return path to the power house for the railway currents, and trouble can best be obviated by making provision of a suitable return. This involves proper track construction, bonding and cross-bonding of rails, and the use of additional return circuits in the form of negative feeders. It has been demonstrated that such feeders, whether used with or without boosters, are much more efficient when insulated than when not insulated, and the report emphatically advocates the use of insulated negative feeders.

Another method of mitigation which has been little used in this country, but has been applied in Nuremburg, Germany, for a number of years, is a three-wire system of supply to the railway. This has recently been applied to at least two American street railway systems, the latest of which is at Springfield, Mass., as reported in our issue of January 1. In this system, alternate sections of the trolley are fed from the positive busbar, the intermediate sections being fed from the negative busbar. The tracks and any feeders paralleling them constitute the neutral conductor, which has to convey to the power station only so much current as is represented by the unbalance of the positive and negative sections. In the case of a double-track railway, one track may be fed from the positive side and one from the negative.

The three-wire method is simple in application and greatly decreases the amount of current flowing in the earth return. It is reported to have given operating trouble when first applied in this country, but its recent application in Los Angeles and Springfield would indicate that the officials of the companies in these two cities have faith that these troubles can be overcome. It involves insulation for double voltage between adjacent sections of trolley wire, but otherwise the insulation problem is no different than under the ordinary method. If regulations limiting the permissible voltage drop in track-return systems become widely adopted, the three-wire method would seem to offer a cheaper solution of the difficulty than would the investment in large quantities of copper for improving the resistance of return circuits.

CO-OPERATION IN AMERICA AND IN ENGLAND.

Complaints are frequently heard of the lack of co-operation not only among the different branches of the electrical industry in this country, but among the individuals of the same branch. It is said that there is too much talk about co-operation and too little action. At times this appears to be true, but a review covering any considerable period of time will disclose many instances of practical and successful co-operation. The situation in this respect is far better than in England, where the prevalent ideas of extreme individualism make it difficult to initiate any concerted and organized movement for the general good. There it is every fellow for himself and the devil take the hindmost. In this respect we occupy an intermediate position between the British and German extremes, for it must be admitted that in organization and co-operative efficiency Germany leads the world. This is evidenced not only in industry, but in municipal affairs, military action, etc. Indeed, if we are not to be forced in the struggle for existence into an equally efficient socialism of either the democratic or paternal variety, with the resultant danger of suppressing initiative and originality, it behooves us to inaugurate a social and industrial system founded on the individualistic ideal which does not base one man's success upon another's failure or loss. With an equitable distribution of the products of industry, greater productiveness on the part of any individual or group would mean greater prosperity for others as well as himself. Similarly between nations, greater efficiency in one would be welcomed instead of feared by another. Fighting between commercial nations which should mutually benefit bv trade is an anomalous condition. What Great Britain needs more than the crushing of Germany is a new industrial system—regeneration from within.

That the chaotic state of affairs which exists in England with respect to any mutual co-operation in electrical matters is recognized at home has long been evident in the columns of its electrical journals. The postion has never been better painted, however, than by a writer in the last 1915 issue of *Electrical Industries and Investments*, who has penned a clever satire supposedly taken from the columns of the same journal ten years in the future. A presidential address before the Institution of Electrical Engineers, a speech by the president of the Board of Trade, reports of meetings of a municipal corporation and of the Electrical Contractors' Association, all indicate an inability to get together and co-operate, as well as an inability to grasp and solve the problems confronting the industry. While congratulating this anonymous writer upon his effort, we must offer condolence to our British brethren, and express our thankfulness that we have made at least some progress in these matters at home.

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THE FUTURE OF COPPER.

In discussing last week the probable extension of the use of aluminum for electrical purposes and especially in transmission lines, we referred to the likelihood of the exhaustion of the present sources of supply of copper about a generation hence. It may be of interest at this time to consider in more detail the present status of copper in the industry and what may be expected of it in the near future. Unfortunately complete information is not available as to the present visible supply of copper ore, but partial estimates have been made which will shed some light upon the world's resources.

An estimate made in 1911 of the ore reserves in the Lake Superior district indicated recoverable copper from mines now in operation amounting to over 1,000,000 tons. Similar estimates for the Anaconda district and certain other large producers are not available. But a survey of other sources, including several of the largest mines in this country, indicated a visible supply of 10,000,000 tons. For foreign mines even less authentic data are available, but a partial list of these indicates another 10,000,000 tons of copper. It is thus evident that at the present rate of consumption of about 1,000,000 tons per annum the present visible supply would last considerably longer than twenty years. Account should be taken, however, of the fact that the annual consumption shows a tendency to greatly increase.

At the present time the United States produces more than half of the total copper output of the world. Of the world's production it is estimated that 60 to 70 per cent is used in the electrical industry in normal times. Some of the items which go to make up this total may be of interest. It has been estimated that the telephone and telegraph systems of the world have used about 600,000 tons of copper, 60 per cent of which is charged against the United States. In addition to this, submarine cables have required about 10,000 tons. The annual increase for telegraph and telephone business is over 40,000 tons. Excluding private plants, it has been estimated that electric railway, lighting and power plants in this country have absorbed a total of about 50,000 tons of copper.

Consumption of copper has increased at an extraordinarily rapid rate and this tendency may be expected to continue in the future. For some time it may be expected that ordinary supply and demand rather than an approach to exhaustion of ore reserves will control the market price of this metal. However, as the mines now producing the greatest supply approach exhaustion, a rise in price will probably occur. This should result in making profitable the working of mines which are not at present in operation and also in the search for new ore deposits. It is expected that large deposits of ore may be found in the Congo district of Africa and in China. The opening of such ore bodies would, of course, delay the rapid advance in price, so that it is likely that more than a generation will pass before we experience an actual scarcity of copper. At the present time Japan is the next largest producer to the United States, while still smaller outputs are reported from Russia, Australia, and Spain. North and South America together produce at present about 73 per cent of the world's supply. Before an actual scarcity is felt, however, as pointed out last week, the metal will probably be suffiicently valuable in comparison with aluminum to bring about a general substitution of the latter for those purposes where it is most suitable, such as transmission lines and busbars.

UNIVERSAL ELECTRICITY SUPPLY AND THE CONSERVATION MOVEMENT.

A very marked tendency in the electrical industry in the last ten or more years has been the gradual electrification of power production coincident with the consolidation and extension of central-station electrical supply systems. This has been in accord with the economic necessities of the times. On looking into the economic necessities of the future there has arisen the need for active measures to promote the conservation of our natural resources and the agitation of this subject has been successful at least in emphasizing its importance. The close relation between these two movements was not at once apparent and it is only recently that this has been very strikingly pointed out.

In an address delivered last week before the Western Society of Engineers, which is briefly reported in another part of this issue, and in a similar address in Boston during the preceding week, Mr. Samuel Insull disclosed some very striking figures on the economics of universal electricity supply and its effect in conserving coal and other resources. If the steam railroads and all isolated and manufacturing plants of Chicago were electrified and had their electrical energy supplied from the central-station system, Mr. Insull said that the coal consumption for the consolidated load would be 6,000,000 tons a year as against 11,000,000 tons if the energy production remained independent and isolated as at present.

A study of the entire country showed that there would result from the consolidation of the energy supply to the railroads, industrial and commercial plants, and the present central-station networks an annual saving of some 250,000,000 tons of coal; in other words, the coal used for these three principal classes of power users would be reduced by about 45 per cent. The value of this fuel saving would amount to between $500,000,000 and $625,000,000 a year.

Other elements of conservation resulting would be the release of capital now tied up in isolated and other small energy-producing plants, reduction in the cost of living due to practical elimination of smoke with its resultant need for frequent washing and cleaning, reduction of cost of manufacture, improved housing and living conditions, and in general a marked conservation of human health and happiness.

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Happenings in the Industry

Theory of Impulse Currents Discussed by American Institute—Western Society of Engineers Elects Officers—Samuel Insull Discusses Universal Electrical Supply—Flood Lighting Gaining Prominence—Wisconsin Contractors Meet at Milwaukee—Annual Meeting of Northern White Cedar Association—Edison Banqueted by Ohio Society

THEORY OF IMPULSE CURRENTS.

The Monthly Meeting of the American Institute of Electrical Engineers.

The 317th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on Friday evening, January 14, with President J. J. Carty in the chair.

A paper was presented by Charles P. Steinmetz entitled "Outline of Theory of Impulse Currents." This paper started out with the differential equations which apply to a circuit in which the resistance, shunted conductance, inductance and capacity are constant and from these developed the general equations which apply to all circuits coming within this category. Special cases were then taken up. These included continuous currents, alternating currents, impulse currents and general transients. Continuous currents represent a limiting case. While the alternating currents are the useful currents of our electric systems, the impulse currents may be said to be the harmful currents, since many disturbances and troubles are caused by them. Circuits with massed constants, continuous circuits with distributed constants and alternating-current circuits with distributed constants were first considered, but the larger part of the paper was devoted to impulse currents, to which but little systematic study has heretofore been given.

The values of the constants which occur in the fundamental equations, which characterize impulse currents, were first considered. These constants are designated as the energy-transfer constant, the energy-dissipation constant and the distortion constant of the circuit. Two classes of impulse currents were considered, periodic and non-periodic. Equations for the current and the voltage in terms of the electrical characteristics of the circuit were worked out for each case.

The discussion was opened by Michael I. Pupin, who differed with Dr. Steinmetz in his point of view of some of the phenomena concerned. Impulse currents form the basis of the two great early electrical arts, telegraphy and telephony. He referred to the work of Lord Kelvin and Kirchhoff, who had worked out complete solutions for the cases of the submarine cable and the overhead line, respectively. He regarded Kirchhoff's publication in 1858, which utilized Fourier's series, as the most beautiful work in the mathematical theory of electricity which had ever been performed. Telephony, as well as telegraphy, deals with impulse currents, and not with alternating currents, since articulation does not represent a sustained frequency, but a mixing of various overtones in short impulses. He pointed out that the equations of Dr. Steinmetz do not cover all cases, since the electrical constants of the circuits are sometimes variables. These equations are, however, a useful foundation for working out many problems. He referred to the oscillating arc, in which there is a variable resistance, and the oscillation in a vacuum tube, which is due to something else. In a single-phase induction motor there is a variable mutual inductance, which may result in the production of oscillations. When the capacity has the proper value such oscillations may result in large currents which may ruin the machine or bring it to a standstill.

Harold Pender pointed out that the impulse current of the paper was what is usually called a transient current. He regretted that the author had not given more physical interpretation of the integrated equations. He referred to the complications arising when mutual inductance exists between two or more circuits.

D. B. Rushmore pointed out the relation between theoretical investigation and commercial work.

Hans Lippelt cited the case of an open-coil direct-current machine as one in which the constants of the circuit are variable, hence one to which the equations of the paper do not apply.

In closing the discussion, Dr. Steinmetz pointed out the limitations of the equations which had been worked out. He used the term impulse currents to mean a certain class of transients which are characterized by being non-periodic. They thus differ from oscillating currents, which are alternating currents of diminishing amplitude. The work referred to by Professor Pupin represented special cases.

During the course of the evening President Carty was called from the room to speak over the telephone to a meeting of the Boston Section which was being held the same evening in Boston.

In place of the usual monthly meeting in February, the midwinter convention will be held in New York City on February 8 and 9 These dates were decided upon in co-operation with the Illuminating Engineering Society, which will hold a convention on February 10 and 11 in the same building. It is expected that this arrangement will be of convenience to the members of either society who desire to attend both conventions.

ANNUAL MEETING OF THE WESTERN SOCIETY OF ENGINEERS.

Address by Mr. Insull on Universal Electricity Supply.

The forty-sixth annual dinner and meeting of the Western Society of Engineers was held at the Hotel Sherman, Chicago, on the evening of January 12. During the dinner music was provided by the Commonwealth Edison Orchestra and by the Peoples Gas Company Choral Society. Edwin H. Lewis acted as toastmaster.

A brief report was presented by Acting-Secretary E. N. Layfield covering the more important activities of the Society during the past year. The membership is now 1,228. The Octave Chanute medals, which are annually awarded to members who have presented the best papers in civil engineering, mechanical engineering and electrical engineering during the preceding year, were awarded, respectively, to N. M. Stineman, H. E. Goldberg and Andrew Allen.

President William B. Jackson then made his retiring address, in which he first paid a tribute to the late secretary, J. H. Warder. He reviewed some of the work accomplished during his administration, particularly the appointment of the two very important committees on Public Relations and Engineering Ethics; the latter committee has drafted, after very careful study, a code of engineering ethics which will be presented to the consideration of the Society in the near future. Mr. Jackson referred to the offer made by Past-president John W. Alvord of $1,000 in interest-paying securities, which is to be used as a fund

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the income from which will be used in an annual award to the engineer who has accomplished some notable engineering achievement for the public good. This fund has been accepted by the Society, and a committee appointed to draw up the details respecting this award.

Newly Elected Officers.

Mr. Jackson then announced the results of the election of officers as follows:

President, Bertrand E. Grant.
First vice-president, Charles H. Cartlidge.
Second vice-president, Denney C. Roper.
Third vice-president, Frederick H. Newell.
Treasurer, Carlton R. Dart.
Trustee, Ernest McCullough.

On assuming the chair, Mr. Grant made a brief address in which he referred to the organization of the Western Society of Engineers, in May, 1869, and reviewed some of the early history of the Society. He called attention to the many important engineering works that have been executed by its members.

Mr. Insull's Address.

The principal address of the evening was delivered by Samuel Insull, president of the Commonwealth Edison Company, Chicago, on the subject "Universal Electricity Supply." The experimental central station developed by Edison at Menlo Park, N. J., in 1881, was referred to. This contained all of the important elements of the modern central station.

Taking up the main theme of his address, Mr. Insull spoke of the erection by Ferranti of the first central station using alternating-current generation and distribution. This was at Deptford, London, and in Mr. Insull's opinion was the earliest conception of a system permitting universal supply of electrical energy. He then referred to Ferranti's address as president of the Institution of Electrical Engineers in 1910, when he proposed the generation of electrical energy by large units located at the mines and the transmission of the energy to present plants, where it would be converted to suitable form for its distribution over the present distributing networks. A few years later in an address before the Franklin Institute, Charles P. Steinmetz predicted that there would be developed in the near future great electrical supply systems providing universal energy supply over extensive areas. Mr. Insull referred to his own various talks on this subject, and confessed that it had become a hobby of his.

Citing the United States census figures of 1912, he showed that as yet only a small part of the energy supply of the country comes from centralized plants. He called attention to the improvement in the efficiency of electricity production in recent years. It is now possible in large stations to obtain an average of about 17 per cent of the energy of the fuel delivered at the switchboard. He predicted that during the next few years improvements in steam and generating equipment would doubtless raise this to between 20 and 25 per cent.

When one considers these figures carefully an extraordinary gain is evident from the mass production of electrical energy compared with the wasteful methods used in small plants. This economic gain has many aspects, of which the conservation of fuel is one of the most important. This improved economy in energy production is attainable only through generation in very large units and distribution of the energy over unified transmission and distributing networks. He compared the energy production in the 69 central stations that supply Greater London with the energy supply from one central station in Chicago. The output of the latter is very much greater and the energy is produced much more cheaply in Chicago. This is a very emphatic example of the economy of centralized production.

Mr. Insull referred to the recent report of the Chicago Commission on Smoke Abatement and Railroad Electrification. Based on the data of that report he had figures prepared to show the economy resulting from the complete electrification of the entire city of Chicago and suburban district. If all of the manufacturing and isolated plants, and all of the steam railroads in this territory were electrified, the total coincident demand would be about 577,000 kilowatts. If all of this energy were supplied from one central station system there would result a saving of 150,000 kilowatts in generating capacity through the diversity-factor obtained by supplying the various classes from one system. There would also result an improvement in load-factor of the Chicago central station from 40 to about 50 per cent. If the three classes, that is, the present central-station load, all present isolated and manufacturing plants, and the steam railroads, were operated separately as they do now they would require about 11,000,000 tons of coal per year as compared with 6,000,000 tons of coal annually if all the energy production had been centralized. This comparison shows the extraordinary conservation of our coal resources which results from the monopoly supply of electricity.

Mr. Insull made a similar study of the complete electrification of all energy production of the entire country. The steam railroads of this country now use about 135,000,000 tons of coal annually. If all of the three classes of load above referred to were electrically supplied from a unified or co-ordinated electrical system throughout the country, the maximum horsepower required would be 30,000,000, as against 43,000,000 horsepower if the three classes of load remained as they do now. Assuming an investment of $200 per horsepower in the generating plant, the amount of capital released by such unified energy production would be tremendous, running into the billions of dollars. Estimates prepared showed that in 1925 such a unified energy production would mean the saving of 250,000,000 tons of coal annually, or billing this at $2.50 a ton, a saving of $625,000,000 a year in this one item alone. In these comparisons many other loads were not included, such as power for water pumping, drainage, etc., which, had they been included in the estimates, would have increased the savings about 25 per cent.

In conclusion, Mr. Insull declared emphatically that the economics of centralized energy supply were so clear that it is bound to be developed and brought about in the not distant future. He spoke of the restrictions of regulatory bodies and other obstacles which have been met in the carrying out of the idea of universal electric service. In the West, where fuel is expensive and water power available, these obstacles have been brushed aside. The time is coming when it will be realized that, if we wish to conserve our resources both in fuel and in capital, if we wish to secure the lowest cost of manufacture, provide energy to the most humble citizen of the community, it will be necessary to marshal the production and distribution of energy in a unified system, and this is bound to come regardless of whether it will be done by private or public capital.

Engineers' Club of Springfield Elects New Officers.

The Springfield (Ill.) Engineers' Club has entered upon the second year's work of the organization by electing Clifford Older, bridge engineer for the Illinois State Highway Commission, president; H. B. Lewis of the Central Union Telephone Company, recording secretary, and J. R. Hughes of the State Public Utilities Commission, corresponding secretary. The club has an active membership of 130.

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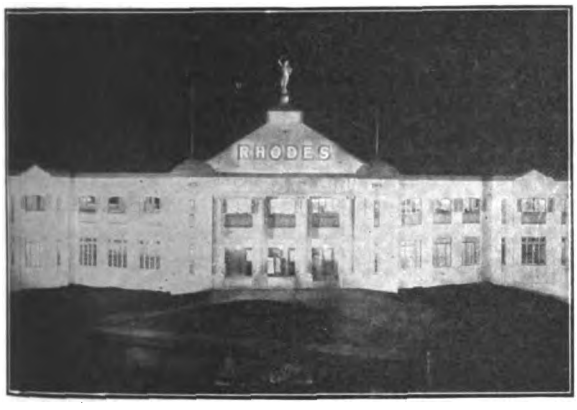
Flood Lighting Discussed by Chicago Illuminating Engineers.

At a meeting of the Chicago Section of the Illuminating Engineering Society held on the evening of January 13 in the Edison Building, Chicago, James R. Cravath gave an illustrated talk on "The Exterior Lighting of Buildings." The possibilities in making the exterior of buildings attractive at night have been indicated by the developments in outdoor lighting at the several great national and international expositions held in this country since 1893. The Chicago World's Fair in 1893 was the first installation in which outline lighting was used extensively. At the Pan-American Exposition, at Buffalo, in 1901, flood lighting was used for the first time in the illumination of the tower. At the St. Louis Exposition of 1904 further developments occurred, but it was not until the Panama-Pacific International Exposition in San Francisco last year that flood lighting came into its own; there it was used almost exclusively for the exterior lighting of buildings, statuary, etc., and demonstrated on a grand scale and to an extent hitherto unknown the great possibilities of this particular method of lighting.

Mr. Cravath said that the general trend of exterior lighting has been, just as in the case of interior lighting, to get away more and more from glare, this being particularly necessitated of late through the development of high-power and high-efficiency units. Outline lighting has in general been quite successful as a means of advertising or spectacular lighting, but it is comparatively expensive on account of the elaborate wiring and large number of lamps required.



Flood Lighting of Rhodes Casino, Providence, R. I.

Flood lighting has become very popular during the past year or so, because of the novel effects it is possible to produce thereby. Other features making it distinctive are that it is free from glare, can be operated at relatively low cost and trouble, permits lighting with the new gas-filled tungsten lamps, which are much more easily controlled than arc lamps, and lights the entire building front instead of only parts thereof. In general flood lighting is done by projector lamps placed at a distance from the building or in some instances by reflector equipment mounted on the building itself, or special equipment installed in lamp posts closely adjoining the building.

Several typical installations of flood lighting were shown and described.

Mr. Cravath pointed out that the efficiency of projectors depends on the amount of light flux intercepted by the reflector, and on the efficiency of the reflector itself. From tests he had made he had found that the maximum efficiency in the light beam as yet attained is about 47 per cent, that is, about that percentage of the total light flux developed by the lamp is projected in a concentrated beam. In the placing of equipment for flood lighting on buildings across the street from those to be illuminated care must be used so that the direct light from the projectors does not annoy pedestrians passing the building

Demonstrations were made of several types of projectors for flood lighting by representatives of the National X-Ray Reflector Company, General Electric Company, and American Lighting Company.

In opening the discussion, Acting-chairman M. G. Lloyd called attention to the great variety of applications of flood lighting, which is finding new uses almost every day. F. A. Vaughn referred to the lighting of a large sign in front of the Merrill Theater, Milwaukee. This sign is studded with jewels, and lighted through projector lamps in which a color effect was ingeniously produced. In the main entrance of this theater a rainbow-like effect was produced from one white reflector and three colored units; the color was gradually changed in three-minute cycles through motor-driven dimmers which controlled the relative amount of light projected by the different units. The bulletin boards were also illuminated by means of small flood lamps. In the new street-lighting installation of Milwaukee an effort is being made to light the fronts of buildings in the downtown district by mounting the lamps at a height of 30 feet above the street.

J. A. Hoeveler showed views of and described the flood lighting of the Rhodes Casino in Providence, R. I. C. A. Luther said that an objection to flood lighting of commercial buildings by means of projectors located on adjoining or opposite buildings is the difficulty of obtaining consent to mount the equipment there. The installation at the store of Klee Brothers, Chicago, which Mr. Cravath had described and which was first described and illustrated in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 16, 1915, gave Mr. Luther a suggestion that similar results could be obtained by the use of gas lamps, and he looked forward to important developments in that line.

Albert Scheible believed that the development of flood lighting will react on architecture by bringing about the selection of material for use in building fronts that is especially adaptable to effective lighting at night, and which can be easily kept clean. Another important development is in the possibility opened up of producing color effects on a building front.

A. L. Arenberg had found one installation where the exterior of the building was flood-lighted in which it was necessary to pull the blinds in the offices to prevent serious glare from the brilliant lamps which were directly opposite the windows. J. Stair had found on the contrary that in the case of the First National Bank in Cleveland that the light thrown into the interior was not found objectionable. L. Friedmann stated that it is not always necessary to mount the reflectors or projectors on buildings across the street. It is frequently possible to use a part of the building being illuminated for this purpose, or the projector equipment may be placed very close to the building. F. H. Bernhard called attention to the fact that in carefully designed flood-lighting installations the effect of electric signs and of store-window lighting is not spoiled by the superposition of flood lighting. On the contrary, it is possible to produce a very harmonious result.

J. B. Jackson then described at length the series of experiments that has been made on the proposed lighting of the Edison Building, Chicago. A large number of systems have been tried out and the work is in charge of a committee which has decided on some of the important features, but others have not yet been approved. This building is over 20 stories high; opposite one of its fronts is the Federal Building, and obtaining consent to mount projectors on this was out of the question; opposite the other front is a 12-story building which might have been used

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for this purpose but the projectors mounted on the roof of this structure would not have given a uniform lighting of that front. Tests were made at lighting from a building diagonally opposite without complete success. Many other difficulties were met. The scheme proposed is to use a combination of outline and flood lighting, there being three or four rows of lamps at different levels for outline effect and two rows of projector lamps mounted on ledges of the building at the second and fourth floor levers for flood lighting. Only part of the equipment is as yet installed, but it is believed that when the installation is completed it will be a very noteworthy one because of the very difficult problem involved in the effective lighting of this building. G. W. Baker spoke of some of the preliminary tests and methods used to overcome the difficulties in the selection of proper units for this purpose. He also described the projector lamps specially designed for this installation. R. E. Powell also explained some of the difficulties met in the attempt to light the building from other buildings nearby. It was found that the beam from the projectors was very noticeable on account of dust and smoke in the air.

Other uses for flood lighting were spoken of by Charles Starr and H. Schaedlich. Mr. Starr called attention to its use in aiding construction work at night where it has been found not only very successful, but extremely economical compared with former methods. It also has been used with much success in permitting ice harvesting at night. Mr. Schaedlich spoke of the trial installation of flood lighting at the Clarendon Municipal Beach, Chicago. In the permanent installation which will be put in this spring it is proposed to light this extensive beach from two 75-foot towers placed at the north and south ends of the beach. The area lighted will be 800 feet along the shore and extend outward into the lake about 500 feet. Flood lighting is also being used successfully for the lighting of a number of playgrounds, particularly those adjoining school buildings, in which case the projectors are located on top of the buildings about 60 feet above ground.

Illinois Contractors to Meet Next Week.

The regular semi-annual meeting of the Electrical Contractors' Association of the State of Illinois will be held at the Sherman Hotel, Chicago, on Thursday and Friday, January 27 and 28. An open session will be held in the morning of each day and a closed session in the afternoon. Among the speakers will be W. W. Low, of the Electric Appliance Company.

On Thursday afternoon there will be a theater party for visiting ladies and on Friday evening the usual banquet will be held. On Saturday it is proposed that the members will attend the Automobile Show which will be held at the Coliseum during the week.

Carrying Capacities for Transient Currents—A Correction.

On page 55 of the issue of Januay 8 an abstract was given of a paper by Frank C. Wagner on carrying capacities of wires for transient currents. An error occurred in the formula giving the time necessary for fusion in different cases. This should read $t=K^2F/I^2$, where t is the time in seconds, I is the current in amperes, F has a value depending on the metal, and K is the cross-section in square centimeters.

Storage-Battery Traction Line for Connecticut.

Plans for a storage battery electric line between New Britain and Meriden, Conn., are being brought to a head by representatives of the Chambers of Commerce of the two cities and a storage-battery company. It is estimated that the road and equipment will cost about $150,000.

Electrical Contractors' Association of Wisconsin Holds Meeting.

The thirteenth annual meeting of the Electrical Contractors' Association of Wisconsin was held in Milwaukee at the Hotel Wisconsin, January 17, 18 and 19.

The first business session was called to order by President L. W. Burch of Madison at 2:30 p. m., January 17. The most important matter discussed and acted upon at this session, was that new blood in the form of additional members is needed, and that a determined effort be made to get them.

B. Berssenbrugge, electrical inspector of the city of Milwaukee, then gave an interesting talk, outlining his experiences in "Enforcing the Code." He began with a brief history of how his department was created.

This brought out the fact that the Electrical Contractors' Association of Wisconsin was the prime mover in bringing about the licensing of electrical contractors and municipal inspectors in Milwaukee, as the association as far back as 1907 began working thereon, through the Legislature at Madison. Although this department's inspection is considered final the Board of Underwriters (now termed Wisconsin Inspection Bureau) also inspects, without fee, all work they are notified on, or where their interests warrant. This means considerable "dual inspection," which is more or less of a nuisance.

H. L. Geisler opened the morning session on January 18 with a paper on "Liability Insurance." Mr. Geisler's paper gave a clear statement of costs and other interesting information on this subject that is or should be included in the contractor's overhead expense account.

O. E. Rhuoff substituting for Prof. Chas. F. Burgess of the French Carbon & Battery Company, Madison, followed with a 30-minute paper on "Dry Batteries." Prof. Burgess' paper was decidedly interesting and instructive.

At 2 p. m. L. L. Tatum of the Cutler-Hammer Manufacturing Company began the open session with a talk on "Remote Control of Electrical Apparatus."

Mr. Tatum presented a very complete discussion covering remote control apparatus in detail.

L. F. Meissner Jr., of the Edison Storage Battery Company, Chicago, followed with a talk on "Storage Batteries."

Beginning with a brief non-technical history of storage batteries in general, Mr. Meissner later interestingly explained the construction and general make-up of Edison storage batteries.

Henry A. Morss, vice-president of the Simplex Wire & Cable Company followed with a paper on "The Manufacture of Insulated Wires and Cables" which was illustrated with motion-pictures and lantern slides.

Discussion more or less spirited was indulged in after most of the subjects presented, so if discussion, "makes for knowledge and wise decision," those attending surely profited.

The informal dinner at 6:30 p. m. was attended by 54 person, many of whom were jobers, manufacturers or their representatives.

Many interesting talks, some serious, some humorous, were given by M. B. Austin, H. A. Morss, H. L. Geisler, W. F. Patton and J. B. McMullin, they having been called upon for a few words by President L. W. Burch, who acted as toastmaster.

The closing sessions were held January 19, during which officers as follows were elected for the ensuing year:

President, F. J. Natwick, Grand Rapids.

Vice-president, Paul Honold, Sheboygan.

Treasurer, George Knoerr.

Secretary, Albert Petermann, Milwaukee.

Director for three years, B. L. Burdick, W. R. Johnson, Wausaw, holding over 2 years and Paul F. Harloff, Madison, holding over one year.

Herman Andrae was elected director to the National Association.

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...ern White Cedar Association at Minneapolis.

...attention was given the matter of publicity ...twentieth annual meeting of the Northern White Cedar Association which was held at the Hotel Radisson, Minneapolis, January 13 and 14. In the presidential address, L. A. Page, Jr., called attention to the campaign which is just being inaugurated and to the benefit which is expected. It was announced that the Western Red Cedar-men's Association had decided to spend $5,000 on a campaign to increase the use of their product and as this field is identical with the Northern White Cedar field, it was thought best to carry on a co-operative campaign, thus gaining economy for both Associations.

The report of the secretary reviewed the activities of the Association during the past year. Special attention was

H. F. Partridge,
President-elect, Northern White Cedar Association.

Mr. Partridge, who is one of the most popular members of the Association, was born in New York in 1875. He moved west in 1892 and for eight years thereafter was connected with the wholesale lumber business. In 1900 Mr. Partridge with his brother T. M. Partridge organized the T. M. Partridge Lumber Company, of Minneapolis, at present one of the largest producers of cedar poles, with yards at various points in the Northwest. Mr. Partridge has been one of the most active members of the Association for the past 10 years and last year served as vice-president.

called to exhibits which were participated in by Northern white cedar producers, and to a suggestion that the State of Minnesota should, in line with adjoining states, maintain a department to investigate its natural woods, with a view toward determining the length of life of different woods under various conditions of service and treatment.

The Insurance Committee explained the desirability of blanket insurance which has been generally in effect among producers of lumber and had proven very satisfactory in their business and was desired over other forms of insurance. Because of reduction of rates by recent legislation the situation in Minnesota and Michigan has grown very favorable. The Railroad Committee reported that during the year many readjustments of rates had been sought and secured.

The annual banquet was held on January 13, there being present 60 guests, who displayed the usual spirit of good fellowship which characterizes the banquets of this organization.

Considerable discussion took place on the second day of the convention relative to ascertaining the cost of producing various cedar products, a committee having been appointed to collect such data. The committee reported that much difficulty was being encountered because of variable costs incident to diversified operations.

The election of omcers resulted as follows:

President, H. F. Partridge, of the T. M. Partridge Lumber Company, Minneapolis.

Vice-president, J. C. Kirkpatrick, of the National Pole Company, Escanaba, Mich.

Treasurer, W. B. Thomas, of the White Marble Lime Company, Manistique, Mich.

Secretary, N. E. Voucher, of Minneapolis.

Directors, F. W. Wilhelmi, of the Cloquet Tie Post Company, Cloquet, Mich., and J. E. Gerrich, of the MacGillis & Gibbs Company, Milwaukee.

Among those in attendance were representatives of the following firms: Bell Lumber Company, Minneapolis; Brooks & Ross Lumber Company, Schofield, Wis.; Clark Pole & Tie Company, Bemidji, Minn.; Cloquet Tie & Post Company, Cloquet, Minn.; Crawford Cedar Company, Menominee, Mich.; Curry & Whyte, Duluth; Duluth Log Company, Duluth; Erickson & Bissell, Escanaba, Mich.; Larson Brothers Lumber Company, Minneapolis; Learned Cedar Company, Escanaba, Mich.; McCulloch & Moss, Minneapolis; MacGillis & Gibbs Company, Milwaukee; Martin Brothers, Duluth; Meloney Brothers, Spooner, Minn.; National Pole Company, Escanaba, Mich.; Naugle Pole & Tie Company, Chicago; Page & Hill Company, Minnepaolis; T. M. Partridge Lumber Company, Minneapolis; Pendleton & Gilkey, Minneapolis; St. Croix Pine & Cedar Company, Kelliher, Minn; C. P. Tinkham, Milwaukee, Wis.; Valentine-Clark Company, Minneapolis; Virginia & Rainy Lake Lumber Company, Virginia, Minn.; Western Electric Company, New York; Wisconsin Land & Lumber Company, Hermansville, Mich.

Edison Banqueted by Ohio Society of New York.

Thomas Alva Edison, illustrious son of Ohio, was the guest of honor at the thirtieth annual banquet of the Ohio Society of New York, at the Waldorf-Astoria Hotel, Saturday, January 15.

"Preparedness for Defense" was the subject of stirring addresses by the Hon. Henry D. Estabrook, the Reverend S. Parkes Cadman, D. D., and the Hon. Josephus Daniels, Secretary of the Navy.

Charles P. Bruch, president of the Ohio Society of New York, was a most entertaining toastmaster and chairman of proceedings. Over 800 sons of Ohio and guests attended the banquet, and the galleries were filled with visiting ladies, Mrs. Edison and party occupying the central boxes. Many men prominent in the electrical industry were present. During the evening the following message was presented to Mr. Edison from old associates in attendance:

"Thomas Alva Edison—Your early associates and members of the Ohio Society send 73 to the wizard of Menlo Park: Millard F. Anderson, David Homer Bates, David Homer Bates, Jr., Charles P. Bruch, Edward B. Bruch, Frank N. Dowler, Charles M. Higgins, Lincoln R. Hypes, Nathan C. Kingsbury, Harry B. Logan, Virgil W. Miller, Charles W. Price, George F. Randolph, John F. Schindler, George W. Spaid, Theodore N. Vail, Ralph H. Wallace."

The great inventor was in perfect health, and through Mr. Bruch made an enthusiastic response to the felicitation accorded him.

There are over 500 electric central stations in Japan, having a total capacity of about 728,000 kilowatts.

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Mammoth Spring Hydroelectric Plant

Low-Head Water-Power Plant Constructed by the Mammoth Spring Electric Light & Power Company Combines Efficiency with Esthetic Appearance

By E. C. Bellamy

Mammoth Spring, Ark., is one of the many natural wonders of the United States which American travelers whom the European war is keeping at home will learn to visit in increasing numbers. Grand Gulf, Spring River and Mammoth Spring form a picturesque group whose beauty has not been marred by the hydroelectric plant by which they have been harnessed to serve the rapidly growing territory surrounding.

The water which supplies this plant flows directly from Mammoth Spring, the largest spring in the world. Two shallow streams about one-fourth of a mile distant from each other, flowing in the same direction over an elevated plateau, suddenly drop into canyons 500 feet deep. These two canyons form a junction half a mile below, where they strike a mountain lying directly across their path. This mountain has been tunnelled by the erosive action of the water, forming a picturesque natural bridge almost equal in size to the well-known Natural Bridge of Virginia.

After passing through the mountain the united stream strikes another mountain and tunnels it for several hundred feet, then spreading out into an immense underground lake, the exact area of which has never been ascertained. This underground lake is presumably the reservoir which supplies Mammoth Spring with its 60,000 cubic feet of water a minute. It is a curious fact that the flow from the spring remains practically constant regardless of the volume of water in the two streams which are supposed to feed it.

Mammoth Spring covers 18 acres of ground, and has a depth of 90 feet. It is confined by a series of three dams, forming three distinct lakes.

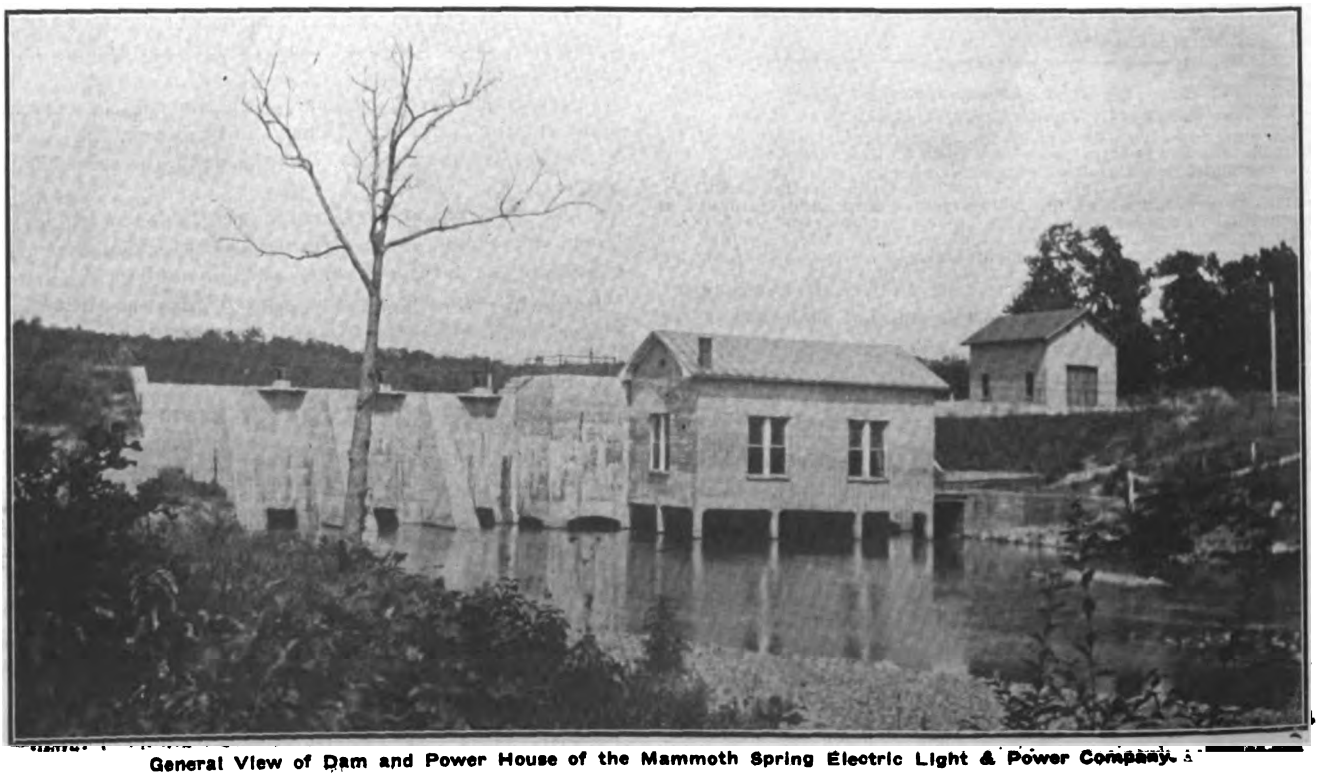
The first dam is of solid masonry, 170 feet long and 28 feet high. This fall affords mechanical power to drive the machinery in a large flour mill. The second dam, of approximately equal size, impounds water to drive two auxiliary generators which furnish current for distribution in Mammoth Spring, Ark.

The third dam is a reinforced-concrete structure, 24 feet high and 610 feet long. At this point is situated the generating station of the Mammoth Spring Electric Light & Power Company. It is a substantial concrete building, constructed as an integral part of the dam.

The power is generated by means of three Westinghouse 2,300-volt three-phase alternators, two of 375 kilovolt-amperes each; and the other at dam No. 2 of 150 kilovolt-amperes capacity. They are directly connected to two 35-inch Samson Lefell horizontal, center-discharge water-wheels, while the smaller alternator at Dam No. 2 is belted to a water-wheel of similar type and size. This arrangement will allow the smaller generator to be readily replaced by one of greater capacity as the maximum demand on the station increases.

Excitation for both alternators is furnished by an 18-kilowatt direct-current generator, which is belted to a Lefell water-wheel. The switchboard in the generating station consists of nine standard Westinghouse panels. These are of black marine-finished slate, and equipped with the usual arrangement of meters.

The Mammoth Spring Electric & Power Company serves a total population of about 10,000. Energy is transmitted at 33,000 volts over a 40-foot steel-tower transmission line 32 miles long, furnishing power to the towns of Thayer, Koshkonong, Brandsville, and West Plains. The connected motor load totals 192 horsepower, and the plant operates at a load-factor of 42 per cent. The possibilities of the territory served by the Mammoth Spring Electric Light & Power Company are shown by the fact that the increase in the business at the present time over that handled with the original plant is 700 per cent.



General View of Dam and Power House of the Mammoth Spring Electric Light & Power Company.

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Steel Tower and Transformer Substation for Distribution to Mammoth Spring, Duplicates of Which Are Located at Koshkonong and Brandsville, Mo.

The transmission line consists of a three-phase line running from Mammoth Spring, Ark., to West Plains, Mo. The wires, which are of No. 4 bare hard-drawn copper wire, are carried on steel towers, 40 feet in height. Transformer substations are located at West Plains, Koshkonong and Brandsville to reduce the line pressure of 33,000 volts to a potential of 2,300 volts for local distribution. A view of one of these towers is shown herewith.

The transformers at the Mammoth Spring end of the line are located in a transformer house which is distinct from the generating plant. The equipment in this house consists of a bank of three transformers and a standard control panel. The transformers are each of 200 kilovolt-amperes capacity, 33,000/2,300 volts and are connected delta-delta.

In one of the accompanying illustrations is shown the transformer house, with its equipment of electrolytic lightning arresters installed out-of-doors, while another view shows the dam and spillway.

Another View of Dam, Showing Spillway.

Missouri Contractors Elect Officers.

The fifteenth semi-annual meeting of the Missouri Electrical Contractors' Association was held Saturday, January 15, 1916, at the Kupper Hotel, Kansas City, Mo. E. S. Cowie, president, presided at the meeting. The first action was the amendment of the by-laws, changing the date of the annual meeting to the third Saturday in January, and that of the semi-annual session to the second Saturday in July, or the Saturday immediately preceding the date of the national convention. New officers of the association were elected as follows:

President, Fred B. Adam, of the Frank Adam Electric Company, St. Louis.

First vice-president, William Koeneman, of the Guarantee Electric Company, St. Louis.

Second vice-president, Robert Baker, of Baker Electric Construction Company, Kansas City.

Secretary, A. J. Burns, of Economy Construction Company, Kansas City.

Treasurer, Edward Heath, of Heath Electric Company, Kansas City.

Sergeant-at-arms, L. E. Reed, of American Electric Company, St. Joseph, Mo.

A. P. Denton, who is president of the Denton Engineering & Construction Company, was elected national director. He said he would use every effort to put Missouri "on the map" in the National Association. The state association immediately took action that would enable Mr. Denton to do much active work in this respect, and he probably will use a great deal of his time in boosting national membership and in promoting its interests, as well as those of the state association. This action was a resolution that the $10 commission offered by the national for each new member, was to be turned into the treasury of the state association, and used by the national director in getting members.

The Legislative Committee was empowered and instructed to proceed vigorously in the effort to secure a state law for Missouri, which has already been introduced, providing for state examinations, licensing of contractors, and penalty for contracting by unauthorized persons. The committee consists of A. J. Burns, chairman; W. L. Hutchison, L. E. Reed and William Koeneman.

The Committee on Concentric Wiring asked more time for its investigations, reporting that it was gathering much useful information from contractors, and would have a report for the semi-annual meeting in St. Louis next July indicating the consensus of opinion of Missouri contractors. This Committee consists of W. L. Hutchison, Kansas City, chairman; L. E. Reed, St. Joseph; A. Penn Denton, Kansas City; Fred B. Adam, St. Louis; J. C. Bushong, Ottawa; J. A. Mercer, Topeka. The Kansas members were included last summer on the committee, that as broad an inquiry as possible from the district might be secured.

Following the business session, talks were made by guests, including J. A. Mercer and W. E. Barry of Topeka, and R. C. Stueve of Tulsa, Okla.

Transformer House at Mammoth Spring.

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Electricity in the Manufacture of Gears

Electric Motor Drive is Being Successfully Employed in Two Large Gear-Manufacturing Plants Which Are Fully Described—Tabulated Motor Data are Given for Each Installation

Industrial Power Series—Article No. 151.

This article describes the electric motor equipment and the mechanical manufacturing processes of two large manufacturing plants in Syracuse, N. Y., using electric motor drive and central-station service exclusively. The companies are: Brown-Lipe-Chapin Company, manufacturer of automobile differential gears, and the Brown-Lipe Gear Company, manufacturer of various types and forms of automobile transmission gears and control sets. Before taking up the manufacturing details it may be well to consider some of the advantages of central-station service and motor drive in this class of industries.

In the manufacture of gears there is needed a large number of comparatively small machines and it is important that they be so located that the logical sequence of operations in the manufacturing process be carried out so that the material and finished products do not have to repass through any department. The nature of the machinery used naturally lends itself to group drive with a comparatively small number of machines driven from each motor. By this arrangement a single group or any number of groups of machines can be run during the noon hour or on holidays to accommodate a rush in any particular department. An accident to any group of machines interferes with that group only and if a single motor needs repairs, which seldom occurs, it can be quickly replaced by a spare unit. Friction losses are reduced to a minimum as there are only short line shafts and small belts. With central-station service, continuity of operation is secured as modern practice provides so many safeguards that interruption of the service is practically impossible. Another important feature is that motor drive affords uniform speeds which are important in the turning out of work of precision and it increases production and quality.

In case of an accident to an operative any group of machines can be quickly brought to a stop without interrupting or in any way affecting other groups. The maintenance expense of large belts and long lines of heavy shafting is eliminated. Furthermore, the electric motor can be overloaded to a considerable extent without serious variation in speed, while with a mechanical prime mover it is either "stalled" or slowed up and as soon as the load is reduced there is a surging caused by the effort of the driving engine to regain its equilibrium. This variation of speed is decidedly detrimental to the quality and quantity of the product.

Changes and Extensions Easily Made.

With electric drive and central-station service machines

Motor-Driven Screw Machines.

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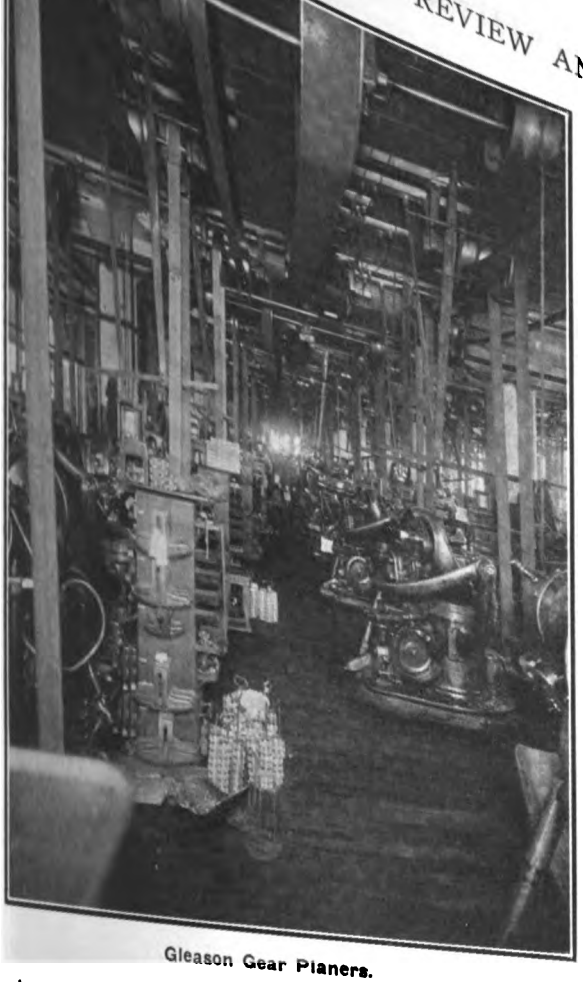


Gleason Gear Planers.

and motors are easily and quickly regrouped and additional machines and motors can be installed on short notice. Power is always instantly available and it is only necessary to throw in the starting device. Motors can be mounted on the wall or floor or suspended from the ceiling and can be located where room is not needed for manufacturing purposes.

Electric drive affords the only satisfactory propulsion where speed variations are essential for the performance of certain work. Auxiliary machinery, such as blowers, air compressors, pumps, etc., can be placed in pits, in outside buildings, or any convenient place without regard to line shafts or other driving methods. Where there are several buildings composing a plant, motor drive is especially adapted to the work. If mechanical drive is used for such conditions either a number of small and inefficient engines are required or cumbersome and power-wasting mechanical transmission has to be employed. The human element of a factory has to be considered as there is better feeling among the workmen where there are desirable working conditions and the surroundings are hygienic. Electric drive materially aids in maintaining these conditions. Electric drive can easily provide for increases in machinery and in the addition of new buildings as it is only necessary to run additional feeders and the central station provides an abundance of power during the entire 24 hours of each day. When a belt breaks only one group of machines is affected and with individual drive the belt in question is entirely eliminated. Fire risks are reduced and heavy belt connections from floor to floor are eliminated. Central-station service does much to relieve the smoke nuisance which is important where manufacturing plants are located in the central part of the city. Further there does not have to be made any elaborate provision for the shipment of coal and the disposition of ashes, only enough fuel for some low-pressure heating boilers is necessary.

Service for the companies described here is furnished by the Syracuse Lighting Company.

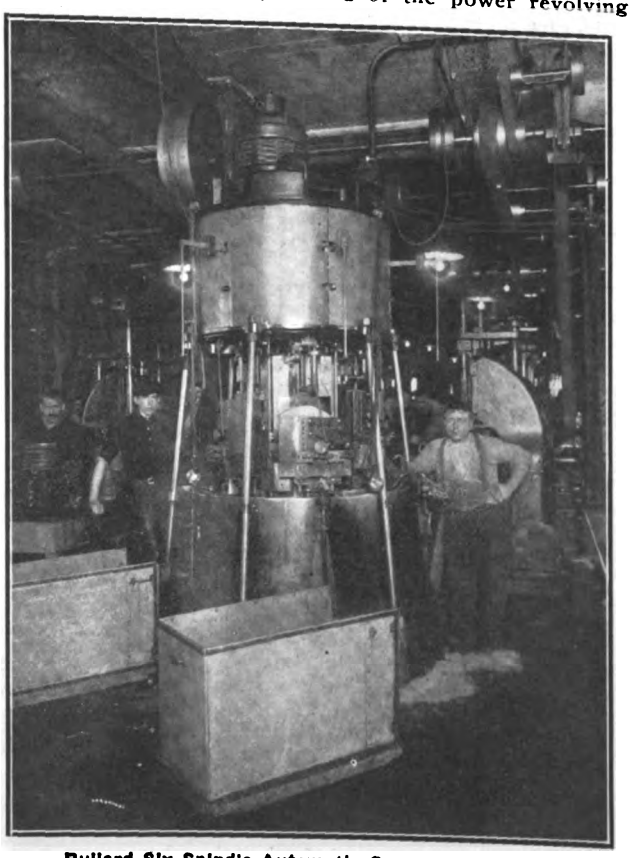
Installation of Brown-Lipe Gear Company.

The Brown-Lipe Gear Company originally came into existence in the early days of the bicycle industry as manufacturer of sprockets and two-speed gears for bicycles. From that start have grown two large manufacturing institutions that today supply a large percentage of the automobile manufacturers of the country with the differentials, transmission and control sets. In the plant of the Brown-Lipe-Chapin Company are produced the differentials, while the Brown-Lipe Gear Company confines its manufacturing facilities to the production of the various types and forms of transmissions and control sets.

In ordinary language, a differential is an assembly of gears that enables the rear wheels to move at different speeds. When an automobile turns a corner the inside wheel nearest the curb revolves slower than the outside wheel. The two rear wheels, which are the driving members, are locked together by the main axle shaft when the car is proceeding in a straight line and are both revolving at the same speed in proportion to the speed of the engine. Provision must be made, therefore, for breaking of this lock when the speed of the two wheels becomes different. It is this function of permitting one wheel to go slow and the other to go fast that is performed by the differential. The differential set consists of a pair of cases, a four-armed spider, two side gears, four side pinion gears, twelve cap screws, one bevel drive gear, twelve rivets, and one bevel drive pinion.

When a car is proceeding in a straight line the power is transmitted through the main driving shaft to the bevel pinion which is meshed with the bevel gear. As the shaft revolves the bevel pinion in turn revolves the main axle shaft and the entire differential assembly at right angles to the main driving shaft of the engine. The main axle shaft is in two parts, each one attached firmly to its road wheel and differential side gear. This simply makes the wheels revolve and propels the car forward.

When a turn is made, instead of the power revolving



Bullard Six-Spindle Automatic Gear Machine.

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the entire differential as a unit, two side gears and four side pinions immediately begin to turn upon their bearings in the four-arm spider. In this way the difference in speed between the two wheels is assimilated or compensated for within the differential itself, by the pinions and side gears.

Before taking up the manufacturing process and the motor equipment it may be pertinent to give a brief general description of the buildings of the Brown-Lipe-Chapin Company. The main building is a modern reinforced concrete structure, of "L"-shape, five stories in height with a basement, making six working floors. There are 163,574 square feet of floor space including the hardening plant which is located in a separate building. The part of the building corresponding to the stem of the L is 297 by 71 feet, and the wing corresponding to the base of the L is 71 by 59 feet. The floors and the roof are supported by 34 reinforced-concrete columns. At the present time there are 800 day employees and 750 night employees.

The basement is occupied by the plumbing and blacksmith shops, the box department where the shipping cases are made, supply department, and the raw-stock department. The machinery and motor equipment in the basement consists of a size 12 by 12 by 16-inch Bury air compressor with a capacity of 620 cubic feet of air per minute belted to a 150-horsepower, squirrel-cage induction motor operating at 485 revolutions per minute under full load. There is a second air compressor of the same make with dimensions of 10 by 10 by 14 inches and having a capacity of 400 cubic feet of air per minute, driven by a 75-horsepower induction motor operating at 720 revolutions per minute. A 35-horsepower motor operating at 720 revolutions per minute group drives a Bradley hammer, two forge blowers, an exhaust fan, and two circular wood saws. Three cut-off saws and a drill press are driven in a group by a 15-horsepower induction motor operating at 710 revolutions per minute under full load. For the heating system there is an 8-foot Sturtevant fan driven through a Morse chain by a 50-horsepower variable-speed, slip-ring induction motor. On an upper floor there is a third air compressor, size 8 by 9 inches, with a capacity of 100 cubic feet of air per minute. The two compressors in the basement furnish compressed air for sand blasts, air lifts and the Gleason straightening and tempering machines in the hardening department, and the third compressor furnishes compressed air for pneumatic riveting machines.

Service is supplied by the Syracuse Lighting Company from the 2,300-volt, 3-phase, 25-cycle street mains. In the basement there is a transformer room where are located three 250-kilovolt-ampere, oil-insulated, water-cooled transformers with a transformation ratio of 2,300-440 volts. An additional bank of transformers with the same characteristics and rated at 150-kilovolt-amperes will soon be installed. The entrance switch is oil-break and located on a slate panel supported on an angle-iron frame. In addition there is a building feeder panel and a panel containing a graphic recording watt-hour meter. There are a total of 42 motors aggregating 1,400 horsepower and the average load carried is 800 kilowatts. The rate per kilowatt-hour, based on several factors, averages one cent. The monthly current consumption for seven months of 1915 is given on the motor data sheet.

Electrical construction throughout the building is of the most modern and approved style. All elevators are provided with a snap switch which, when on, locks the elevator control rope so that any tampering has no effect and the car cannot be started until the switch is turned off. The switch is inclosed in an iron box with a hinged cover and a hasp. All stairway lighting can be controlled from each floor landing and the lights turned on or extinguished from top to the bottom of the building from any one of the switches. A novel electrical attachment is used on the Gleason gear generators consisting of a small ruby incandescent lamp which automatically lights when the last tooth in the gear is finished.

Motor Applications.

The manufacturing process next demands attention. The gear blanks consisting of drop-forged rings of steel of approximately the shape of the finished bevel gear are received from a forge plant. The first operation is what is termed the rough forging inspection. The gear blanks are inspected carefully to see that there are no cracks nor flaws apparent from an outside examination after which a certain fixed percentage of these blanks is drilled sufficiently to get samples of the steel to be analyzed in the chemical laboratory. The entire shipment of rough forgings is held in the receiving stock room until the samples have been thoroughly analyzed. After the chemical analysis the gear blanks are still further prepared for the first machine operation by going through a preliminary heat-treating and annealing process. This makes the forging uniform in consistency throughout and removes the forging or internal strains.

In the machine department the first operation consists

Motor-Driven Blower.

of boring out the center of the gear and facing the back so that it presents an absolute right angle to the bored center. This operation is then inspected with micrometers to insure absolute accuracy of size and is also tested on specially constructed jigs. The boring is done on a battery of boring mills including six machines which are group-driven by a 30-horsepower motor operating at 1,125 revolutions per minute at full load. This motor also drives a turret lathe and two small grinders. Located near the boring mills is an interesting group of machines consisting of seven broaching presses which make square holes in gears that move over a square shaft. The hole is made by drawing a series of dies through the round hole first drilled. This group of machines is driven by a 30-horsepower motor operating at 1,125 revolutions per minute under full load.

From the inspection, after the gear blank leaves the boring mill, it is sent to another machine which finishes the face and the back angle surfaces. This machine is individually driven by a 25-horsepower motor. The blank is then placed in what is called a running fixture and inspected while running, to insure trueness of the running gear. The blank is then placed in a jig, drilled and counterbored. This work is done on the drills indicated in the motor data sheet. At this point the various surfaces have been machined to such an extent that the blank itself can

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Motor Data Sheet.

Brown-Lipe-Chapin Company, Syracuse, N. Y. Service from Syracuse Lighting Company—Three-phase, 25 cycles, 2,300-440 volts, 42 motors, 1,440 horsepower, 440 volts, squirrel-cage type unless otherwise noted.

Kilowatt-hour consumption, seven months:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
June	287,800	August	282,100	October	360,000
July	294,900	September	319,200	November	306,000
				December (estimated)	308,000

Note—Letters fl following motor speed indicate full-load speed.

Average load for lighting and power, 800 kilowatts. Average cost of current per kilowatt-hour, one cent.

No.	Horse-power.	Speed, R. P. M.	Kind of Drive.	Application.
1	150	485 fl	Belt	Bury air compressor—size, 12 by 12 by 16 inches; capacity, 620 cubic feet of air per minute; use, sand blast, air lifts, Gleason straightening and tempering machines.
1	75	720	Belt	Bury air compressor—size, 10 by 10 by 14 inches; capacity, 400 cubic feet of air per minute; use, sand blast, air lifts, Gleason straightening and tempering machines.
1	35	720	Group	Bradley hammer, two forge blowers, exhaust fan, two circular saws.
1	15	710 fl	Group	Three cut-off metal saws, one drill press.
1	50	.....	Chain	Sturtevant 8-foot fan for heating system.
1	35	720	Belt	Air compressor—size, 8 by 9 inches; capacity, 100 cubic feet of air per minute; use, pneumatic riveting machines.
1	35	720	Morse chain	Root No. 4 blower—size, 14 by 38.5 inches; pressure, 2.5 pounds; capacity, 167 cubic feet of air per minute; use, air pressure for tempering furnaces.
1	25	720	Gears	Triplex pump—capacity, 250 gallons per minute; use, circulating cooling oil for tempering.
1	30	1,125 fl	Group	Seven broaching presses for making square holes in pinion centers.
1	30	1,125 fl	Group	Six small boring mills, one turret lathe, two small grinders.
2	35	1,500	Group	Thirty turret lathes.
1	35	1,500	Group	Fifteen turret lathes, two 4-way spider machines, group small miscellaneous machines.
1	25	1,500	Group	Ten Fay machines, group miscellaneous small machines.
1	35	1,500	Group	Three small engine lathes, 22 automatic screw machines, four multiple-spindle drills.
1	25	1,500	Direct	Bullard 6-spindle, automatic gear machine for facing gear blanks.
7	25	1,435 fl	Group	Ninety Jones & Lamson semi-automatic turret lathes for finishing parts of gears and cases.
1	35	1,500	Group	Fourteen engine-lathes, three shapers, five milling machines.
6	35	1,500	Group	Battery of 115 Gleason gear planers used in generating bevel gears.
2	35	1,500	Group	Battery of 39 Pilgrim machines for finishing pinions.
		1,440 fl	Group	Battery of 47 blocking machines for the rough cutting of gear teeth.
1	35	1,500	Group	Seven Jones & Lamson turret lathes, miscellaneous small drills, five engine lathes, two boring mills, one cutting-off machine.
1	25	1,435 fl	Group	Five Pratt & Whitney screw machines, four testing machines, seven Lucas presses, two key-seating machines, four engine lathes.
1	15	710 fl	Group	Two shapers, 12 drill presses, one slotter, one small shaper.
1	25	1,435 fl	Group	Nineteen drill presses.
1	50	720	Group	Twenty-nine grinders.
1	30	1,425 fl	Group	Sixteen grinders.
1	35	1,440 fl	Group	Nine test machines.
1	25	1,435 fl	Group	Miscellaneous small machine tools.

Brown-Lipe Gear Company. Service from Syracuse Lighting Company—Three-phase, 25 cycles, 2,300-400 volts. Seventeen motors, squirrel-cage type unless otherwise indicated in text.

No.	Horse-power.	Speed, R. P. M.	Kind of Drive.	Application.
1	25	1,200	Group	Four forge blowers, one Bradley hammer, one power hack saw, one emery grinder, four cut-off saws.
1	15	1,200	Group	Two circular wood saws, one emery grinder.
1	25	1,200	Group	One engine lathe, two special milling machines, one small drill, one emery grinder.
1	25	1,200	Group	Thirteen grinding machines, one small pump.
1	15	1,200	Group	One power hack saw, five engine lathes, three milling machines, two drills, one shaper.
1	25	1,200	Group	Two small drills, one shaper, one drill press, ten milling machines.
1	25	1,200	Group	One engine lathe, eight milling machines.
1	25	1,200	Group	Two small milling machines, one engine lathe, ten blocking machines, thirteen Fellow gear shapers.
1	25	1,200	Group	Ten Jones & Lamson turret lathes.
1	25	1,200	Group	Twenty-three Jones & Lamson turret lathes.
1	25	1,725 fl	Group	Three small special machines, twelve engine lathes.
1	15	1,200	Group	Three Pratt & Whitney grinders.
1	25	1,200	Group	Three engine lathes, two emery grinders, four traveling-bed milling machines, three special turret lathes, three drills.
1	25	1,200	Group	Three shapers, one engine lathe, four milling machines, six drill presses, one special lathe.
1	25	1,200	Group	Twenty ball-bearing machines.
1	25	1,200	Group	Three drills, emery grinder.
1	25	1,200	Group	One testing machine, six turret lathes, eight multiple-spindle drills, eight milling machines.

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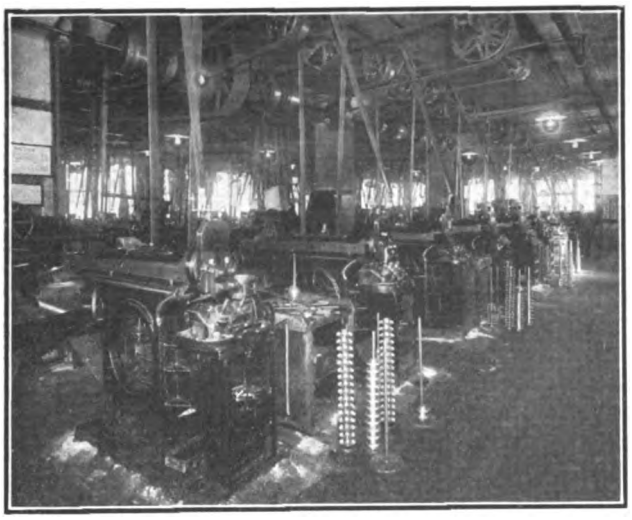


Gear Planers for Rough Cuts.

be held in a cutting machine which performs the next operation known as rough blocking or gashing of the teeth. For the rough cutting of the pinion and gear teeth there is a battery of 47 blocking machines driven by a 35-horsepower motor operating at 1,440 revolutions per minute full-load speed. The pinions are finished on a battery of 39 Pilgrim machines driven in two groups by two 35-horsepower motors whose rated speeds are 1,500 revolutions per minute.

The gears when removed from the blocking machines are again inspected and the blanks are sent to the gear generating department. It is here that perhaps the most unique operation in the entire manufacture of gears takes place. So remarkable is this process of generating a gear that no attempt will be made to go into details here. When the gear blank comes from this operation it is completely machined, and to all outward appearances ready for work. There is a battery of 115 Gleason gear-planing machines for this work which are arranged in groups and driven by seven motors, two of 25 and five of 35-horsepower capacity, with rated speeds of 1,500 revolutions per minute. The next process is hardening or heat tempering which takes place in the hardening department. The surface of the gear and the teeth must be hard to resist the wear during the operation of the car. The gears are subjected to a process which hardens the surface of the gear to a depth of one-thirty-second of an inch and refines the toughness of the core.

The hardened gear is then sent to the testing department in the heat-treating room, and by a variety of unique tests, is examined as to the hardness and evenness of hardening. The gear then goes to another machine for straightening it, inasmuch as it frequently bulges out of true during the subjection to extreme heat. An electric pyrometer is connected to each furnace and an accurate record of the time and temperature is taken. In the hardening department there is a Root No. 4 blower, size 14 by 28.5 inches which furnishes air at 2.5 pounds pressure to the tempering furnaces. For circulating the cooling oil, there is a 250-gallon triplex pump geared to a 25-horsepower motor operating at 720 revolutions per minute.

So far the machines and motors used for the principal manufacturing processes only have been enumerated. There are numerous groups of miscellaneous machines for the production of the various parts as indicated on the motor-data sheets. There are in addition several important groups of machines for special work, one of which is a battery of 90 Jones & Lamson semi-automatic turret lathes which are driven in groups by seven 25-horsepower induction motors.

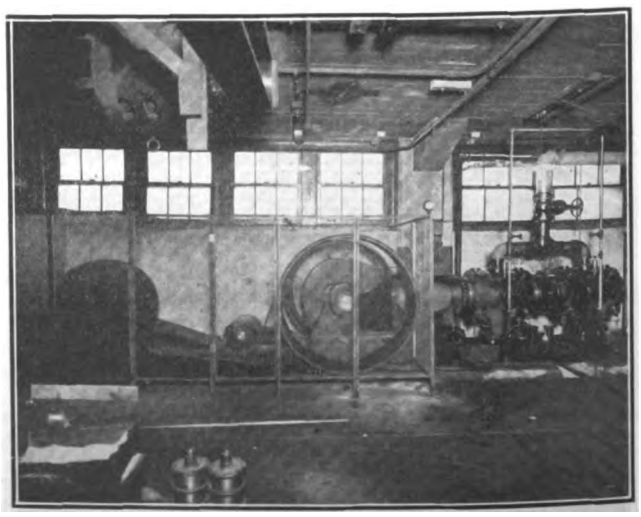
Brown-Lipe Installation.

Attention is next directed to the plant of the Brown-Lipe Gear Company, which, as before stated, specializes in automobile transmission gears and control sets. A transmission set is a combination of gears and shafts that provides for variable speeds and variable power applications to the driving wheels of the car. The necessity for the use of a transmission set is based on the principle that in internal-combustion engines the power delivered by the engine is absolutely correlated to the speed at which the engine is revolving. If a certain gas engine is delivering a certain power impulse, of say three horsepower at 200 revolutions per minute, at ten times that speed or 2,000 revolutions per minute, the engine will provide approximately ten times the power, or 30 horsepower. In the driving of every car there are times when great power is required at slow speed, as evidenced in the starting or driving through mud or hill climbing. It is obvious that it requires more power to move a car from a dead stop into motion than to propel a car forward on a perfectly level road. To accommodate the various operating conditions the transmission is built so that while the engine may be turning over at top speed and delivering its maximum power, the car may be geared down so that it is not moving at maximum speed.

In the production of the transmission gears, there is one feature which is carefully watched that is perhaps at a little variance with common practice. In the generating of gears, several blanks are laid one on the other, and put into a gear shaper in such a manner that the cutting tool works up and down over three, four or more gears at the same time. This work is done by 10 blocking machines driven by a 25-horsepower motor operating at 1,200 revolutions per minute, and 13 Fellows gear shapers driven by the same motor.

In order to have all of the teeth cut at absolute right angles to the face of the gear, the gear blanks must be absolutely parallel and accurate. All gear blanks are ground parallel before shaping by 13 grinding machines driven by a 25-horsepower motor operating at 1,200 revolutions.

As indicated in some of the preceding paragraphs, there is probably no single operation so important as that of heat treating of the metal after it has been machined. When the gears are brought into the heat-treating department of the Brown-Lipe plant they are first turned over to an operator who lays them out to be placed in a certain furnace. Each individual gear is then numbered in such a manner that two or three years afterwards, if the case requires, the gear can be identified as having been heated on a certain day, in a certain furnace, in a particular pot and position in the furnace.



Motor-Driven Air Compressor.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Demonstrations of Electrical Appliances Made for Benefit of Housewives and Maids.

In an effort to emphasize the value of electricity to the housewife and to acquaint the women of Greater New York with the unlimited possibilities of electric cooking and heating appliances, the Bureau of Home Economics of the New York Edison Company has arranged a series of demonstrations and lectures to take place in the Forty-second Street Building. These occur daily between the hours of three and four o'clock, except Saturdays.

A general invitation has been sent out to the women of New York to visit the Edison Company's building during these demonstrations. And as an indication of the general interest in electric cooking and heating appliances, a score of women have accepted these invitations and large audiences gather at the Edison building daily.

Demonstration of Electric Cooking Appliances in the Forty-second Street Building of the New York Edison Company.

The demonstrations so far have been carried on by the employees of the Home Economic Bureau. Their method is to devote each day to a separate cooking appliance. Several grills are operated at the same time and the lecturer demonstrates what can be done with them and how they should be used to secure the most satisfactory results.

An interesting feature of this new work undertaken by the Edison Company is a class for servants which will soon be inaugurated. Maids will be taught the use of the various forms of household appliances and given a thorough training in cooking with electric utensils. This has been instituted in an effort to overcome one of the chief difficulties encountered by electric appliance salesmen who contend that the ignorance of domestics regarding electric cooking appliances is responsible for the loss of a number of possible sales.

A "Wireless" Sign Attracts Attention in Springfield Window.

A novel electric sign operated by a Tesla coil recently was shown in operation in a window display of the Springfield Gas & Electric Company, at Springfield, Ill. The sign is the invention of William R. Davis, chief electrician of the company, and has several attractive features.

The sign read "Do It Electrically" and in addition to the letters being formed by a series of blue crashing sparks, each letter was automatically spelled out in dots and dashes of the wireless telegraph code. The noise made by the sparks attracted attention and the curiosity of the spectator was aroused to interpret the meaning of the dots and dashes. A copy of the code as used was displayed on a large card near the sign so those not familiar with the meaning of the dots and dashes could watch and listen and identify each letter as it was spelled out.

The sign was made of billposter's tacks driven into a pine board stained black, a gap of about one-sixty-fourth of an inch between tacks being allowed. The board was mounted on a table and surrounded by a funnel of black cloth in order to exclude any outside light. The over-all dimensions of the sign were 4 feet long by 1 foot high. The letters were 4 inches high and 3 inches wide, making a total of 320 gaps which was equal to about a five-inch gap. The tacks being almost invisible in the dark background added some mystery to the sign and the quick-acting blue sparks gave a very sharp appearance to the letters. It could be seen and heard for about a block away. The 16 letters were spelled out in 45 seconds and at the end of this period the window lights were automatically turned on, displaying other electrical appliances in the window.

The dots and dashes corresponding to the letters of the signs were made by means of contacts of dot and dash size soldered on a copper ribbon which was then mounted on the rim of a wooden wheel about 10 inches in diameter. On one side of this wheel was a continuous copper strip which supplied current to the contact for flashing on the window lights during the time the sign was inoperative. Brushes of spring copper were used to convey the current to and from the wheel. To produce the sparks the high-frequency current of the Tesla coil was used. This coil was designed to give a spark of about six inches. The primary of this coil was made of copper ribbon one-half inch wide and one-thirty-second of an inch thick and consisted of 450 turns of No. 28 enameled-copper wire wound on a paper tube five inches in diameter, spaced 32 turns per inch. The Telsa coil was operated through a 0.5-kilowatt closed-core transformer with a ratio of 110 to 1,500 volts. A condenser consisting of 20 glass plates 8 by 10 inches covered with tinfoil 6 by 8 inches submerged in transformer oil was connected across the secondary of this transformer and discharged across a needle-point spark gap of about three-sixteenths of an inch through the primary of the Tesla coil. The energy input to the transformer was 200 watts.

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Co-Operative 14 Months Appliance Campaign

Complete Details of a Comprehensive Sales Effort Inaugurated by the Pacific Gas & Electric Company Which Is Participated in by All Local Dealers

What is undoubtedly the most comprehensive current-consuming device campaign that has ever been conducted on a co-operative basis is now in progress under the auspices of the Pacific Gas & Electric Company, of San Francisco, in the entire territory served by the company. The campaign began on November 29 and is to continue without interruption for 14 months, during which time every customer served directly by the company will be visited by seven salesmen representing seven different dealers.

The general features of the campaign, which is novel in many ways, are best outlined in a general letter which was sent to the seven dealers who are participating in the campaign and to all employees of the Pacific Gas & Electric Company who are affected by it. The following data are taken from this letter.

There are many angles to the question of whether or not a central-station company should engage in the sale of appliances. Examples of successful operation under both policies can be cited almost without number.

It is quite generally believed, however, that by deciding to refrain from the handling of appliances the central station forfeits its rights to take an active part in building up this class of business. That this view is entirely without foundation is evidenced by the comprehensive campaign inaugurated in northern California under the auspices of the Pacific Gas & Electric Company, which is described herewith.

The Pacific Gas & Electric Company divided its territory into seven districts and assigned one district to each of the seven distributors of electrical appliances who are co-operating in the campaign. Every district is to be worked for 60 days by each distributor. Thus the campaign will continue for 14 months, during which time every customer of the company will be approached by seven different salesmen.

The Pacific Gas & Electric Company pays each salesman, employed by the distributor, $12 per week salary and in addition allows a commission of 50 cents for every new appliance placed on its lines. It also has dedicated all newspaper space regularly contracted for in its entire territory to the campaign.

It will be interesting to follow the results of this campaign, which is perhaps the most extensive ever conducted on a co-operative basis.

Division of Territory.

To enable the various distributors to thoroughly cover the Company's territory, seven districts have been created for the purpose of this campaign and are designated as Nos. 1 to 7 inclusive.

The following is the division of territory and to whom assigned:

District No. 1, comprising Oakland, including Emeryville and Piedmont, was assigned to the Western Electric Company.

District No. 2, comprising the balance of Alameda County, was assigned to Dunham, Carrigan & Hayden.

District No. 3, comprising San Jose and Redwood districts, was assigned to the Electric Appliance Company.

District No. 4, comprising Marin, Petaluma, Santa Rosa, Contra Costa, San Joaquin, Stanislaus and Electra districts, was assigned to the Electric Railway & Manufacturers Supply Company.

District No. 5, comprising Napa, Solano, Yolo, Nevada, Placer and Drum districts, was assigned to the Telephone-Electric Equipment Company.

District No. 6, comprising Chico, Colusa, Colgate, DeSabla and Marysville districts, was assigned to the Pacific States Electric Company.

District No. 7, comprising Sacramento district, was assigned to the Holabird-Reynolds Company.

STATEMENT OF CONSUMERS.

Division No. 1	29,186
Division No. 2	15,515
Division No. 3	15,252
Division No. 4	12,327
Division No. 5	7,283
Division No. 6	5,103
Division No. 7	11,134

The original assignments were determined by drawing lots.

Each of the above distributors agreed to work the territory allotted to him for a period, not to exceed 60 days, at the end of which time he will move on to the next district in numerical order. For instance the distributor in District No. 1 will at the end of 60 days move to District 2, and the distributor in District No. 7 will move to District No. 1. The work will continue in this manner until each distributor has worked in all districts, which will require 14 months, the period of the campaign.

Advertising.

The Company offered to place at the disposal of the distributors the advertising space it has in newspapers and other publications in all districts. The distributors will prepare their own copy which must be approved by the publicity manager of the Company before publication.

Each district manager of the Pacific Gas & Electric Company gives publicity to the campaign by arranging for the display of appropriate banners, cards, and other advertising matter in the office, show window, and on the vehicles of the Company, as agreed upon by him and the representative of the distributor in his district.

The Company has also arranged to attach to consumers' monthly bills, stickers or posterettes when furnished by the distributor.

The various district managers render all possible assistance in the distribution of literature descriptive of the appliances being offered for sale by distributors. This literature is given out over the counter and inclosed with bills sent out by mail. One of the conditions of the campaign is that all literature to be distributed by the Company must bear the imprint:

"For Sale by the Pacific Gas & Electric Company, and ———— dealers." The names of the distributor's local dealers are given in the blank space.

Selling Organization.

The distributors agreed to employ salesmen, either male or female, not to exceed five in number, which number shall be determined by the manager and shall be increased only by agreement of the distributor and the representative of the Company. Salesmen must in every instance be acceptable to the Company.

Distributors, their representatives, or salesmen are not to be permitted to make any collections, these being made by the Company's regular collectors or by some other person designated by the district manager.

One rather unusual feature of the campaign is that all salesmen are introduced by card, which is furnished by the

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Company, upon application of the distributor. The distributors make request for cards by letter, giving the names of the salesmen, quantity required, and stating to whom delivery should be made. Salesmen present these cards when calling on a customer.

The Company pays the expense of transporting salesmen from one district to another once only, and to points within the district in accordance with its established practice. No funds for entertainment or living expenses of salesmen are allowed. All expenses of the distributor's crew manager and demonstrator are borne by the distributor.

Distributors also pay the expense of transporting salesmen to the district where the distributor is to initiate his campaign.

Salesmen are paid a weekly salary of $12 by the district office of the Pacific Gas & Electric Company. In addition to weekly salary they receive a commission of 50 cents on each appliance sold, such commissions are also to be payable weekly by the Company. Commissions on office sales are divided equally among the total salesmen employed in the district.

Salesmen are required to turn in daily time cards to the crew manager, who approves same and delivers to the district manager or some person designated by him. Salesmen record their sales in order books which will be furnished by the Company. The crew manager furnishes daily reports on sales.

Space is allotted in all offices by district managers for the proper display and demonstration of the various devices being offered for sale. Each distributor is required to remove his display at the conclusion of his work in the district so that the space will be available for the next distributor.

Handling of Stock.

The distributor or his representative must request the Company's district manager to place requisitions for appliances from time to time, as may be deemed necessary for the prompt filling of orders. Such requisitions are placed by the district manager in accordance with established methods of the Company.

Upon conclusion of the distributor's operation in a district he consults with the Company's district manager as to disposition of any unused stock, and it will be in order for the district manager to arrange with the manager of the district to which the distributor is moving to place a requisition, through the regular channels, for such unsold stock, it being understood that no distributor is to leave behind him any unsold stock.

The Company will not provide any stock to be left with consumers on trial, nor will salesmen be permitted to leave any sample stock with consumers for trial purposes.

Local Dealers Participate.

Local dealers participating in the campaign are encouraged to make proper window displays and demonstrations. Such dealers will receive from the Company 50 cents per appliance sold when placed on the Company's lines. They, however, must make application to the district manager for a supply of forms which must be used in obtaining a receipt from the purchaser of each appliance. These receipts must be turned in to the district manager, preferably weekly, and upon receipt of same by him the record will be entered on the consumers' cards. The dealer must keep a proper record of all sales and at the close of each month submit a statement to the district manager showing the number of appliances sold. The dealer must also file a copy of this statement with his jobber. Upon receipt of the monthly report with such proof as may be required he will receive payment from the Company.

Installment Payment.

Dealers have the privilege of making sales on the installment plan. They must make application to the district manager, however, for approved installment forms which, when properly filled out and accepted by the Company together with first payment, the dealer will receive the full retail price of the article from the Company. For instance, an appliance selling at retail for $3.00 cash, by installments will sell for the cash price plus 10 per cent, or $3.30. The dealer will receive for this contract when sold to a consumer on the Company's lines the sum of $3.00 and in addition thereto his regular allowance of 50 cents for each appliance sold.

No installment contract made by a dealer becomes an obligation on the Company until accepted by it and in all cases the 10 per cent added to carry the installment is to be deducted in the payment to the dealer.

The crew manager of the distributor is required to confer with the Company's district manager on all questions arising in the district which may require decision as to course of procedure when such matters are not covered by written instructions.

S. V. Walton, commercial manager of the Pacific Gas & Electric Company, is in direct charge of the campaign.

Descriptions of Forms Used.

The following is a description of the various forms used in the campaign.

Appliance Installation Record.

The district manager has one of these cards filled out with the name and address of each electric consumer in the district, the work being done with the addressograph whenever possible. They will then be turned over to the crew manager who will apportion a certain number each day to the salesmen who are to fill in the list of appliances already used by the consumer, and on the reverse side, the list of appliances he sells to him.

These cards when filled out by the salesmen must be returned to the crew manager who will be responsible for the systematic filing and safe keeping while he is in the district, that they may form a permanent record for the crew managers succeeding him.

Appliance Order.

This form is made out by the salesmen who will fill in all information and obtain the signature of the purchaser to all the copies. The original copies must be turned in daily to the district office, the duplicate is given to the purchaser at the time of taking the order, and the triplicate remains in the book to form a permanent record.

Appliance Sales Agreement.

This form is made out in duplicate in the district office in accordance with information contained on the Appliance Order. It is signed by the purchaser at the time of delivery of the appliances by an employee of the Company who shall leave the duplicate copy with the purchaser and retain the original for office record.

Appliance Sales Agreement for Dealers.

This agreement is used by dealers selling appliances on installments to consumers on the Company's lines. When the credit of the purchaser is satisfactory to the Company and the assignment of the agreement is made to the Company in accordance with instructions the dealer will be credited with the cash price of the appliance.

Certificate of Purchase.

The Company will allow the 50 cents per appliance to dealers selling appliances to consumers on the Company's lines only when this form is made out by the dealer and signed by the consumer at the time of purchase. The original copies of these certificates are turned in weekly to the District Office.

Notice of Assignment.

This form is made out in duplicate when Appliance Sales Agreements are assigned by dealers to the Company. The original copy is sent to the purchaser, the duplicate remaining in the office for record.

Lamp Socket Appliance Campaign Daily Report.

These reports are made out in triplicate daily by the crew manager and forwarded as follows: original to the district manager, duplicate to the distributor, and triplicate to the head office representative of the Company.

Monthly Statement of Appliances Sold by Dealers.

This form is made out at the end of the month by each dealer in quadruplicate, covering all sales made during that month for which he claims a revenue from the Company. The dealer must forward within ten days after the close of the month the original, duplicate, and triplicate copies to the district manager of the Company.

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SUCCESSFUL COMMERCIAL MANAGERS.

S. V. Walton.

Those who were fortunate enough to attend the annual convention of the National Electric Light Association, at San Francisco last June, were agreeably surprised to learn from committee reports of the remarkable commercial development which has characterized the central-station industry in the West. One of the leading figures in this commercial activity is Stanley V. Walton, manager of the commercial department of the Pacific Gas & Electric Company, San Francisco. Mr. Walton is now conducting an appliance campaign, described elsewhere in this issue, that is perhaps without parallel in the history of the central-station industry.

Mr. Walton was born on a ranch in Sutter County, California, about 50 miles north of the City of Sacramento and practically in the center of the Sacramento Valley. His youth was spent on a ranch. After graduating from the country school he attended the Oakland High School, in Oakland, Cal., and later took the electrical engineering course at the University of California, graduating in 1904 with the degree of Bachelor of Science.

In the summer of 1898, together with a number of other young fellows from Sutter County, Mr. Walton went up to the Big Bend country, in eastern Washington, to help introduce the combined harvester for harvesting grain crops in that section. At that time most of the combined harvesters on the market were pulled by horses and mules and the machinery operated by the tractive effort of the wheels, although there were then on the market a few harvesters pulled by large steam-driven traction engines. Since that time the operation of farm machinery has been revolutionized by the gasoline engine, and now, in some instances, electricity is utilized, particularly for the operation of stationary apparatus.

In the fall of 1904 Mr. Walton had a short experience in merchandising business with the J. K. Armsby Company, of San Francisco. On January 6, 1905, he entered the employ of the California Gas & Electric Corporation, the predecessor of the Pacific Gas & Electric Company. His work in the beginning was surveying for electric pole lines. In March, 1906, he was transferred to the Land Department of the company, and in May, 1907, was appointed manager of the commercial department, which position he has since held.

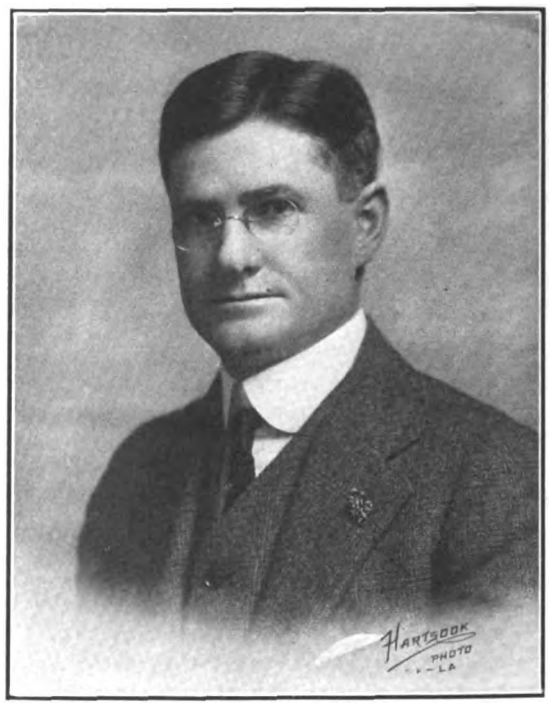
There have been a number of interesting developments in the company since Mr. Walton's connection with the commercial department. This company was one of the pioneers in the business of developing electricity on the farm, and considerable attention has been attracted by two booklets which Mr. Walton prepared, one in connection with electrically driven pumping plants and the other in connection with an electrical demonstration car. Both of these booklets were issued in the spring of 1912. The demonstration car was operated from April until September, 1912, both months inclusive, after which it was dismantled, as there seemed to be no further need for it. The car was exhibited at the state fair, early in September, 1912, and took first prizes for electrical devices suitable for household and farm use.

Mr. Walton learned early in his commercial experience the value of the small consumer; first, because of the fact that the small consumer pays a higher rate and when present in large quantities the cost of serving is not exorbitant, and second, if one or two of them drop out there is no great loss in revenue, as would be the case with larger consumers. Having once been impressed with this fact he has endeavored to develop the small consumers, particularly those on existing lines, although, of course, not overlooking the larger consumers as well, as it is the proper balance of large and small consumers that produces the large diversity-factor on a system such as that of the Pacific Gas & Electric Company.

In 1913 he conducted a campaign to replace gas engines with electric motors, and as a result secured over 100 new consumers aggregating a load considerably over 1,000 horsepower, practically all of these being located close to existing lines where the cost of connecting up was very small.

During the period he has been connected with the company there has been a very large increase in total revenue, due, of course, to increase in population as well as to the activities of the company in developing new business.

Mr. Walton has given a great deal of thought to the matter of co-operation with the various electrical interests —manufacturers, jobbers, dealers and contractors—and has in effect at the present time a co-operative sales campaign covering the entire system, in which all of the electrical interests are participating.



Stanley V. Walton,
Manager, Commercial Department, Pacific Gas & Electric Company, San Francisco.

He has taken an active interest in National Electric Light Association affairs for a number of years, and at the present time is a member of the Executive Committee of the Commercial Section. He was chairman of the Company Section of the N. E. L. A. last year and is now a member of the Executive Committee of the Section.

Increasing Business Makes Plant Extensions Necessary at Joplin.

The recent large industrial development of Joplin, Mo., and its district has been assisting, as well as reacting favorably upon, the Empire District Electric Company. The load on the plant has increased so rapidly that it now has left only about 30 per cent of reserve, and is not taking on any new accounts. Additional service is given only to customers already on the lines, and to these on condition that they relinquish service in case of trouble which requires use of the reserve. The press of business necessitated immediate enlargement of capacity, and the company has purchased an available turbine at Brooklyn, with a capacity of 9,000 kilowatts. The company is extending its turbine room at the Riverton plant to accommodate this machine.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

PLANNING A POWER SALES CAMPAIGN.

Details of Methods for Organizing a Power Bureau and Systematically Securing Industrial Business.

By Thomas R. Hay.

The development of our industrial life is necessarily dependent upon the manufacture of power and the ability to utilize it in such form that it can be substituted for the physical work of man and electricity is the most convenient form in which this energy can be generated, transmitted and distributed to the various desired points of application. It is not in itself a source of energy, but is obtained, either directly or indirectly, by transformation in either a chemical or mechanical form and in all practical cases is again transformed before being utilized. This last transformation can be accomplished by means of the electric motor.

Ten years or so ago central-station managers were devoting their energies almost exclusively to the expansion of the electric illuminating business, unmindful of the fact that the requirements of their customers necessitated 24-hour service for a revenue load condensed in an evening peak of 3 or 4 hours. Gradually, however, they began to realize the necessity for increasing the operating load-factor and the over-all efficiency of the generating station made necessary by the increasing cost of efficient and reliable service and the more exacting requirements of the user. Attention was naturally turned to the industrial field for a solution of this problem and in proportion as the value of a day load was appreciated in just such a proportion was the central-station management aggressive in soliciting this class of business and progressive in its standards of equipment and service until now a central station is rarely found that does not systematically cultivate this field. And the natural result has been that, in most cases, the domestic and municipal illumination is a by-product of the central-station's activity. This remarkable progress has been largely due, initially at least, to the hearty co-operation of the manufacturers of electrical equipment who, in endeavoring to expand the market for the sale of their products, perceived in the central station an agent that could be interested and developed in a quick and easy manner. At first, central-station managements were slow to realize the possibilities offered by this new field and were somewhat reluctant to co-operate to the extent of reducing rates to a point where they would be at all comparable with the existing industrial manufacturing costs for power. But gradually and, in some cases, in spite of themselves, the load has been increased with the result that it is now considered possible to sell power at a low cost and yet at a profit. The initial users of central-station service were small operations, as it was not considered possible to sell this service to the large users. Now, however, no installation is too big and every user of power, other than central-station power, should be and is a legitimate prospect.

Make Complete Survey.

In beginning a campaign for the sale of electric power a good plan is to make a complete survey of the fields to be covered. This will require a quick, but reasonably accurate, census of all power users and the preparation of a report showing for each user the class of business, type of power in use, condition of the existing plant and of the business, the total available load and other pertinent data, together with an estimate of the probable annual revenue to be derived and the cost of adapting the existing plant to central-station service. A statement regarding the attitude of the prospect and other notes that may be of value in determining the most active ones and those which will be most benefited by the use of central-station service should be included. If the field to be covered is sufficiently extensive individual salesmen may be assigned to cover related industries or each man may be assigned to a district. If some districts are more important than others the more capable and experienced men may be assigned to handle the larger and more important prospects with less experienced men to look after the smaller ones.

With the information obtained from the census it will be possible to determine the areas of probable growth and to lay out the transmission and distribution circuits accordingly. The management will also have a very definite knowledge as to how much unconnected load there is available, how much work has been assigned to each salesman and, therefore, how much business he ought to be able to turn in. This census will also be a convenient means of determining the most active prospects which can be concentrated on, the spare time being used to keep the less active ones in line and to continuously keep before them the general advisability and economy of central-station service.

By assigning individual power salesmen to certain related industries it will be possible for them to become familiar with the general requirements of the specific installations and also to gain an intimate and accurate knowledge of the particular industry. Later he may be assigned to another industry and so on until gradually a more or less intimate knowledge of the fundamental conditions and requirements of each industry may be acquired. By this method the individual salesmen will be able to gain a knowledge that will enable them to secure for their customers the maximum benefits at minimum cost and maximum satisfaction. Where power salesmen work entirely by territories it is not possible for them to gain this detailed experience and knowledge as they will usually be called on to handle propositions involving several different types of industry in the same day and will, therefore, not study any particular one in detail. As a result, they are less liable to render their several customers as good service as would be possible if they specialized on certain related industries. Perhaps a combination of the two methods of specialization and territorial assignment would bring the best results while at the same time insuring intensive work in the individual districts. As a means of co-ordinating the work of the power sales force weekly meetings are usually advisable.

Every Power User a Prospect.

That every power user is a central-station prospect is axiomatic. Neither the kind of power he uses, the cost of it nor the mental attitude toward the central station

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S U M M A R Y

1. Connected Load. This includes only the equipment taking service from the Central Station transformers
2. Maximum 5-minute Demand in kilowatts. By measurement or estimate.
3. Consumption in kilowatt hours. By measurement or estimate.
4. Estimated Monthly Central Station Charge.
5. Cost per kilowatt hour.
6. Operating load factor
7. Estimated investment necessary to properly adapt plant to Central Station service.
8. Monthly heating cost on an annual basis

NOTE: Power service will be furnished at _____ volts, _____ phase, _____ cycles, and lighting service will be furnished at _____ volts, _____ phase, _____ cycles.
Necessary transformers and meters for recording the amount used will be furnished by the Power Company.

Summary of Data Collected Is Tabulated In This Manner.

can establish a negative to this statement. The improbable customer of to-day is the probable one of to-morrow. Unforeseen conditions such as a break-down, a large order taxing the existing equipment beyond its capacity, etc., may arise, making imperative the use of a power supply that is adequate and reliable and that can be readily increased. The successful power salesman will know personally every user of power in his territory, including those already connected to central-station lines as well as those operating isolated plants. His methods and knowledge will be of such a prompt and capable nature that when any questions arise relative to the use of the service he is selling, the applicant will instinctively turn to him for a solution. No problem should be too small or too simple to receive careful attention and none are too large. New business will develop automatically and in unforeseen places if all power users, both connected and prospective, are served efficiently and continuously.

When the central station actively entered the industrial field for the purpose of selling electric power, many plants were easily convinced that it would be advantageous to use this type of service. Many plants were found to be ideal prospects due to having grown beyond the existing facilities; to antiquated and inefficient equipment; to necessary enlargements made necessary by increasing manufacturing requirements; to poor mechanical lay-out, etc., and it was not difficult to induce them to contract for central-station service. Gradually, however, the field covered by the individual organizations has become pretty well filled with plants using central-station service, but in many cases intermediate and large operations were still generating power locally.

In order to get these plants on the lines of the central station a continued and efficient effort is necessary. In the early days such effort was not put forth, due to the fact that so much easily procurable load only awaited intelligent solicitation, and that it was not, in most cases, believed that the ends justified the means, and that eventually these isolated plants would become central-station consumers without an appreciable amount of effort being expended. In some cases this attitude on the part of the central station was justified, as in the case of rebuilding or enlargement of the existing plant, rearrangement of the equipment to keep up with increasing and enlarging requirements, or because of a destructive fire, etc.

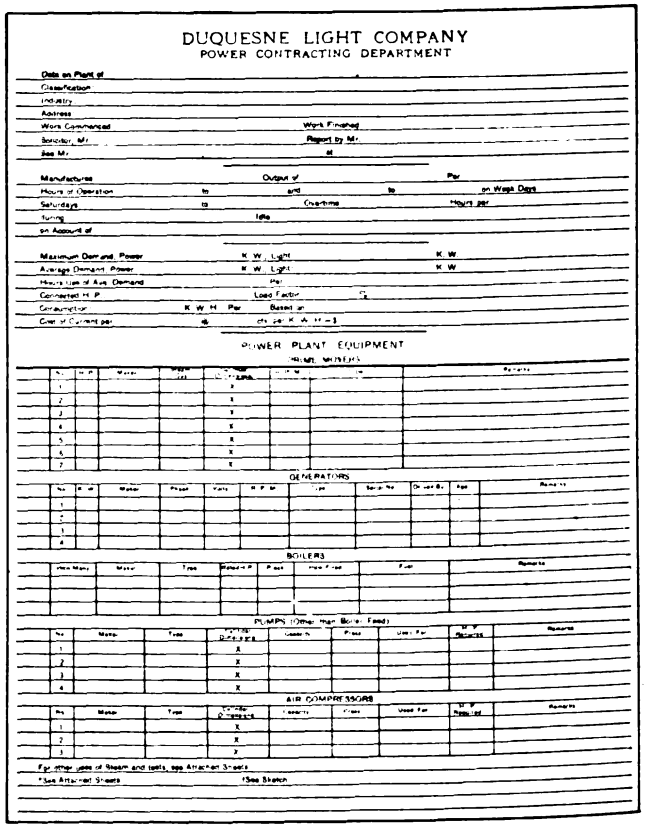
Thorough Analysis of Existing Conditions.

When such fortuitous conditions as those mentioned are not present and the manufacturer still holds out in opposition to purchased power, the only alternative is to sufficiently interest the prospect to obtain authority to make a thorough analysis of the existing power conditions and lay-out and from the information obtained to draw up and submit a proposition contemplating the substitution of central-station service. If such a report is satisfactory from the central station's point of view but still does not swing the prospect into line, the only alternative is to file the papers for ready reference and to pursue a policy of "watchful waiting." Eventually a break-down; a rising unit cost, due to obsolete and inefficient equipment; poor lay-out and uneconomic operating conditions; expansion, making additional equipment and power necessary; and the like will cause the manufacturer to stop and take thought and then with the report on the plant in hand, the power salesman will be in a position to strike quickly and effectively and with a complete knowledge, not only of the conditions to be met and overcome, but with an accurate solution of the problem presented.

It is of course neither necessary nor advisable to spend much time and money on relatively small prospects, but in the case of the larger ones such a course is not only advisable, but, in most cases, necessary to obtain such information as will make possible the drawing up of a satisfactory proposition. The report should be detailed and extensive in accordance with the size and importance of the proposition and should contain as complete and accurate information as possible, properly and logically set down and in such form as to be readily intelligible to the prospect. The prospect, it must be remembered, is, in most cases, not an engineer, does not understand lengthy and detailed technical reports and will not take the time to analyze one, however much to his advantage such a course of procedure may be.

Details of Proposition.

The first page of the report should contain a synopsis of the results obtained, giving existing costs, where advisable and when they are available, connected load and estimated future costs when using central-station service, estimated saving, if advisable, necessary investment required to make


DUQUESNE LIGHT COMPANY
POWER CONTRACTING DEPARTMENT

Date on Plant of
Classification
Industry
Address
Work Commenced — Work Finished
Solicitor, Mr. — Report by Mr.
See Mr. — at

Manufactures — Output of — Per
Hours of Operation — to — and — to — on Week Days
Saturdays — to — Overtime — Hours per
Turns — Idle
on Account of

Maximum Demand Power — K.W. Light — K.W.
Average Demand Power — K.W. Light — K.W.
Hours Use of Avg. Demand — Per
Connected H.P. — Load Factor — %
Consumption — K.W.H. Per — Based on
Cost of Current per — ¢ — cts. per K.W.H.

POWER PLANT EQUIPMENT

HEAT METERS

No.	H.P.	Make	Model	Capacity	K.W.	Remarks
1				X		
2				X		
3				X		
4				X		
5				X		
6				X		
7				X		

GENERATORS

No.	H.P.	Make	Phase	Volts	R.P.M.	Type	Serial No.	Driven By	Year	Remarks
1										
2										
3										
4										

BOILERS

Heat Meter	Make	Type	Rated H.P.	Fuel	Heat Fuel	Fuel	Remarks

PUMPS (Other than Boiler Feed)

No.	Make	Type	Capacity Required	Capacity	Press	Used For	H.P. Required	Remarks
1			X					
2			X					
3			X					
4			X					

AIR COMPRESSORS

No.	Make	Type	Capacity Required	Capacity	Press	Used For	H.P. Required	Remarks
1			X					
2			X					
3			X					

For other uses of Steam and tests, see Attached Sheets
*See Attached Sheets — *See Sketch

A Form Used in Collecting Data at a Plant to Be Converted.

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the change, cost per kilowatt-hour and other unit costs that may have a bearing on the proposition. This synopsis should be followed by a few general and concise statements regarding the advantages to be derived from the use of central-station service, an effort being made to eliminate, so far as possible, technical terms and phrases not in common use, and to make that part of the report that first meets the prospect's eye as simple, logical, convincing and self-explanatory as possible. The fact that the business of the central station is the manufacture and sale of electricity should be especially emphasized. Such simple, clear and concise statements so placed in a report will show the prospect at a glance just what can be accomplished by the change and will usually act as a challenge for refutation.

If at all interested the prospect will probably want to know how the results were obtained and there should follow a detailed report of the tests made, together with complete data and information, set forth clearly, but in detail, so that all the several steps of the solution shall be readily apparent. This detailed statement should be of particular value, when properly made up, if the report is to be submitted to a consulting engineer for consideration.

It is not to be expected that a business man with no particular engineering knowledge will wade through a highly technical report to find how he will be benefited by using central-station service; hence, the desirability, even necessity, of placing the results as outlined above and in such a way that all the findings may be readily noted and easily understood. When submitting figures for observation and comparison, gross and net results should be given, together with the net cost per kilowatt-hour and with an explanation as to the amount and computation of the kilowatt-hours consumed. In order to save time and expense the investigations should be reasonably detailed and accurate the first time, so as to be of use for some time to come. Such a procedure prevents the piling up of reports, some of little or no value through lack of sufficiently accurate information, on the same prospect and makes available for instant use a valuable collection of information that is thoroughly logical and understandable as well as being reasonably accurate and comprehensive. And after a prospect has been converted into a consumer further interest in his operation should not be dropped. The power salesman can be of great assistance to his customer when purchasing any necessary equipment. Occasional visits will serve to make clear any points of difference that may arise regarding the correct interpretation of the contract or in the method of billing, thus keeping a satisfied customer and a booster instead of a dissatisfied consumer and a knocker. This co-operation will be to the mutual advantage of the central station and the consumer and will reduce to a minimum the chances of losing customers that it has cost time, money and effort to connect.

There are still many fields of application awaiting development. This is due to some extent to the lack of simplification of equipment on the part of the manufacturers and also, and primarily perhaps, to the lack of a reduction of power rates by the central station to a point which should prove universally attractive and economical to the user, especially in installations such as paper mills, laundries, etc., where steam is necessary in varying quantities and where the majority of the equipment requires constant-speed operation and can thus be handled fairly satisfactorily with a drive other than the electric motor.

Loyalty of Sales Force Necessary.

It should be the endeavor of every central-station manager to build up an efficient and loyal sales organization with every member co-operating and all working for a common end. And always the watchword of such an organization should be service, service in the form of information and advice, to prospects and also to connected consumers. In all cases whether the field to be covered is assigned to the sales force by industries or by territories, propositions originating in the different industries or territories should be in charge of the salesman assigned to that particular field and he should have personal charge and direction of all negotiations, co-operating and consulting freely with all other departments and with the representatives of the electrical manufacturers for information and advice. Such a procedure insures continuity of action in the handling of the individual propositions and brings the prospect into intimate and stimulating touch with one representative of the central station instead of into casual and indifferent communication with a number of representatives. After a prospect has been signed by the sales department, other departments responsible for the institution of the service contracted for should co-operate loyally by promptly ordering, constructing and making ready for use facilities for this service guaranteed by the sales department. The individual salesmen should not have to make excuses to their customers for delays in making service connections.

When business is hard to get and slow in coming in, the sales department should go at it harder than ever before. Each salesman should go over his assigned field and pick out and concentrate on those plants that would be most desirable as customers. A depression affords an opportunity to investigate such prospects in detail and to obtain data and information for the gathering of which the time necessary might not have been available when business was good. By assuring power salesmen of the stability of their positions, through good times and bad, there is given an extra incentive to dig up business and to spend some time and study on the various prospects that are located.

Always the central-station salesman must realize that he is not only selling electricity, whether power or light, but also service. And always he should be a salesman first and an engineer afterwards. He reflects the central station to the public and in proportion as he is courteous, aggressive and truthful in all his statements and relations with his public in just such proportion will he favorably reflect his employer to this public while at the same time fulfilling his mission and justifying his employment.

Industrial Heating Contract Secured in Chicago.

The Commonwealth Edison Company has recently closed a contract with the Ford Motor Company for the supply of current to its assembling plant located in Chicago for heating enameling ovens. Four ovens requiring 650 kilowatts will be equipped at once and the installation will later be enlarged. Three-phase current will be supplied at 230 volts and General Electric Company heating units are to be used.

Another large contract closed by the Commonwealth Edison Company last week is for 1,000 horsepower to be applied in driving motors for refrigerating equipment by the Chicago Cold Storage Company.

Convenience of Electric Heating.

Electricity is readily adaptable to any heating system. A hot-water plant with the water heated electrically has been found to have some advantages over direct radiation placed in each room. It is perhaps a little more economical and convenient to operate. One drawback is that the cost of installing the hot-water radiators and circulating piping is usually more than twice the cost of wiring the house. If a building is already piped for steam or hot water an electric boiler can readily be substituted for the coal-fired boiler. On account of the saving in initial cost most homes and stores are wired and air heaters placed wherever desired. This system is flexible, and very satisfactory and economical results are obtained.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL CONSTRUCTION AT CRANE PLANT, CHICAGO.

Details of a Recently Completed Installation Which Embodies Many Interesting and Unusual Features

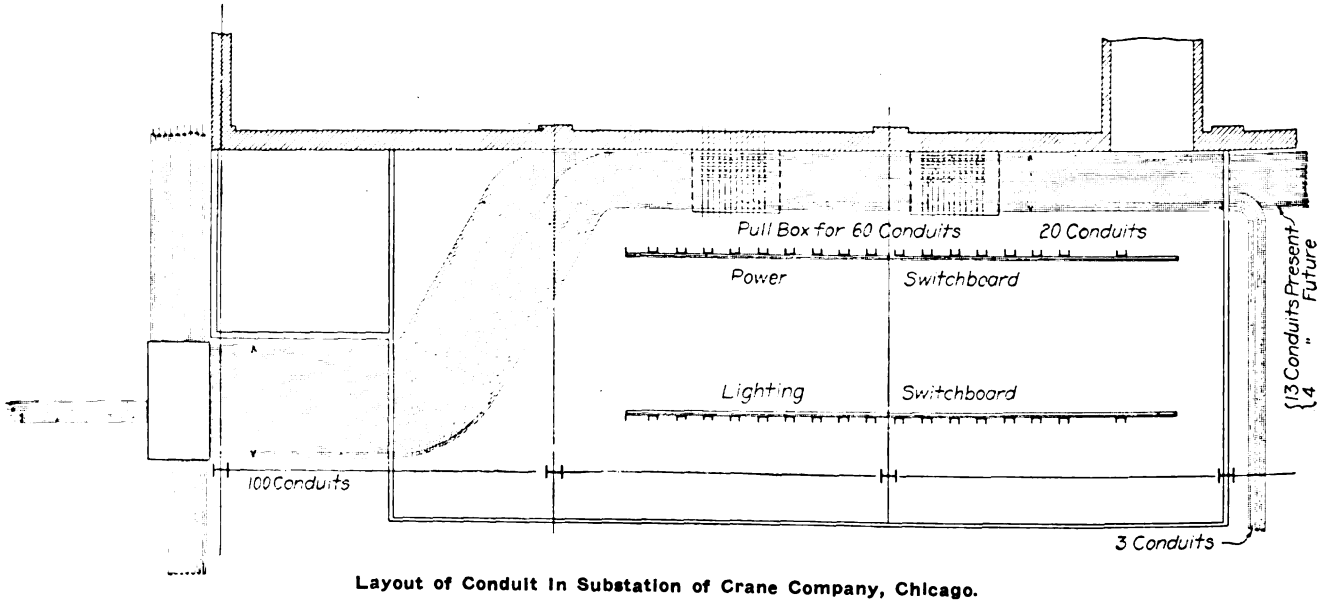
One of the most modern and comprehensive industrial institutions in Chicago is the new Corwith plant of the Crane Company, one of the world's largest manufacturers of valves and pipe fittings. A tract of land comprising 160 acres near the western boundary of the city was selected by the company as the site for its plant because of the transportation facilities and other features essential to a project of the magnitude of the Crane factory. At present about one-third of the acreage is utilized by buildings and yards, leaving a wide margin for future growth and extensions. About 15 factory buildings, office building, hospital and substation buildings comprise the group at present completed and occupied at Corwith, although as yet, many of the departments located at various isolated points about the city have not been moved to the new location.

All buildings are of modern reinforced-concrete construction with steel frames, and are laid out with a view to obtaining the greatest efficiency in handling material from the raw stage to the finished product. An underground service tunnel containing pipes for water and steam supply, gas, etc., connects all of the buildings. Transportation between departments and between various buildings is afforded by the means of electric industrial trucks of the company's own manufacture.

The above brief résumé of the general features of the Crane Company's establishment are given simply with a view to conveying an idea of the completeness and extensiveness of the plant. The electrical installation is in every way as complete and ranks among the foremost equipments of its kind in the country. While standard construction is adhered to throughout, nevertheless many ingenious features have been worked out under the direction of Harry S. Stewart, chief electrician for the Crane Company. For instance, under the conditions existing at the plant, Mr. Stewart believes that circuit-breakers are much more preferable than fuses for protecting circuits and consequently every motor in the plant and every lighting circuit is protected by a circuit-breaker, many of which were designed especially for this installation.

The total connected load at the Crane plant is approximately 2,000 kilowatts, of which about 500 kilowatts is for lighting. All energy for light and power is supplied by the Commonwealth Edison Company. Three direct power lines, two from the Quarry Street generating station of the Commonwealth Edison Company and one direct from the Troy Street substation supply the plant. There is a Crane substation for each group of buildings, each group comprising three buildings. Two central substations are distributing stations for high-tension energy which is distributed to two substations at the south end of the property and one at the north end. There are two lines connecting each of these substations, one being used in case of break down to the main line or for other emergency. The two main distributing substations, which are designated by the company as C2 and D2 respectively, are tied together with a tie line for emergency purposes. The high-tension supply is received at a pressure of 12,000 volts and stepped down to 240 volts, which is the working pressure in the plant.

One of the Commonwealth Edison Company's main lines from Quarry Street and the line from the Troy Street substation enter D2 substation. The other Quarry Street line which runs to the plant through a substation located at the Dickinson Seed Company's plant enters the C2 substation. At the south end of the property are two secondary substations termed E1 and E7. From the E1 station, energy at 236 volts is distributed through remote-control switches, controlled at the switchboard in the substation, to a group of adjacent buildings. The garage and main warehouse which is also at the southern end of the property receives secondary energy from the E7 substation.



Layout of Conduit in Substation of Crane Company, Chicago.

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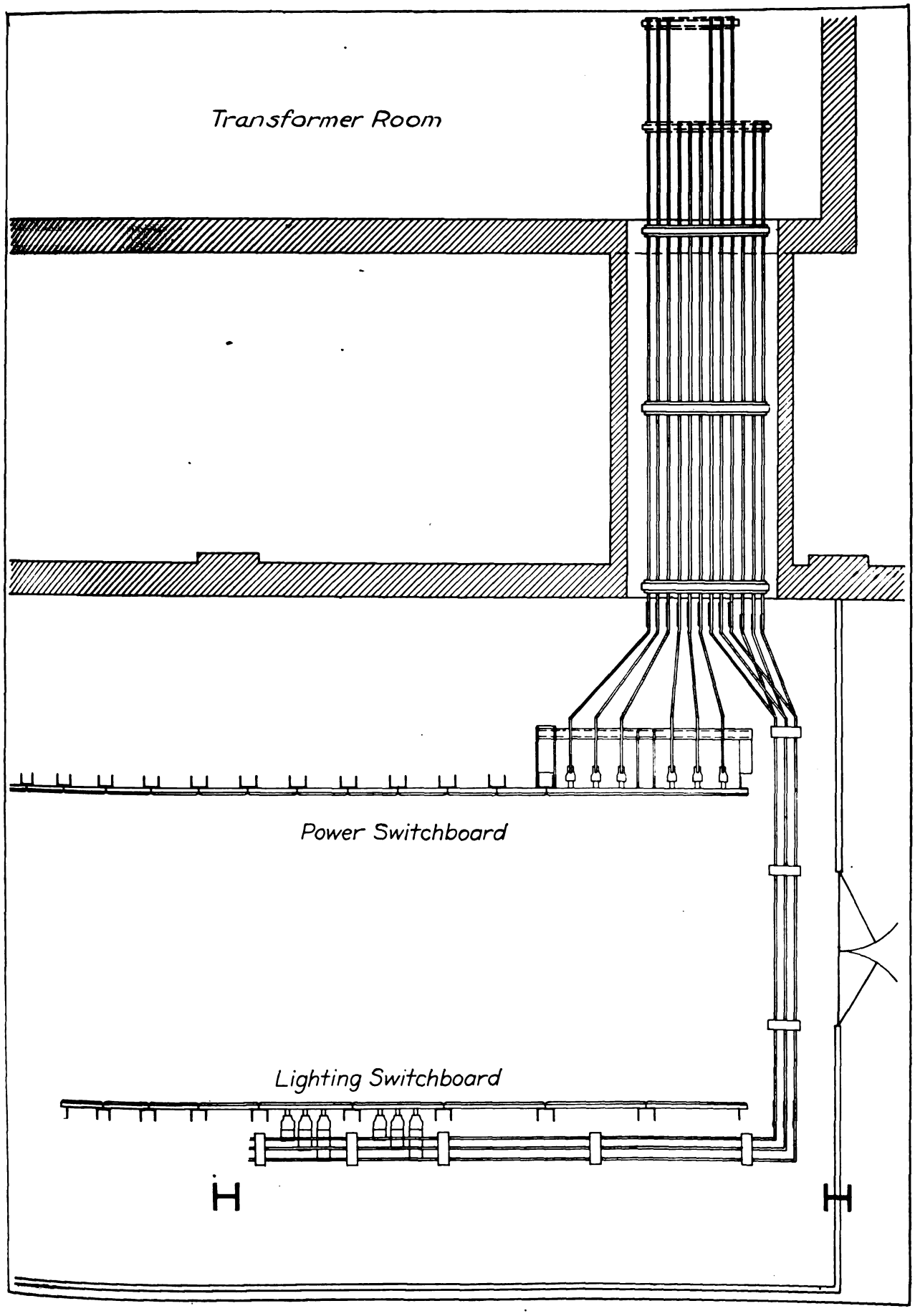

General Arrangement of Buses and Power and Lighting Switchboards in Typical Substation of the Crane Company, Chicago, Ill.

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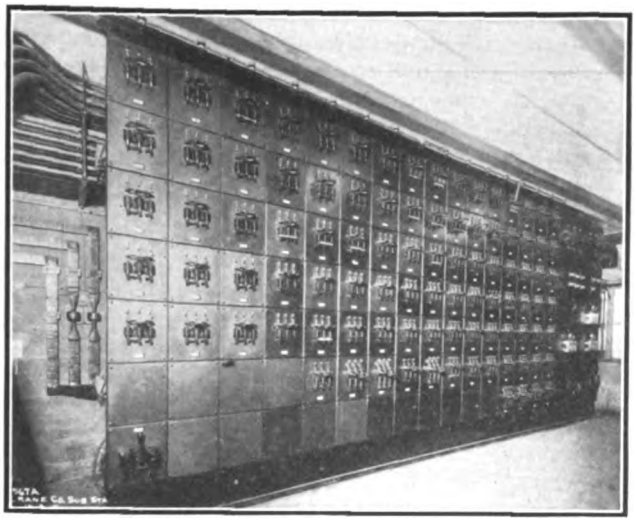
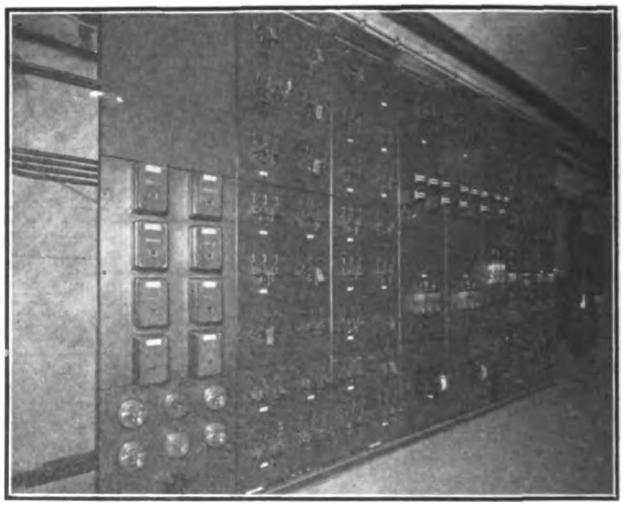


Main Power Board Showing Individual Circuit-Breakers for Each Motor Circuit.



Typical Lighting and Elevator Switchboard at Crane Company's Plant.

The high-tension feeders entering these two distributing stations are operated through disconnecting switches and remote-control switches, then through another disconnecting switch to the bus, which is separated by two sectionalizing switches where the lighting load is tapped. This arrangement permits the lighting load served by any substation to be supplied by either of the incoming lines.

All high-tension lines connecting the various substations are of varnished cambric and are run in underground conduit. Typical substation views are shown in the accompanying illustrations.

Description of Typical Substation.

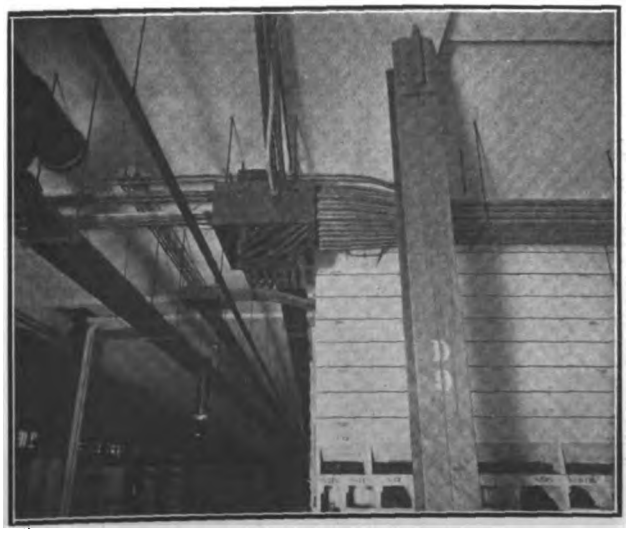
The four substations which serve the plant from convenient centers of distribution are of the same general design and contain approximately the same equipment, differing only as to sizes and capacity, depending, of course, upon the present load served. In each, provision is made for extensions as the plant increases in size. In fact, the entire electrical system is so designed that additions and changes can readily be made to care for growth for many years to come.

A description of a typical substation will serve to indicate the completeness and high character of the installation at the Crane Company's plant and give a general idea of the methods employed in the remaining three stations. The substation designated by the company as C2 is best adapted for description as it is at present serving the largest group of shops and represents to a certain degree the ultimate development in the other stations.

The substation proper really comprises two entirely separate buildings, one for housing the oil switches for control of the incoming high-tension lines and the transformer equipment for stepping down the voltage, and the other building contains the main power and lighting switchboards and a motor-generator set for supplying direct current for elevators, cranes, etc. Each building is of reinforced concrete construction measuring about 50 feet long by 25 feet wide. There are two 12,000-volt incoming lines which are run in underground ducts into the transformer room. These lines are protected by overload relays mounted on the main power switchboard and are controlled by oil switches also located in the switchboard room of C2 station, alongside of remote-control oil switches which control the main lines to the other substations about the plant.

There are eight 200-kilovolt-ampere Pittsburgh transformers in C2 station, six for transforming power voltage and two for the lighting supply. The power transformers are arranged in two banks of three each and reduce the voltage from 12,000 to 236, at which pressure energy is supplied to the motors.

The main buses from the transformers run through an overhead concrete duct which connects the transformer room with the switchboard room, the space between the two buildings being approximately 12 feet. The arrangement of the bus connections is shown in one of the accompanying diagrams. It will be observed from this view that the transformers are paralleled at the switchboard, which is provided with two buses operated from each bank



A Branch Box.

Main Box Outside of Substation.

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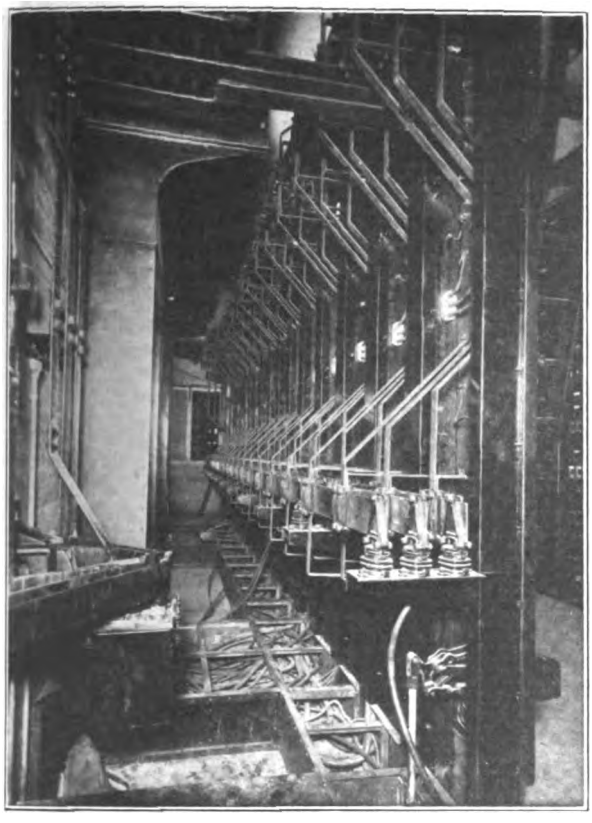


Back of Power Switchboard.

of transformers, or if so desired the system can be operated open delta.

Because of the limited space back of the power switchboard, a rather unusual method had to be adopted for mounting the buses. Steel gusset plates are bolted to the angle-iron framework of the switchboard and the busbar supports are clamped to these in such manner that the distance between busbars has been reduced to a minimum. About 15 gusset plates are used, the supports being staggered on each. All busbar supports and insulators at the Crane plant were supplied by the General Devices & Fittings Company, Chicago.

There is a main circuit-breaker for each bank of power transformers located on the switchboard. The main power board is of black Munson slate about 12 feet high by 30 feet long and comprises at present 18 panels, including the two incoming-line panels. There are 16 panels for controlling feeders. On the former there are installed the usual curve-drawing voltmeters and other graphic instruments. The large circuit-breakers controlling main lines are of General Electric manufacture, known as type C.K. and are equipped with shunt-trip attachments, so arranged that if any one of the three overload coils operate, sufficient current will be transmitted to the other two to operate all three legs of the breaker.

One very interesting feature of the electrical installation at the Crane Company's plant is that fuses have been practically eliminated. All motor circuits are protected by individual circuit-breakers located on the main power switchboard. Because of the city inspection rules, which state that in case fuses are not used circuits may be protected with circuit-breakers providing that efficient supervision is maintained, circuit-breakers were provided in this instance having all three legs protected. Special circuit-breakers having three coils in place of the standard two are used. It is thus impossible to replace a breaker on overload or short-circuit until the trouble has been remedied. To further safeguard against accidents, a pilot light is provided for each breaker panel which is automatically lighted when a circuit-breaker goes out. This signal system further is arranged so that a telltale lamp is lighted in the office of the chief electrician and remains lighted until the breaker is returned. For the benefit of the station operator, a gong is caused to ring whenever a pilot light indicates a circuit-breaker out.

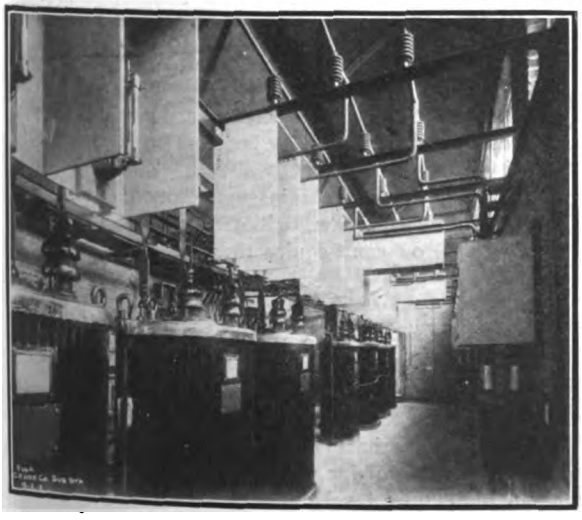
Power Wiring.

At present there are 112 power circuits controlled in this manner from the C2 substation, although the ultimate capacity will be 150 lines. The capacity of the station is 1,000 kilowatts, the power-factor 70 per cent at 236 volts and the load-factor, figured on a 24-hour basis, is 30 per cent.

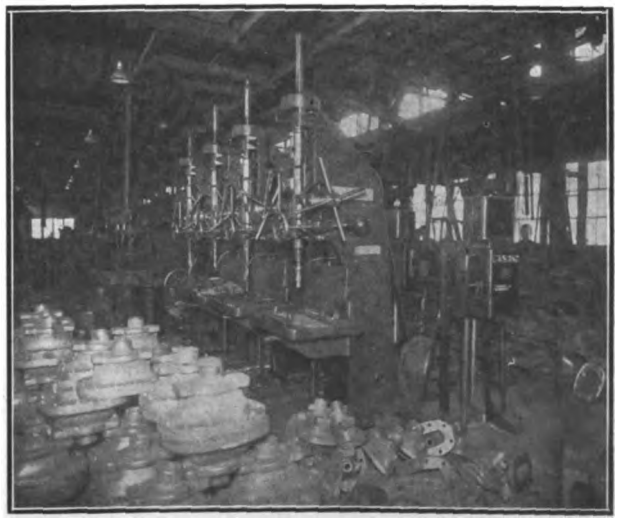
The wiring from the circuit-breakers is carried in compartments, formed by the angle irons which support the switchboard, to a box on the ceiling back of the board where the conduits terminate.

As shown in diagram, the buses from the lighting transformers run through the same overhead duct as the power buses. Each transformer carries one-half of the lighting load. The lighting switchboard is located along the east wall of the station, opposite from the power board. It is also of black Munson slate, of ten panels, comprising two incoming line panels of 1,000 amperes each, one totalizing meter panel containing watt-hour meters and maximum-demand indicators, and feeder panels which contain a circuit-breaker for protecting distribution boxes for lighting service. The lighting load is approximately 250 kilowatts.

The elevator control board is located adjacent to the lighting switchboard and receives its energy from a motor-generator set, comprising a 225-horsepower motor with



Transformer Room in Typical Substation.



A Group of Motor-Driven Multiple Drills.

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form-wound rotor, direct-connected to a 150-kilowatt, 250-volt direct-current generator, operating at 900 revolutions per minute. The leads from this generator are run in conduit under the floor of the station to the generator panel of the elevator switchboard where instruments are provided for measuring all energy delivered by this set. There are 16 elevator circuits, each provided with a double-pole circuit-breaker and knife switch.

All wiring from the power switchboard to motors is run in Galvaduct ranging in diameter from 1.5 inches up, depending upon the size of the conductor. Standard three-conductor, General Electric varnished-cambric cable of 1,200 volts capacity is used throughout. On wires of No. 6 size and smaller 30 per cent para rubber insulation is used. One view shows the arrangement of the conduit from the wire trough back of the power switchboard to the main distributing box located to the left of the switchboard room. This distributing box is shown in one of the accompanying views. All motors used throughout the plant are of General Electric manufacture. In the case of standard applications, that is on special direct-connected tool service, squirrel-cage motors are used in sizes up to 25 horsepower, above which size slip-ring motors are employed. Each of the squirrel-cage motors in sizes from 7.5-horsepower and above are equipped with oil-type starting compensators fitted with no-voltage release attachment and overload relays. On motors of five horsepower and under an ordinary oil switch is used, which is a modification of the standard compensator having overload relay switch working in oil, and no-voltage release attachment, and which is manipulated the same as the standard compensators. All compensators and switches are arranged for conduit wiring.

The conduit runs throughout the plant follow standard practice. The supports are formed by 0.75-inch bolts, secured to the ceiling by means of Diamond expansion shields. Conduit is run about one foot from the ceiling to permit of future extensions without changing the hanger.

Lighting.

The total connected lighting load is approximately 500 kilowatts. General lighting is adhered to throughout the entire plant, metal reflectors being used in shops and prismatic glass reflectors in offices. Type C Mazda lamps are used throughout, the 100-watt size in enameled-steel reflectors being used in the shops and 250-watt lamps in the offices. In the receiving buildings where there are higher ceilings 500-watt lamps are used.

An additional feature of the plant is a street-lighting system, employing 250-watt nitrogen-filled lamps.

Important Questions to the Electrical Contractor

By G. W. Hill

Eight pertinent questions of vital interest to the electrical contractor are suggested in this article. Each question will be discussed separately in subsequent articles by the author, who is well known in the electrical contracting field. The next installment, dealing with "Estimating," will be published in an early issue.

Estimating.

Do you know that if you spend your entire time and energy in the role of a Sherlock Holmes, gumshoeing around in an effort to learn what amount your competitor is going to ask for a certain job, rather than to ascertain your actual cost, that you may be led into a trap which will cause you to seek with less difficulty the bankruptcy courts for relief?

Salesmanship.

Do you know that the men who make the most miserable failures in business are those who permit their customers or competitors to set their prices?

Do you know that everybody is a salesman from the man who sells his labor by the day up to the President of the United States?

Do you realize without the use of salesmanship no man can succeed in any business?

Organization.

Can you go away and leave your business for a couple of weeks and return finding it in perfect condition?

If not you have not the proper organization.

Do you know that too much detail will make a clerk out of an executive?

Duty.

Do you know that it is going to be hard to explain to your family who may be in need, that you have wasted all of your productive years in an effort to put some one out of business instead of putting yourself in business?

Do you know that in doing business in a haphazard manner, and not making money, that you are imposing the same condition upon your competitor and lowering the standard of your business?

Do you know that in failure the money which you lose is oftentimes much in excess of your own?

Account Keeping.

Can you tell exactly where you stand in the commercial world at the end of each month, by reference to your financial statement? If not, you are at sea and should use care not to allow your creditors to find this out. They may refuse you further credit for this reason.

Do you know that your possibilities in business may be unjustly limited due solely to a lack of ability to produce a comprehensive financial statement?

If you are incapable of appreciating the difference between a gross profit and a net profit, and knowing the different ways in which an apparently handsome gross profit is whittled down to a miserable inadequate net profit or eventually to a minus quantity your aspirations should not raise above a weekly wage check.

Principle.

Do you know that the want of principle will cause you to be as much shunned in business as a leper is in society?

To be just requires brains—you cannot go straight without a determination, without principle or without will power. You can acquire these requisites.

Method.

Do you know that many failures are due largely to the lack of method, prudence, tact, knowledge and purpose?

Fourflushing.

Do you know that the fourflusher rises to the top quickly but the plodder remains on top to see him sink back to his proper level?

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"LET THE CODE DECIDE."

Secretary's Message.

The Secretary regrets that only one question appears this week; also for so little material lately. As a matter of fact, a Question Bulletin was sent November 21 to the Executive Committee, but to date of writing, December 26, so few replies (only 7 out of 25 members) have been received that the material cannot be used. If the members will not reply, what can the Secretary do? A, F and G, T, U, E, O, are all that have replied. F, G and A are section representatives; the others are not. The New Code being now out, perhaps some questions may come in soon. The Secretary has none except one question which unfortunately does not appear to fall under either of the two categories available for our columns. The various members simply must come forward and help.

December Meeting of the New York Section.

The fifteenth meeting of The New York Section was held Monday evening, December 13, 1915, in the Municipal Building, Manhattan, G. E. Bruen presiding. On the same date New York was completely in the grip of a snow storm which paralyzed street-car and railroad traffic. In spite of this, however, there was a fair attendance and no lack of enthusiasm. The members who braved the storm felt repaid, as Alfred E. Braddell's paper on the evolution of iron conduits proved to be the most interesting subject featured so far. Conduit developments, starting with E. T. Greenfield's asphaltum paper tubing, put on the market for the first time in 1889, "Brass-Armored Conduit" introduced in 1891, "Iron-Armored Conduit," lined with asphaltum-treated paper, brought out in 1894, and the present type of "unlined metal conduit" in use since 1897, were reviewed by the speaker and many of the old samples of apparatus and fittings were shown. Mr. Braddell next explained the methods used to prevent corrosion in conduit, taking up the enameling, electro-galvanizing, sherardizing and hot dipping processes.

Lastly he described the tests applied to determine the efficiency of such protective coatings.

There is no doubt every inspector will be interested in the processes described as well as the three principal tests known as the "potash test," "salt-spray test" and the "sulphate-of-copper or Preece test." Part I of the article referred to appears elsewhere in this department. Part II will appear in an early issue.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Fusing Reverse-Current Relays.

Question 315.—In connecting up reverse-current relays, small lead wires, say No. 12, are connected to main motor leads No. 0 or larger. Rule 23b calls for fusing, but objection is made; companies not wishing the chance of blown fuses making relays inoperative, which in case of reversal of phases on elevator motor would cause serious accident. Should Rule be waived?

Answer 1(R)*. In such a case I think the inspector is justified in asking for appropriate fusing, as the current passing through such a device has a fixed maximum, depending on the impedance of same. A current of sufficient volume to melt the fuse would have to be caused by a short-circuit, which without fusing would simply cause a burnout of the relays or their feed wires, or possibly open the protection of the No. 0 wire.

Answer 2(O). The writer does not consider that Rule 23b would apply in this case. The relays should be considered a part of the motor-starting or controlling apparatus and can be very readily inclosed or guarded so that even if they should be destroyed no damage would result to surrounding materials.

Answer 3(S). There are many devices which should not become inoperative by failure of fuse or wires connecting same. This is of great importance in this question. Safety of life, in this city, is given first consideration and the fuse should be omitted in connecting relays of this type.

Answer 4(M). It has been our experience that relay circuits are never provided with fuse protection. The function of a relay ceases to a certain extent when fuses are installed in the control wires. However, for reverse-current relays, when used on high-potential circuits, fuses should be provided on the primary of the potential transformers. I do not consider fuses to be necessary on the secondary of the transformers as the high-tension fuses are usually of very small capacity and will open on any disturbance on the secondary circuit. For self-contained units, fuses should be provided on the potential circuit, but in no instance should fuses be installed in the current circuit.

Answer 5(F and G). In the placing of cutouts for a reduction in the size of wire it is often necessary when chang-

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ing from large-sized cables to small wires to use a short section of small wire between the cable and cutout in order to make a satisfactory job. This, too, is a violation of the Code, but has been common practice for years and we think that the short section of wire necessary for the connection of reverse phase relays should have the same consideration given it, especially in view of the fact that a fuse connected to a device of this kind may be inoperative and not discovered until after an accident has happened.

Answer 6(W). Owing to the chances of introducing very serious life hazard, lead wires supplying current to the reverse relays in connection with alternating-current, elevator motors should not be fused, and the rule should, therefore, be waived.

Answer 7(P)*. I should waive the rule, in order to secure the greater, rather than the lesser safety.

Answer 8(E). We would waive the rule and ask that the relay be inclosed in a fire-resisting cabinet.

Answer 9(T). I do not believe that Rule 23, section *b*, should apply in connection with change in wire sizes to protective relays, owing to the short length of wire generally used, location and installation of such relays makes the increased fire hazard due to omitting the fuse of slight extent.

Answer 10(N)*. I do not consider there is any question of "waiving." As the phrase goes in law, "the question can be decided without considering that point," so we will omit any question of justifying such action.

I do not think Rule 23 has anything to do with the matter at all, but to general distribution circuits in buildings. This may also be inferred from the third paragraph on page 46, 1915 edition of National Electrical Code, definitely stating that a certain provision "shall also apply to motors." Notice also Rule 23*f*: "Each conductor of motor circuits except on main switchboard or when otherwise subject to competent supervision," etc. Again, Rule 2*c*, second paragraph: "For protection of instruments and pilot lamps on switchboards, etc." Protection of protective devices is not mentioned. The reverse-current relay should be guarded so its destruction will not endanger combustible material nearby, but it, like a surgeon on the firing line, must be ready at all times regardless of risk to itself.

Answer 11(U). I see no reason why the fuse should not be put in; as it can be fused high enough by using No. 12 wire, so that there would be no danger of the fuse blowing out unless something went wrong with the relays and then the fuse might as well blow as to have a short-circuit.

Electric Power Being Sent from Sweden to Denmark.

The Sydsvenska Kraftaktieselskab has begun to deliver electric power from Sweden to Denmark via submarine cable between Helsingborg and Elsinore, a distance of about 10 miles. To begin with only 500 horsepower is being transmitted. The power is produced by waterfalls in the southern part of Sweden. It is intended to increase the power to 5,000 horsepower in the near future.

Norwegian Hydroelectric Project.—A project has been started for utilizing the Saude Falls, in Norway, and the hydroelectric plant to be erected will have a capacity of 27,000 horsepower. Farther down the stream will be other plants generating 12,000, 45,000 and 12,000 horsepower, respectively.

CONDUIT EVOLUTION.[1]

Various Processes to Prevent Corrosion and Tests to Determine Efficiency of Protective Coatings.

By Alfred E. Braddell.

My subject being electrical conduits for buildings, I have thought, with your permission, it might prove of interest shortly to review the evolution of such conduits to date.

I feel that this subject should never be discussed without paying some little tribute to the originator and inventor of conduit as applied to building work, E. T. Greenfield.

You all undoubtedly know that prior to the entry of conduit into the electrical business, conductors in buildings were supported on porcelain insulators, etc., and one of the main difficulties encountered in a building of any dimensions was the lack of suitable mechanical protection for the conductors during the period of installation, they being injured by the fall of bricks, timber and other materials, and not receiving very much attention from the various mechanics on the job.

This condition of things was noted by Mr. Greenfield and he conceived the idea of running the various wires in a tube or conduit.

It was, therefore, in the year 1889 that Mr. Greenfield placed before the electrical world the first conduit ever manufactured, it being placed on the market by the Interior Electrical Conduit Company of New York.

This conduit consisted of paper treated with asphaltum and was furnished in the following sizes and lengths:

¼ inch conduit in six-foot lengths.

⅜, ½, ¾, 1, 1.25, 1.5, 2 and 2.5-inch in 10-foot lengths.

You will note that the majority of the sizes were in 10-foot lengths, which is the standard length of today; also standard diameters of the conduit.

It is interesting to know how the 10-foot length was arrived at. As Mr. Greenfield explained to the author, experiment showed that by taking various lengths of the product and holding it close to one end, and then snapping it like a whip he found that a length of 10 feet was sufficient to stand up under the strain without breaking. The one-quarter inch size would not stand the strain under this experiment in greater than 6-foot lengths.

These lengths were joined together by means of brass couplings, which were crimped tight to the conduit by a suitable hand device. Elbows for the various sizes of conduit were furnished and even in that early day Mr. Greenfield had designed a line of outlet boxes to be used in connection with the conduit system. This system of installing wires in buildings was naturally highly endorsed by engineers and architects, and, of course, duly accepted and approved by the fire underwriters.

At that date alternating current was not in vogue, therefore the rules called for a conduit for each wire, induction not having to be considered. While this type of conduit filled a long felt want, it was not a complete success principally because it had not sufficient strength to stand the abuse to which it was subjected by being walked on, run over by wheelbarrows, etc., but it was used without any material change from 1889 to 1891.

The next step to obtain a better and more substantial character of conduit was the placing of a brass covering over the same asphaltum-treated paper tube, such type of conduit being placed on the market in the year 1891 and manufactured by the Interior Conduit & Insulation Company and known as the brass-armored conduit. This was quite a step in advance over the original type from a mechanical standpoint, but it was still unsatisfactory, especially in buildings of a fireproof character, which more and more were being erected.

In order to meet the conditions encountered in such buildings, Mr. Greenfield then conceived the idea of using iron

1 Paper read at the New York Section meeting, National Association of Electrical Inspectors, December 13, 1915.

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pipe and lining the interior with the asphaltum treated paper and such type of conduit was manufactured and placed on the market in the year 1894 by the Interior Conduit & Insulation Company, and known as "iron-armored conduit," this being the original iron conduit, and with same we finally obtained the two main requisites of a conduit system, viz., a continued raceway for the drawing in of wires and a complete mechanical protection for these wires.

I might state here that when this type of conduit was placed on the market the alternating-current system was coming into use and I recollect many instances where wires were run in separate pipes in accordance with the then existing Underwriters' Rules, thus causing induction trouble, and the rules, therefore, had to be changed to meet the altered conditions.

The iron-armored conduit held its own until 1897, in December of which year the underwriters approved the so-called "unlined metal conduit," this type being furnished with a black enamel finish on both the interior and exterior surfaces, and incidentally the rules called for a rubber wire having a double braid, instead of a single braid as was required for "lined conduit."

The unlined enamel-coated conduit being manufactured at a less cost than the lined type, also the cost of installation of the former being considerably less, as elbows could be bent on the job instead of purchasing formed elbows from the manufacturer of lined conduit, it will be naturally seen that the unlined conduit soon sounded the death knell of the lined type.

Mr. Greenfield, however, seemed determined to remain in the business which he created and in the year 1899, he produced another original conduit formed of steel strip known as flexible steel conduit, this being placed on the market by the Sprague Electric Company. This character of conduit is made in two types known as double-strip and single-strip types.

The former is constructed of two steel strips, one having a concave and the other a convex surface, spirally wound upon each other in such a manner as to interlock their concave surfaces. Each strip is thoroughly galvanized and a suitable gasket is provided between the inner and outer strips rendering the conduit moisture-proof.

The latter type is formed from a single steel strip in such a manner that it is interlocked and is also provided with a suitable gasket. The steel strip is galvanized similarly to that used for the double-strip type.

Both types are used extensively for new and finished buildings of ordinary construction and if desired to be laid in concrete the single-strip type is recommended, as owing to its formation it is of a more moisture-proof character than the double-strip type.

As the cost of installation is one of the greatest factors in the wiring of buildings, the thought undoubtedly occurred to Mr. Greenfield that a great saving of time could be gained if it were possible to pull in the raceway or conduit together with the conductors at one operation.

He certainly succeeded in doing this when he designed the flexible steel-armored conductors known to the electrical trade as "BX" cable, which was placed on the market by the Sprague Electric Company in the year 1899.

Here again was another original material and as you all no doubt know the idea was merely, so to speak, the forming of the flexible steel conduit over the conductors. This material I have no doubt is too well known by all to describe in more detail.

I may be permitted to quote at this point the following interesting phophecy made in 1889 by Fremont Wilson as published in the *Electrical Engineer* June 8, 1892.

Iron Pipes for Interior Conduits.

Two and a half years ago the writer was asked for an opinion in regard to interior conduits and to the surprise of the party asking the question, he said: "Interior conduits to be successful must be able to stand the action of all kinds of alkali in plasters, and must be absolutely proof against the tools of mechanics, and, furthermore, absolutely waterproof and fireproof, and must not be relied upon for *insulation, the only place for insulation being upon the conductors themselves.*" The question was then asked: "Why, then, do the New England Underwriters insist upon the use of conduits, and furthermore, allow the use of such cheap grades of wire?" The reply was, that any party or parties who recommended any conduit then on the market, or demanded its use, and allowed twin conductors with cotton insulation, was either ignorant of the entire subject, or was interested; for the only conduit that was needed was that used by the gas man, viz., iron pipe, to be made and installed under certain specifications. The writer also had the word of one of the largest pipe-makers that a first-class article of piping with right and left threads could be placed on the market at the same price as gas pipe, and perhaps cheaper; but the trouble with this system was simply that it could not be patented, and, therefore, underwriters, architects, and owners of buildings must be kept in blissful ignorance of the safety and feasibility of iron conduits so as to enable conduit people to line their pockets with the money of the poor public.

For this answer the writer was severely criticized by certain parties, but, nevertheless, time has proved that the remarks were correct, inasmuch as, at the convention held at Buffalo in February of this year, Captain Brophy, formerly of the Boston Insurance Exchange, was forced to admit that the conduits used were a failure.

The writer over two years installed in New York an installation of over 3,000 lamps, and all the primary feeders connecting the various converters were placed in gas pipes. The pipes were laid on iron ledges of the building and white-core taped wire used; and, although these pipes and wires of a total length of about two miles were placed in position by inexperienced men, yet they have been in constant successful use for eighteen months, conveying a current of 15 amperes and 1,000 volts, constantly exposed to the weather; and yet we hear that it can't be done—that to install iron pipes and pull in wires for use at 50 or 100 volts pressure would be suicidal.

Is not every combination gas fixture an example of conduits?

That the conduit people have seen their blunder is only too evident as we all know, from the fact of their covering their present material with metal; but let us hope that before long the underwriters will not only *allow*, but *insist* on, solid metal conduits specially built and installed in all classes of concealed work, and then, and not till then, will this everlasting hue and cry about electric-light fires cease.

The New Orleans underwriters have just adopted a stringent rule in regard to conduits, but they are simply recommending a special conduit, although it does not show on the face of their order, and they will go through the same experience, only in a less degree, that the Boston underwriters have passed through. There is, in the writer's judgment, but one conduit; and let us learn a lesson from our enemy, the gas man, and use it—the iron one. I may add that the Chicago underwriters have recently stated that they are in favor of iron conduits and the question must soon be faced by all concerned.

(To be continued.)

Record Production of Copper in 1915.

The production of copper in the United States in 1915 passed all previous records, according to the United States Geological Survey. At an average price of about 17.3 cents a pound, the output for 1915 has a value of $236,000,000, compared with $152,968,000 for the output of 1914.

According to the statistics and estimates received, the output of blister and Lake copper was 1,365,500,000 pounds in 1915, against 1,150,137,000 pounds in 1914.

The output of refined copper from primary sources, domestic and foreign, for 1915 is estimated at 1,647,000,000 pounds, compared with 1,533,781,000 pounds in 1914 and with the previous record production of 1,615,000,000 pounds in 1913.

The average price of copper for 1915 showed a marked increase over that of the preceding year, being about 17.3 cents a pound, compared with 13.3 cents in 1914.

Anthracite Production in 1915.—Estimates prepared by the Anthracite Bureau of Information at Wilkes-Barre indicate that the production of anthracite coal in Pennsylvania in 1915 shows a decrease, as compared with 1914, of about 2,000,000 long tons.

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PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

ARIZONA.

Pacific Gas & Electric Company. The Commission has investigated the complaint of a real estate firm based upon the refusal of the Pacific Gas & Electric Company to refund $221 deposited to secure an electric extension to Bella Vista Place, a sub-division to the City of Phoenix, comprising 30 acres divided into 127 improved lots. It was found that six houses have already been constructed, plans have been drawn for six more and the construction of 12 more is contemplated. The power company already had a line passing the sub-division which was serving farmers and other consumers in the vicinity. The Commission found that the estimated yearly revenue from the tract was more than half of the cost of construction to the customers and the deposit was ordered refunded.

CALIFORNIA.

The Railroad Commission has issued an order authorizing the Pacific Gas & Electric Company to issue $2,500,00 par value of first preferred stock and $2,000,000 face value general and refunding bonds. The company is also authorized to use $2,573,046 cash on hand from the sale of preferred stock, together with $130,005, due on unpaid subscriptions for this stock, to reimburse its treasury for money spent upon its system from May 1, 1914, to August 30, 1915. The first preferred stock must net the company $90 a share, and the bonds 85 per cent face value, plus accrued interest. The funds received from the sale of the first preferred stock and of the bonds are to be used to reimburse the company's treasury for plant expenditures to August 31, 1915, in the sum of $491,744 and pay for extensions, additions and betterments in the sum of $3,150,000. This amount, the company estimates, will have to be spent, because of the development of its business, and the forseen addition of new consumers in 1916.

MAINE.

The Public Utilities Commission has approved the consolidation of the Penobscot Bay Electric Company and the Greenville Light & Power Company with the Central Maine Power Company by the purchase of the Greenville Company by the Penobscot Company and the purchase of the entire capital stock, $200,000 par value, of the Penobscot Company, by the Central Maine Power Compay. This consolidation will make the Central Maine the second largest public utility in the state, not considering the Maine Central Railroad.

Two primary questions were considered by the Commission: whether it was wise to permit the Central Maine Power Company to make this important addition to its already large field, and whether that company was getting value received for money paid or securities issued in the acquisition of the other properties.

The Central Maine had outstanding, prior to this consolidation, securities to the face value of $7,858,500. With the new properties it will cover or partially cover nine of the 16 counties of Maine in its operations.

The company is utilizing only about 50 per cent of the electrical power available in its several plants, besides vast undeveloped water powers yet to be developed as the demand for power increases.

The Commission decides from a careful analysis of facts and figures that the stockholders' rights will be protected by the new acquisition. From the public standpoint, the properties of a public service company, being devoted to a public use, stand on a somewhat different footing from others, it points out.

"A great trust is reposed in the officers of this particular company," the Commission says. "If we did not have the fullest confidence in our Utilities Law as a regulative force, a full belief that it is only by large development and widespread opportunity for use of our great water powers that low rates for light and power can be obtained for our farms and city consumers, a conviction that this petitioner intends (and under the Utilities Law can be compelled) to share fairly with the public, in the form of lower rates, the benefits resulting from the granting of this petition—if we did not feel reasonably convinced that nearly all doubts could be resolved in favor of the public, we would not follow the course we have decided upon."

The Central Maine Power Company is authorized to purchase the entire capital stock of the Penobscot Company—2,000 shares, of which 1,317 are issued and the balance in the treasury—and all outstanding mortgage bonds of the Penobscot Company and of the Belfast Gas & Electric Company, paying $618,000 for the purchase, of which $538,000 is to be in cash and $80,000 in 6 per cent preferred stock; the Central Maine is to issue 5 per cent mortgage bonds, due in 1939, to the amount of $433,000 par value, and 6 per cent cumulative preferred stock to the amount of $207,000, par value.

The Penobscot Bay Electric Company is authorized to issue securities in the form of promissory notes to the amount of $243,000, payable in two years, at 5 per cent interest, for the purchase of its subsidiary, the Greenville Light & Power Company.

MARYLAND.

Rules for Electric Service. The Commission has decided to adopt a set of rules governing electric service throughout the state, as it has done in the case of gas service. A conference was held with representatives of the electric companies on January 12, for the purpose of discussing the new rules prepared by the engineering department of the Commission.

NEW YORK—First District.

The annual report of the Public Service Commission for the First District was submitted to the Legislature during the week. It shows the heaviest year's work in the history of the Commission. The report states that 73 contract sections upon the city-owned lines of the dual system of rapid transit are either completed or under way, leaving only 16 sections yet to award. Rapid transit contracts awarded during the year 1915 aggregated more than $26,000,000. During the year the Commission held 812 hearings, considered 337 formal cases and held 118 meetings. The reports of accidents on railroads and street railroads for the year show a decrease in the total number of accidents and a decrease in the number of persons killed, from 292 in 1914, to 231 in 1915.

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NEW YORK—Second District.

The Public Service Commission has received the opinion of Justice Howard of the Appellate Division in the appeal of the Niagara & Erie Power Company from a decision of the Commission. The decision of this case will be of importance to all town authorities and to all persons seeking franchises from them for the approval of the Commission.

The appellate division holds that the term "town authorities" contained in the law requiring franchises to be secured from them, refers to the town board, and not to the superintendent of highways. It will hence hereafter be necessary for franchises to be sought only from the town board.

For a great many years the Commission has held that the consent of the town superintendent of highways was necessary on a franchise which came before it for approval. It denied approval of a franchise of the Niagara & Erie Power Company in the town of Portland, Chautauqua county, because it was not granted by the town superintendent of highways, but only by the town board.

Justice Howard, in his opinion for the appellate division characterizes the term used by the legislature in framing this act as loose, and says that the question should be definitely decided to avoid confusion. He follows an opinion of Judge Cardozo of the Court of Appeals, which in another case incidentally held that the town board constituted the "town authories" under the meaning of the statute.

VERMONT.

The Public Service Commission has ordered the dismissal of a petition of the Central Power Corporation of Vermont with headquarters at Middleburg, for a certificate that "the establishment and maintenance of the proposed corporation will promote the general good of the state." The incorporators under articles of association sought the right to construct and acquire by purchase, lease or otherwise, and to operate power plants, hydraulic works, stations, dams, storage basins, transmission lines and distributing stations within the state. The Commission is of the opinion that the proposed corporation would be endowed with too broad powers, involving the right of eminent domain. Without regard to the latter question, the Commission holds that it would not be for the good of the state to grant any public service corporation a roving charter to operate anywhere within its limits.

The incorporators of the corporation, as given in the petition, are Charles H. Thompson, Montpelier; Francis A. Walker, Barr; Clarence P. Johnson, Lexington, Mass.; Robert L. Ryder, Boston, and Bancroft Abbott, Norwood, Mass.

WISCONSIN.

City Water Company of Merrill—Going Value. In a recent decision involving the rates and service of the Merrill Water Company, the Commission discusses at length the determination of a proper allowance for going value.

In previous cases, the Commission has computed going value solely as the actual cost of building up the business, that is, has computed as closely as possible the amount of the past deficits below reasonable earnings. In the Merrill case, the Commission determines the actual cost and also makes an estimate on the "comparative plant" basis.

The cost of reproduction new of the physical property of the water company now used and useful is found to be $203,666, and the cost of reproduction less depreciation is $177,274. Adding to the depreciated or present value of the physical property an allowance to cover both working capital and going value, the Commission finds that a value of $200,000 may be used as a basis for rate making.

Amount of Past Deficits. From the data for the period from 1888 to 1913, it appeared that the deficits from operation, including a proper amount for depreciation, is $80,895; and including interest on the annual deficits would increase the total to well over $100,000.

"In other words, the operation of the present plant seems to have cost the company more than $100,000 in excess of its receipts."

Comparative Plant Computation. "One very widely advocated method of determining value of the established business of such a plant, i. e., the amount of its going value, consists in summing the present worths of the differences between the future earnings of the existing plant and the estimated future earnings of an imaginary and similar plant, whose construction is assumed to be begun immediately, and which then and thereafter has to undergo the experience of developing a business equal to that already possessed by the one now operating, the two not being considered competitive. This method obviously involves an assumption as to how much more rapidly a plant now about to be built would acquire consumers and revenue than they have been acquired by the plant whose value is being ascertained. The present volume of business would undoubtedly be developed more rapidly by the imaginary or conceptual plant, as it is sometimes called, than was the case of the one under consideration, because the former would begin operation with a larger population in its territory than existed at the time the original works were built."

The Commision estimates the operating expenses, including a proper rate of return, which would be required by the comparative plant.

"In computing the going value of this plant by estimating the cost of reproducing the business (which has actually been developed more or less gradually throughout a period of about 27 years) in accordance with the method hereinbefore alluded to, it is necessary to compare the probable earnings and expenses of the existing plant during the near future years with the estimated probable earnings and expenses during the same years, if the construction of the same plant were only now about to be begun. Obviously, this is somewhat speculative. It would probably be differently estimated by different parties. To be considered reliable such estimates must be made with freedom from bias or prejudice and upon a careful study of all the available facts and circumstances having a bearing upon the result.

"A period of at least five to six years would doubtless be required to duplicate the plant construction and business development that has already been going on for over 27 years. The sum of the present worths of the differences between the net earnings in the two cases, actual and hypothetical, is considered by the authors and advocates of the method to represent the going value of the existing plant."

Making a computation based on numerous assumptions regarding the period of construction of the comparative plant, the probable revenue from public hydrant service and from general service, and the probable earnings of the present plant the Commission states that "the present worths of the differences between the seemingly probable earnings of the two plants considered," shows a "going value" of $12,807.

The Commission concludes: "In addition to the elements of physical property and going value there is also to be considered an allowance for working capital. The addition of a reasonable amount for this purpose brings the total to substantially $200,000."

Denver & Rio Grande Railway Planning to Electrify.—Estimating that a saving of 30 per cent in operating expenses over the heavy grades of the road, the engineers of the Denver & Rio Grande Railway have submitted plans and estimates for their electrification. A report on electrical power sites along the line, together with costs of power furnished by power companies, was included.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

The "Sunlight" Projector for Flood Lighting.

The past year has seen an extraordinary development in flood lighting. Originally used for the exterior illumination of buildings, its possibilities for many other purposes have been made manifest by almost each new installation. The demand for equipment specially adapted for the varied applications of flood lighting has produced several types of projector lamps, of which the "Sunlight" flood projector, manufactured by the American Lighting Company, 617 West Jackson Boulevard, Chicago, Ill., has been developed after careful study of all the technical and practical requirements of such lamps.

This study was begun with the idea of lighting theater stages from the upper part of the auditorium, a projector lamp of exceptional power and ease of control being developed for the purpose, which resulted in several very successful installations. A development from this was the addition of color effects and the production of strikingly attractive and novel flood-lighting installations in summer gardens, dining halls, and the like. Before using these lamps in the much larger field of exterior flood lighting, they were practically redesigned to adapt them to the severe requirements of this service. The result was the "Sunlight" projector, which has been used with complete success for a great variety of outside purposes, its construction being such as to make it suitable for many uses by simple adjustment.

Fig. 1.—View Showing Back of "Sunlight" Projector.

Fig. 2.—View Showing Wired-Glass Front of Projector.

Fig. 1 shows the rear and side of the "Sunlight" projector. The case is made of substantial and well protected metal. The lamp used is a 1,000-watt gas-filled 110-volt tungsten lamp with concentrated filament. It is screwed into a mogul porcelain receptacle that is mounted in the hood or cap of the outfit so that the lamp is in a pendent position. This cap can be turned or moved up or down so as to permit turning or raising the filament to the most advantageous position; after the lamp is unscrewed, the cap can be readily entirely removed from the housing to give instant access to the receptacle and circuit terminals. The circuit wires pass into the cap through heavy porcelain bushings.

The back of the lamp with its adjustable reflector-supporting stem can be easily removed bodily, it being secured to the casing by means of screwed bayonet joints. This gives instant access to the reflector and lamp. The front of the lamp, Fig. 2, is likewise quickly removable by loosening similar bayonet joints. This front is made of flat wired clear glass to prevent pieces from dropping down in case of accidental breakage; it is given a number of light vertical cuts with a diamond to prevent uneven expansion and cracking due to heat. Should the front be shattered due to dropping the lamp from some high point or other rough handling, it can be much more readily renewed than the special curved glass fronts used in other projectors.

A metallic reflector is used for all portable projectors. It is made of spun brass carefully silvered on its reflecting side and covered with a special, non-tarnishing protective coating; this has been found to be very durable, permits maintaining the high efficiency of the reflector, and yet can be cleaned with a little care. For permanent installations where the projectors are not exposed to rough usage or violent weather conditions, mirrored-glass reflectors are used. In nearly all cases the reflectors are as true parabolas as it is possible to make them commercially, thus giving a powerfully concentrated beam of light rated at 150,000 candlepower in the center of the beam when used as a flood lamp and as high as 500,000 candlepower when used as a searchlight. In special cases where a very large area is to be lighted from relatively few lamps, the reflectors have a shape between the parabolic and spherical. In all the projectors the concentration or spread of the beam is adjustable by means of the handle at the back of the lamp, Fig. 1. This permits moving the reflector toward or away from the lamp to give the light distribution desired. The entire arrangement is such, however, that in no case does a dark spot appear in the middle of the illuminated field.

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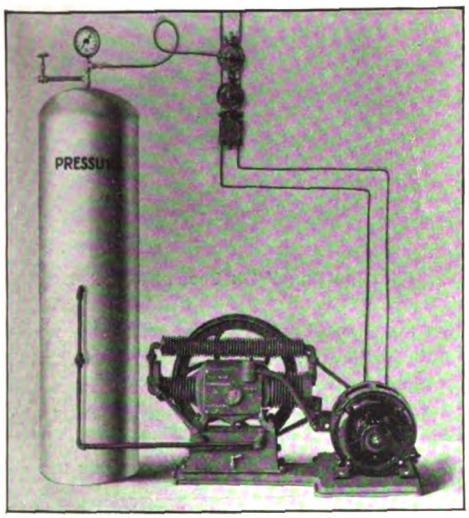
By means of the trunnion and swivel support of the projector, it can be turned to any desired vertical or horizontal angle so as to direct the light to the zone to be illuminated.

The entire projector is well ventilated, inlet openings at the bottom and outlets in the cap giving means for keeping all parts of the outfit cool. Every part of the projector is designed for ready accessibility and quick adjustment, thus making it suitable for mounting on towers or other difficult places, as well as for portable or permanent installations, as has been found in the great variety of cases in which it has been used with completely satisfactory results.

Automatically Controlled Motor-Driven Air-Compressor Plant.

The outfit illustrated herewith has recently been developed by the United States Air Compressor Company, Cleveland, O., for use in garages, factories, air-drill service, etc.

The two-stage compressor is belt-connected to a one-half horsepower single-phase or direct-current motor made by the Robbins & Myers Company, Springfield, O. The tension is maintained on the belt by an automatic belt-tightener. The cylinders of the compressor are opposed and are provided with rings to increase the heat-radiating surface. The connection between the two cylinders is also similarly equipped.



Motor-Driven Air-Compressing Plant.

The outfit is self-oiling and it is necessary to replenish the oil only about once in two months. Every working part runs in oil and no oil cups are used. The bearings are bronze with babbitt lining. All working parts are inclosed to keep out dust. There are no stuffing boxes to cause leakage or require repacking. The body is cast in one piece to insure alinement of the pistons. The valves are steel balls in bronze seats and each pump is equipped with a safety valve to prevent accident from too much pressure. The pump has a capacity of 5,000 cubic inches per minute. The shipping weight is 140 pounds and the floor space required is 14 by 24 inches.

This set is supplied complete with a 30-gallon seamless tank, automatic controller, gauge, valves, compressor, motor, oil trap, safety valve, automatic belt-tightener and belt with all necessary piping shown, all mounted on a large metal subbase.

In addition to the size shown, a larger outfit with a capacity of 15,000 cubic inches per minute can be furnished.

Illuminated Street-Lamp-Changer.

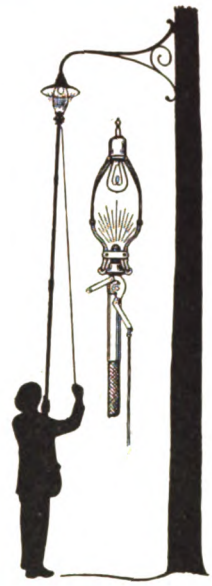
A device for changing series incandescent street lamps from a position on the ground below, with the improved features over former apparatus of being equipped with a means of illuminating the lamp and socket, has been perfected and patented by A. W. Darby, superintendent of the Municipal Electric Light Plant, Holyoke, Mass.

The device consists of a two-pronged clamping tongs made of brass rods, attached to a section of steel tubing, into the lower end of which a jointed wooden pole is inserted. The tubing contains a bull's eye electrical flashlight with dry battery beneath it, and when in use the light is switched on automatically.

The jaws of the tongs are operated by means of a sliding cone, which is projected on the tube by a cam and lever to which a cord about the length of the pole is attached.

One pull of the cord raises the cam, locking the jaws of the clamp onto the socket of the lamp to be extracted. As the jaws are forced together to engage the socket, the light in the tube is switched on, enabling the operator to see clearly what he is doing and where to locate the prongs of the extracting tongs.

In renewing a lamp, the unit is locked into the tongs and the latch-cord, being attached to the opposite lever of the cam, when drawn downward releases the jaws after the lamp has been screwed into position. The bull's eye lamp is simultaneously switched off.



Lamp-Changer and Detail of Head.

The illuminated lamp-changer obviates the necessity of climbing poles or handling apparatus connected with high-voltage circuits at night.

A New Dry Storage Battery.

The extraordinary convenience of the ordinary dry cell has acted as an incentive to inventors to develop a type of storage battery that can be used as freely without danger of spilling or leakage of electrolyte. A new battery of this type has recently been placed on the market by the Venus Electric Lamp Company, 64 Second Avenue, Detroit, Mich.

The Venus dry storage battery is of approximately the same size as the standard No. 6 dry cell, but possesses the capability of being recharged indefinitely. The outer case is of turnplate steel, lined with acidproof material, insuring great durability and rigidity, combined with light weight.

The electrolyte is not in liquid form, but consists of an expensive mineral preparation made up to the company's own formula; it requires no addition of water. It is packed in around and between the cylindrical plates in such a manner as to form a compact, solid mass. The battery conse-

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quently is proof against spilling and leaking. A mineral condenser is used at the top of the cell, which checks all tendency of the moisture to escape by automatically condensing and returning same to the battery. This is an exclusive feature of the Venus battery.

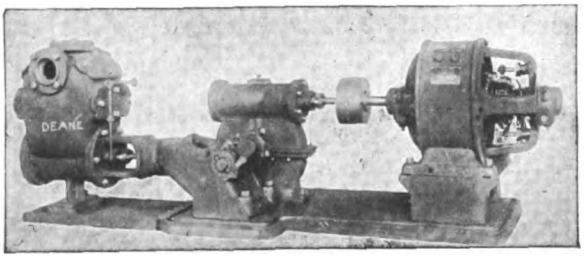
By using the cylindrical type of plate construction it is possible to get a very compact and rigid form of battery, the plates being so tightly packed as to eliminate the danger of short-circuit or distortion. The closeness of the plates, together with the fact that all parts thereof are used to the best advantage, also makes for very high efficiency and capacity, as is evidenced by the relatively high discharging rate of the Venus battery in comparison with its small size.

The capacity of this battery is said to be close to 30 ampere-hours at a discharge rate of 2.5 amperes for nearly 12 hours. This high capacity and discharging rate enables the battery to be used for ignition purposes, for electric head lamps for motorcycles, motorboats, bicycles, and in fact for many other uses which will readily suggest themselves. The charging rate is correspondingly high, or 3.5 amperes, this fully charging the battery in about eight hours.

The Venus battery is claimed to be immune to all the so-called "sicknesses" of the liquid storage battery. This is due to the manner in which the electrolyte is packed between and around the specially designed plates. This construction also largely accounts for the very high efficiency of the battery, as it promotes more effective chemical action on the plates and apparently automatically prevents decrease of capacity, which is not the case with the liquid battery.

Motor-Driven Vacuum Pump for Residence Heating System.

Recently there has been installed in the new residence of Henry Ford, the automobile manufacturer, near Dearborn, Mich., a vacuum heating system in connection with which the pump shown in the illustration is used. In this system a low working pressure throughout the entire heating system is made possible by introducing a vacuum in the return lines. A Deane 8-inch by 7-inch power vacuum pump marketed by the International Steam Pump Company, Holyoke, Mass., takes care of the entire system having about 10,000 square feet of radiating surface. It is driven by a Westinghouse 7.5-horsepower motor through a worm drive which eliminates noise usually accompanying spur-gear drive and makes a very quiet operating pump suitable for residence and office work or other places where noise is objectionable.



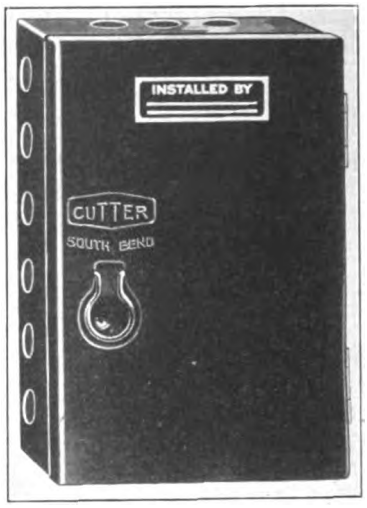
Electrically Driven Vacuum Pump.

Cutter Cutout and Service Boxes to Bear Names of Contractors Installing Them.

Starting from the premise that satisfied customers are the electrical contractors's best asset, the George Cutter Company, South Bend, Ind., has inaugurated a selling campaign on the company's steel rivetless cutout boxes, that offers the contractor an opportunity to gain a certain amount of free publicity by adding his name in permanent form to every installation the contractor undertakes.

"Let your name on the box guarantee your job" is the message the manufacturer conveys to the contractor. As a rule, the only exposed part of an electrical installation is the cutout box. Granted that the box itself is of high quality, the manufacturer points out that this is the logical place to present the contractor's signature as a guarantee of the quality of other parts of the installation not exposed to view. Hence the new thought has been brought out by the George Cutter Company that a gold-leaf name plate on every cutout and service box, showing it was installed by a high-class electrical contractor, will mean a permanent advertisement, making the contractor known to and giving him the confidence of owners, architects, engineers and inspectors. There is no charge made for affixing the name plates on Cutter boxes.

Cutter rivetless steel cutout boxes are formed up from a single piece of sheet steel and electrically welded. Doors overlap and fit tightly, making the boxes dirt and dustproof. A countersunk ring handle is provided. Highly polished Japanned finish is in keeping with the quality of the boxes. The George Cutter Company has published an attractive folder describing the line and giving details of the name-plate offer.



Cutter Box With Special Name Plate.

Electrical Equipment of the Inland Steel Company's New Mill to Include a 15,000-Horsepower Reversing Motor.

The addition to the plant of the Inland Steel Company at Indiana Harbor, Ind., now in course of erection will include all the advantages of electric drive throughout, including the main rolls, and the electrical equipment will incorporate very striking features. It will be practically a complete steel plant in itself. The addition will consist of open-hearth furnaces, blooming and finishing mills.

About two years ago, the Inland Steel Company installed electrical apparatus in its plate and steel mills, the operation of which was so successful that when the decision was made to erect a new mill, electric drive was the only form of motive power considered.

Accordingly a contract was recently awarded the Westinghouse Electric & Manufacturing Company for the complete electrical equipment of the mill, including two 5,000 kilowatt, 25-cycle, 2,400-volt turbogenerators complete with surface condensers, exciters and switchboards; two 1,000-kilowatt synchronous motor-generator sets; one 15,000-horsepower direct-current motor equipment; two 8,000-horsepower motor equipments; also several thousand horsepower of auxiliary apparatus. The contract prac-

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tically doubles in value any ever given by a steel company for electrical equipment and is exceeded in total horsepower, but not in size of units, only by one other installation. It aggregates close to $1,000,000.

This installation will doubtless be watched with considerable interest by steel-plant engineers and operators on account of the many novel features designed by the Westinghouse engineers.

The 15,000-horsepower direct-current motor will be direct-connected to a 40-inch reversing blooming mill, receiving its power from the generator of a flywheel motor-generator set. The direction of rotation of this mill motor is to be obtained by means of voltage control of the generator supplying it with current.

The structural mill consists of one 32-inch reversing roughing mill, and one 28-inch finishing mill of three three-high rolls. Each mill is driven by an 8,000-horsepower direct-connected, direct-current motor and the scheme of control is the same as mentioned for the blooming mill. One flywheel motor-generator set with a generator unit for each motor supplies the power for the mills and by a special system of control and design of apparatus, the power taken from the line is equalized to practically a constant load with variations of not more than 10 per cent plus or minus, although the load on the mill motors will vary from several thousand horsepower in one direction to several thousand horsepower in the opposite direction several times a minute.

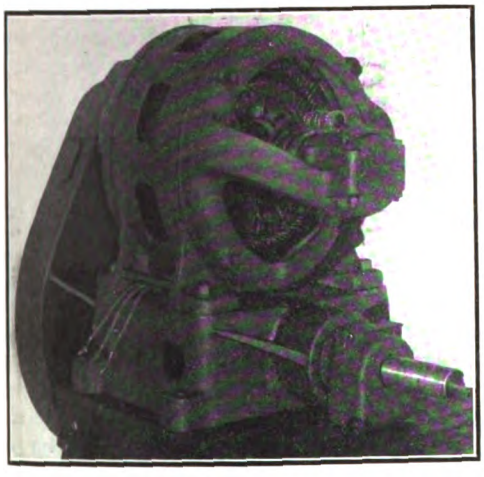

Fig. 1.—Motor With Countershaft Base.

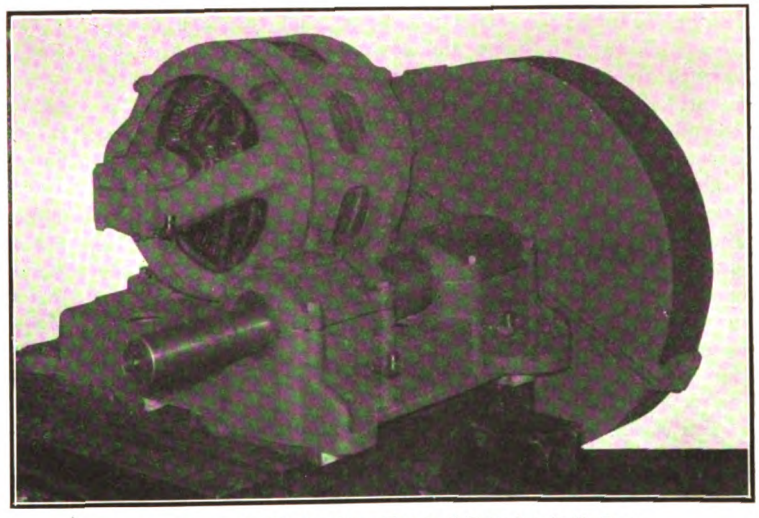

Fig. 2.—Motor With Another Type of Countershaft Base.

Energy for the auxiliaries, most of which are direct-current motor drive, is to be supplied from the two 1,000-kilowatt synchronous motor-generator sets.

Countershaft Induction Motor with Base.

Because of their strong and rigid construction the countershaft induction motors shown herewith are specially adapted for use where the service conditions are severe. In both cases a standard Crocker-Wheeler induction motor is mounted on a massive base which serves as a support for the countershaft bearings. This method of construction results in a low center of gravity. Perfect alinement of the countershaft bearings is insured by mounting them as shown and by using a semi-self-alining design of bearing. By using this base construction it is possible to have the countershaft bearings the maximum distance apart, thus taking care of the heavy thrust that occurs at the pinion end of the countershaft.

In the case of the motor shown in Fig. 1, the base has a bearing support cast integral with it at each end. These bearing supports extend for a considerable distance both inside and outside of the base. Additional rigidity is given each of these supports by the use of two webs or braces located on the outside surface of the base. The bearings proper are castings designed to hold the journal box and to have an oil well in the lower portion. The bearings are securely held in the accurately bored bearing supports of the base. Endwise motion is prevented by a special form of set screw extending through the support into a corresponding hole in the bearing. The oil wells are tapped for oil gauges and drain plugs and are fitted with dustproof sight-hole covers. The ends are, in addition, protected by tightly fitting dust covers.

The journal box fits into the bore of the bearing housing just described, as accurately as do the journal boxes of the rotor in the motor shields, the construction being similar. The journal box is maintained in position by a set screw projecting into a drilled hole in the top.

Oil-ring lubrication is used on all bearings. The oil grooves used to distribute the oil carried up by the rings are so located that no matter in what direction the pressure may come on the bearing, the oil will always be carried between the shaft and the journal box, thus maintaining the oil film without which perfect lubrication and freedom from wear is impossible. In addition the design of the bearings is such that while dust and dirt cannot work into the bearings, the oil cannot get out.

The pinion on the rotor shaft and the gear on the countershaft are inclosed in a two-part gear case, each half being securely bolted to the base of the motor. A hand hole with a self-closing cover is provided in one-half of the gear case to render the gearing readily accessible for inspection and lubrication. When it is desired to attach the motor to the ceiling, or on a wall, the motor shields and bearings and the two countershaft bearings can easily be rotated through the necessary angle, so that the oil rings in the four bearings will operate properly.

Fig. 2 shows another type of construction employed. The base is more massive and the countershaft is mounted to one side of the base of the motor. Split countershaft bearings are employed, the lower halves of which are cast integral with the base. The caps are held together by means of four bolts. Otherwise the general construction is similar to that employed in the type of motor previously described.

As both types of construction permit the use of a standard induction motor, the owner of a standard plain motor can easily change it at any time into a geared countershaft machine by purchasing the countershaft parts. These countershaft motors are being made by the Crocker-Wheeler Company, Ampere, N. J.

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INDUSTRY ACTIVITIES

Woodmansee & Davidson, consulting engineers, have moved their offices from 1048 First National Bank Building to 784 Continental & Commercial National Bank Building, Chicago.

De La Vergne Machine Company, 1185 East 138th Street, New York City, is sending out neat calendars for 1916. The type FH De La Vergne crude-oil engine is pictured and its extraordinary economy is pointed out. The monthly calendar sheets are conveniently arranged to show not only the current month, but also the last and next month.

Phillips Insulated Wire Company, Pawtucket, R. I., has published a very attractive calendar for 1916, printed in colors and presenting a bird's-eye view of the company's large factory, and also carrying embossed trade-marks of the companys product. The calendar is of convenient form and arrangement, and will be popular with all who receive it.

Queen-Gray Company, Philadelphia, Pa., has issued Bulletin E7, dealing with Wheatstone bridges, low-resistance bridges, ohmmeters, resistance boxes and standard resistances. The instruments and apparatus illustrated and described are chiefly for resistance and conductivity measurements of high accuracy. Several types are described in considerable detail, and the construction of parts of the apparatus specially explained.

General Electric Business.—Bookings of the General Electric Company, Schenectady, N. Y., since the beginning of the new year have continued at the same high rate as in the latter part of 1915, when orders averaged about $3,000,000 weekly. This is exclusive of "special export business," the term applied to the company's war orders. Unless an unexpected change occurs the General Electric Company will this year close the greatest volume of contracts ever taken on its books in a single year.

The Electrose Manufacturing Company, Brooklyn, N. Y., is distributing several leaflets and a wall card preliminary to the issuance of its general catalog. The bulletins illustrate and describe a few types of the company's high-tension insulators, insulating connectors and parts, while the wall card shows a photograph of the fighting top of the United States battleship *New York* taken from the Manhattan Bridge. A number of Electrose insulators have been installed on this man-of-war.

Clarence W. Marsh, consulting and chemical engineer, has established offices at 201 Devonshire Street, Boston, Mass. For the past 12 years Mr. Marsh has been chief engineer and special investigator for the Hooper Electrochemical Company and the Development & Funding Company of New York City, and he is now prepared to render service relating to the chemical and allied industries, especially to questions of the manufacture of electrolytic caustic soda, bleaching and chlorine products.

The Richardson Scale Company, Passaic, N. J., has published bulletin No. 101, devoted to illustrations and descriptions of its appliances and apparatus for the automatic weighing of coal and water in power plants. As a contribution to technical literature the bulletin is worthy of a prominent place in the files of every engineer. The illustrations are well presented, the diagramatic suggestions are handled to the best advantage and the typographical arrangement and printing leave nothing to be desired.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has just received an edition of 200,000 copies of an eight-page folder describing the Cutler-Hammer magnetic gear shift for gasoline automobiles. The folder is for general distribution. This automatic means of gear shifting has been adopted by the Pullman Car Company of York, Pa., and as optional by the Winton Motor Car Company of Cleveland, and caused considerable comment when it was exhibited at the New York and Milwaukee automobile shows.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently issued two leaflets on alternating-current switches. Leaflet 3551-A describes Type F alternating-current magnet switches which have been designed to fulfill the severest requirements of industrial service. Details of construction, operating characteristics and illustrations of mounted switches are given. Leaflet 3849 describes and illustrates Type EA alternating-current low-voltage switches. Diagrams of typical connections are given and the construction of the board thoroughly described.

The Wesco Supply Company gathered its entire staff of traveling salesmen for annual conference at its offices, St. Louis, Mo., January 4 to 7. Representative speakers were secured by Sales Manager F. D. Phillips from the manufacturers of the most important lines distributed by the company, and these men outlined the sales policies of each manufacturer for the benefit of the Wesco salesmen. The results of these talks will undoubtedly be shown by greater sales during the year. The conference, deemed a great success, was closed with a banquet given by President Charles Scudder at the St. Louis Club and a ball given by the Wesco Mutual Benefit Association.

The Electric Storage Battery Company, Allegheny Avenue and Nineteenth Street, Philadelphia, Pa., announces that its representative and distributor in southern California, the Kay & Burbank Company, of Pasadena, has found its business has increased so much as to necessitate opening an Exide battery depot and service station in Los Angeles. The new establishment is located at Eleventh and Figureoa Streets in the heart of the automobile district. The front part of the building is occupied by the office and a large battery stockroom, which carries one of the largest stocks of batteries and parts on the Pacific Coast. In the rear of the building with an entrance from Eleventh Street is housed the battery service department and the electrical department where electric vehicle, ignition, starting, lighting and magneto work is taken care of.

Page & Hill Company, Minneapolis, Minn., announces that it has secured the services of W. B. Foshay as sales engineer, with headquarters at the main office of the company. Mr. Foshay is well known in electric lighting circles, having been connected with various lighting companies. He began his work with the United Gas Improvement Company, and was later manager of the Hutchinson (Kan.) Electric Light Company, Fort Dodge (Iowa) Electric Light Company and the Wichita (Kan.) properties. After leaving Wichita he went to Walla Walla, Wash., and took charge of the central station in that city, becoming district manager of a group of plants in the states of Washington and Oregon, covering a territory of 90 miles. Later he opened an office as consulting engineer in Portland, Ore., but received so attractive an offer from Page & Hill Company that he decided to enter the cedar-pole field. Mr. Foshay's experience in the electric lighting business will enable him to do ex-

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cellent work for the company, and his acquisition rounds out a most complete organization.

National Lamp Works of General Electric Company has issued through its Engineering Department, Bulletin 26 entitled "The Mazda Lamp in Photography." The bulletin presents in simple language such data and information in regard to the Mazda lamp and its application to the processes of photography as will assist photographers in their work, and acquaint the electrical public with the principles involved. The first part of the bulletin is devoted to a description of the photographic process and its relation to the Mazda lamp. Particular attention is paid to the special photographic-blue-bulb Mazda C lamp and its application to the lighting of portrait and motion-picture production studios. The use of these lamps for taking interior views, for copying, printing, enlarging, and photomicrography is likewise discussed. Copies of this bulletin may be obtained from the Engineering Department, National Lamp Works, Nela Park, Cleveland, O.

Cutler-Hammer Clutch Company, Milwaukee, Wis., has just issued Bulletin 12 describing lifting magnets. This 24-page bulletin contains over 40 illustrations and interesting information concerning the design, application and cost of handling various materials. Illustrations are reproduced from a moving-picture film showing a Cutler-Hammer High Duty magnet handling a skull-cracker ball for breaking scrap. An increase in lifting capacity of 20 to 50 per cent for all sizes of the new High Duty magnets is claimed. The same company has also issued a circular that briefly describes the Cutler-Hammer magnetic saparator pulley, which is designed to remove stray pieces of iron or steel from diamagnetic substances. The magnetic saparator is used to protect crushers from injury and in such industries as sugar refineries to remove small particles that detract from the purity of the product.

The Esterline Company, Indianapolis, Ind., reports that its business is continually growing and prospects very bright. The graphic-instrument department of the company made sales during December, 1915, to the following companies: Allis-Chalmers Manufacturing Company, Bell Telephone Company of Pennsylvania, Carbon Purchasing Company, Chicago, Burlington & Quincy Railroad Company, Chicago Portland Cement Company, Coal Products Company, Commonwealth Edison Company, Consumers Power Company, Cutler-Hammer Manufacturing Company, Detroit-Edison Company, Diamond Portland Cement Company, Duquesne Light Company, E. I. Dupont de Nemours Company, Eastern Michigan Power Company, Electrical Equipment Company, Montreal; Elizabeth Steel Magee Hospital, Equitable Office Building, Federal Sugar Refining Company, W. W. Geisse, Goodyear Tire & Rubber Company, Indianapolis Heat & Light Company, Lake Charles Railway, Light & Water Works Co., Lowell Textile School, Ludwig Hommel & Company, Merchants Heat & Light Company, Indianapolis; Mond & Nickel Company, Toronto; National Tube Company, New York Central Railroad Company, Northern Electric Company, Montreal; Northern Electric Company, Toronto; Northwestern Electric Company, Northwestern Electric Equipment Company, Ohio State Telephone Company, Patterson-Sargent Company, Pacific Portland Cement Company, Philadelphia Electric Company, Pittsburgh Coal Company, Pittsburgh Crucible Steel Company, Prest-O-Lite, Public Service Railroad Company, Record Electrical Company, Manchester, England; Remy Electric Company, Roessler-Hasslacher Chemical Company, San Joaquin Light & Power Company, Sayles Finishing Company, Scranton Electric Company, Scranton Railway Company, Seymour Power Company, Solvay Process Company, Strathmore Paper Company, Superintendent of Construction, Pittsburgh; Taylor Instrument Company, Tennessee Coal & Iron Company, Terre Haute, Indianapolis & Eastern Traction Company, Toronto Light Company, Toronto; United States Navy Pay Office, United States Smelting Company, West Penn Railway Company, Westinghouse Electric & Manufacturing Company, and Whiting Foundry Equipment Company.

The Standard Underground Cable Company announces the following promotions and rearrangements in its general office and factory staffs: In the general offices P. H. W. Smith, formerly vice-president with duties of general sales manager, becomes vice-president and assistant general manager under President and General Manager J. W. Marsh, and as such will have general oversight of manufacturing and sales activities of the company, with headquarters at Pittsburgh, as formerly. Charles W. Davis, formerly manager of the company's central sales department, general superintendent of construction and manager of the accessories department, becomes vice-president and general sales manager. Mr. Davis' connection with the company dates from 1900, and his former duties and experience have been both broad and long with the Standard Company. Arthur A. Anderson, also for many years connected with the company's sales organization at Pittsburgh, has been made manager of the central sales department in the Pittsburgh district. A. F. Hovey has been made manager of the construction department and J. H. Lytle, manager of the accessories department. In the factory organization C. C. Baldwin, formerly superintendent of the wire and rod mill and weatherproof and magnet-wire departments and of the brass and tubing departments at Perth Amboy, N. J., has been made a vice-president of the company and general manager of the Perth Amboy plant. Mr. Baldwin is well known in the electrical industry as an expert wire and rod-mill man, having built several well known wire and rod mills before becoming connected with the Standard Company in 1903. H. W. Fisher continues as chief electrical engineer of the company, and in addition, becomes manager of the lead-cable works and rubber wire and cable factories, under the assistant general manager and president. He is also made an officer of the company by virtue of his appointment as assistant secretary, but will be located at Perth Amboy, as heretofore. Other advancements at the Perth Amboy plant are: Tracy D. Waring will be assistant manager of the lead-cable works and of the rubber-wire factory, Albert C. Meyers will be superintendent of the rubber-wire factory, and E. J. Waring will be assistant purchasing agent, in addition to his former duties as business manager at the plant. At the Pittsburgh factory Charles Barbour is given the title of manager of the Pittsburgh factory, and also of the plant of the Standard Underground Cable Company of Canada, Limited, at Hamilton, Ont., Canada, the duties of which positions he has performed for some time.

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CURRENT ELECTRICAL NEWS

ATLANTIC STATES.

BRIDGEWATER, MASS.—The Edison Electric Illuminating Company will build an addition to its plant here.

NEW HAVEN, CONN.—The United Illuminating Company is enlarging its powerhouse and will install additional equipment.

NEW LONDON, CONN.—This city is to have a white way and other lighting improvements. The Connecticut Power Company furnishes power.

SOUTH NORWALK, CONN.—Ornamental lighting and municipal power plant improvements are being considered by the city.

ALBANY, N. Y.—The Public Service Commission has authorized the issue of $541,950 in securities of the Northern New York Utilities, Inc., with which to pay certain debts, provide for new extensions and absorb the Cape Vincent municipal plant, the Chaumont Electric Light Company and the Thousand Islands Electric Light & Power Company, and exercise eight new town franchises.

DUNDEE, N. Y.—A power line will be constructed between this city and Lakemont. Address E. L. Bailey.

SENECA FALLS, N. Y.—The Seneca Power Corporation has been incorporated by Henry R. Micks, Paul B. Kendig and others. The corporation will build an electric powerhouse at the new dam of the barge canal, which will be of sufficient magnitude to generate 8,000 horsepower for use by manufacturing interests. The work of building will begin without delay.

ALBURTIS, PA.—The Lehigh Valley Light & Power Company, of Allentown, Pa., has been granted a franchise to supply power in this city. Lines will be extended from Macungie, a distance of about three miles, and it is expected that work will be started shortly.

NEW CASTLE, PA.—Applications for charters in various townships of Lawrence, Mercer and Beaver Counties were filed in Harrisburg in behalf of the Mahoning & Shenango Railway & Light Company. The purpose of the charters is to enable the company to give additional local service in the townships and to permit it to tie together by extensions of its transmission systems the three powerhouses of the system. Address general manager.

PITTSBURGH, PA.—The Baltimore & Ohio Railroad Company will build a powerhouse on Second Avenue.

POTTSVILLE, PA.—Charters giving the Eastern Pennsylvania Light, Heat & Power Company the right to do business in eight nearby townships have been granted.

TROY, N. C.—The Smitherman Power Company has been incorporated with $300,000 capital to generate and distribute electrical energy for light and power.

PALATKA, FLA.—The Southern Utilities Company of Jacksonville is planning to install generating equipment at plant of Palatka Ice Company to furnish, power day and night.

NORTH CENTRAL STATES.

GENEVA, O.—The city contract for electric lighting with the Electric Light & Power Company will soon expire and a municipal plant may be installed. Address city auditor.

SPRINGFIELD, O.—Manager Weare Parsons, of the Springfield Light, Heat & Power Company, stated that the installation of new equipment at the plant will start about March 1.

URBANA, O.—The Urbana Light Company is investigating the extension of its lines to Mingo and Cable, as well as intermediate points, to serve industrial plants and domestic consumers.

WILMINGTON, O.—Bids will be received until February 17 on the construction of the new courthouse and jail, including the electrical equipment. Weber, Werner & Adkins of Cincinnati prepared the plans, which can be obtained of them or of the County Auditor. A deposit of $20 is required. Bids may be submitted on separate branches of the work. L.

WILMINGTON, O.—A proposition to construct a traction line from Wilmington to Xenia, to connect with the Dayton and Xenia line will be considered by the local Chamber of Commerce. Address J. W. Sparks.

YOUNGSTOWN amount of about $3 boulevard lighting construction in East the labor troubles town & Sharon Li is handling the wor of the standards an broken, while about as well as other e have to be replaced

YOUNGSTOWN & Shenango Valle in connection with service to a numb section, will charte companies in the s purpose.

YOUNGSTOWN town & Niles Int planning to extend to Warren.

ANDERSON, I Mellett announced be spent during the ment for the munici light plant.

EVANSVILLE, IND.—The Evansville & New Harmony Traction Company has been organized to construct a new line to extend to Poseyville, Cynthiana, Owensville and New Harmony. Address General Manager Siebert.

NEWCASTLE, IND.—Following the lead of other cities in the state in an effort to obtain lower light and power rates the city will soon go into the retail power business. With the expenditure of $40,000 more it is declared that the city plant can take care of the city's business. Address city clerk.

SEYMOUR, IND.—A new power company here is the answer of the city to the refusal of the Inter-State Public Service Company to reduce its rates for light and power. A 25-year franchise for the new company, which will be known as the Commercial Electric & Power Company, has been asked by the City Council. Address city clerk.

ALLENDALE, ILL.—The Council is making plans to secure electric lighting. Address town clerk.

BASCO, ILL.—Plans have been laid for the installation of electric lights. Address W. O. Fisher.

BELLEVILLE, ILL.—Plans for a white way have been completed. Address W. C. Wolf, city engineer.

DECATUR, ILL.—City officials are considering the installation of a new dynamo at the municipal light plant and ornamental lights on Main Street. The city engineer is preparing estimates.

GALESBURG, ILL.—A new lighting system for this city is being urged by John Walsh, superintendent of lights.

IVESDALE, ILL.—The Council has granted to the Bement Electric Light & Power Company a franchise to build and operate an electric light and power system in Ivesdale.

JOLIET, ILL.—The Joliet & Eastern Traction Company has completed plans to extend its line from Joliet to Hammond, Ind. Address general manager.

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plant costing $5,000. Address John Olson, county commissioner.

SHEBOYGAN FALLS, WIS.—The Common Council has ordered the installation of an ornamental lighting system on North Eight Street from Jefferson to Michigan Avenue.

FLOODWOOD, MINN.—The village council has granted a 30-year franchise to the Cloquet Electric Company.

OSKALOOSA, IOWA.—The Oskaloosa Traction & Light Company will rebuild the power lines in the business district.

NEW VIRGINIA, IOWA.—J. F. Smith of Lorimor has petitioned for a franchise to establish an electric light plant.

WAUKEE, IOWA.—The Council plans

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to install a $7,000 electric plant. Address G. C. Jones, mayor.

BLUE SPRINGS, MO.—The Council plans to install 33 electric street lights. Address town clerk.

HIGGINSVILLE, MO.—The City Council has decided to submit to the voters a proposal to issue bonds to enlarge the municipal power plant. Address town clerk.

KANSAS CITY, MO.—The Industrial Council has approved a movement for a municipal light plant. Address city electrician.

KANSAS CITY, MO.—The Ford Motor Company is having plans prepared for a power plant. C. C. Mead is local manager.

COLUMBUS, KANS.—The Oklahoma & Interstate Railway Company is planning to build an interurban line from this city to Galena and to Commerce. John R. Rose of Oklahoma City is president of the company.

LITTLE RIVER, KANS.—Bonds to the amount of $16,000 have been voted for an electric light plant. Address Ray Jack.

ZENDA, KANS.—A meeting of the township was held preparatory to putting in a $5,000 light plant. Local capitalists will build the plant. Address Dr. C. E. Phillips.

DAWSON, NEB.—The Dawson Electric Light & Power Company will build a transmission line to Humboldt.

FAIRBURY, NEB.—The Lincoln Telephone & Telegraph Company will soon rebuild their Fairbury lines and install a modern switchboard to cost about $10,000. The estimated cost of rebuilding in the city is $65,000.

HURLEY, S. D.—The proposition of purchasing the local electric light system and authorizing the issuance of $10,000 in bonds for payment will be submitted to the voters. Address city clerk.

SOUTH CENTRAL STATES.

DIXON, KY.—The City Council has arranged with the Clay Light & Power Company of Clay, Ky., to furnish electricity. The company will construct an eight-mile transmission system.

MURRAY, KY.—The City Council has voted to submit a bond issue proposition for a municipal lighting plant to the voters.

PROVIDENCE, KY.—The $20,000 municipal lighting bonds have been sold to Weir, Roth & Company of Cincinnati at a premium which will be sufficient to produce at the rate of $106. The bonds will draw six per cent interest for 20 years.

RUSSELLVILLE, ALA.—The Sloss-Sheffield Steel & Iron Company is planning to build an electric power plant here at a cost of about $50,000.

GRENADA, MISS.—An ornamental lighting system on the principal streets is contemplated. Address mayor.

LAHOMA, OKLA.—The Enid Electric & Gas Company, of Enid, Okla., will construct a transmission system to furnish light and power to Lahoma.

TUTTLE, OKLA.—The city is considering propositions for the installation of electric light plant. Address mayor.

BOWIE, TEX.—E. P. Turner, president of the Dallas Northwestern Traction Company, attended a mass meeting of Bowie citizens and residents along the proposed route through Montague County. At this meeting $3,000 was subscribed to be used in making a survey of this road from Bowie to Krum to connect with the route already surveyed from Krum, via Denton to Dallas.

BROWNSVILLE, TEX.—Electric street car service has been inaugurated here. There are three miles of trolley line in operation and plans are under way for an extension. A franchise for an electric street car line across the Rio Grande to Matamoros, Mexico, may be acted upon soon.

BRYAN, TEX.—The city is considering the installation of 54 ornamental light poles on Main Street.

COMANCHE, TEX.—Rapid progress is being made on the transmission line being built by the Texas Power & Light Company from Brownwood to Comanche, a distance of about 30 miles. The line will be 22,000 volts and will also serve the town of Blanket.

DALLAS, TEX.—Extension of time on the franchise for both the Denton-Krum and the Cleburne-Glen Rose interurbans was granted in the County Commissioners' Court on application of E. P. Turner, president of the Dallas Northwestern and Dallas Southwestern Traction Companies.

DALLAS, TEX.—Property owners on Akard Street have filed a petition with the Board of City Commissioners asking for the installation of an ornamental lighting system.

DALLAS, TEX.—The City Commissioners have passed through first reading an ordinance granting the Dallas Standard Traction Company a 20-year franchise in Mount Auburn.

MARBLE FALLS, TEX.—M. M. Barry, lessee of the water and light plant here, will install new machinery and make other improvements.

MARLIN, TEX.—The Marlin-Temple Interurban Promotion Company has been organized with principal office here to construct an interurban electric line between Marlin and Temple, about 35 miles. Right of way is now being secured. It is stated by W. A. Patrick, head of the project, that financial arrangements for the construction of the line have been made.

SHERMAN, TEX.—Work has been started on the rebuilding of the Texas Traction Company substation near Sherman, which recently was destroyed by fire.

TYLER, TEX.—F. C. Cotton of Denver, Colo., has purchased the Tyler electric street railway system from J. W. Fitzgerald and associates. He will install new machinery in the power plant and extend the lines. Mr. Cotton has also purchased the street railway system of Cleburne from John W. Floore. The property will be improved.

WESTERN STATES.

CASA GRANDE, ARIZ.—The City Council has taken steps towards constructing a municipal electric light plant out of the proceeds of a $35,000 bond issue.

PHOENIX, ARIZ.—The State Corporation Commission has granted the Phoenix Street Railway Company 18 months' time for the company to rebuild its system.

WICKENBURG, ARIZ.—P. M. Jewett, who recently purchased the local electric plant, is moving part of the equipment to Lynn Creek, where he expects to install a lighting system.

LOGAN, UTAH.—Application has been made to the state for the water power rights in Logan Canyon by D. C. Bridge, who probably will erect an hydro-electric plant.

JULIAETTA, IDAHO.—C. J. Martin & Son, proprietors of the electric light plant here, have agreed to make improvements in order to give 24-hour service.

BREMERTON, WASH.—Plans have been received from Washington, D. C., for the construction of a high power radio station at Keyport, for which the last Congress appropriated $40,000. According to the Commandant at the Puget Sound Navy Yard, $10,000 of this amount must be expended by July 1, 1916. Plans provide for a station consisting of three towers, plant and equipment to cost completed $125,000. O.

COUPEVILLE, WASH.—The Coupeville Electric Light plant, owned by W. C. Cheney, has been sold to H. E. Wood, of Langley, Wash. Reported the new owner will make improvements and extensions to the existing plant at once. O.

HOOD RIVER, ORE.—Plans for the construction of an electrical power plant and dam on Hood River, near this city, to cost $40,000, are being seriously considered by the Farmers Irrigation Company of Hood River. August Guignard, Hood River, president. O.

OSWEGO, ORE.—The Oswego Lake Water, Light & Power Company has petitioned the County Commissioners for a 25-year franchise to maintain poles carrying power and light wires on the county roads near Oswego.

ALTURAS, CAL.—The Alturas Electric Light & Power Company intends to install an auxiliary plant here and extend its lines 30 miles to Hess Mine.

LOS ANGELES, CAL.—Out of the $4,000,000 bond issue approved by the State Railroad Commission granting the Pacific Light & Power Company authority to issue that sum the company intends to use $1,200,000 for extensions and improvements.

PARADISE, CAL.—The Pacific Gas & Electric Company will build a transmission line from its Centerville power-house to this city, a distance of 20 miles.

REDDING, CAL.—The City Electrician has been authorized to purchase materials for a new street lighting system.

TROPICO, CAL.—The City Council is considering the possibility of municipal ownership of the local electric plant.

TULARE, CAL.—A new conduit system for the city electroliers is being considered by the City Council.

NEW PUBLICATIONS.

ELECTROLYSIS.—The Bureau of Standards, Washington, D. C., has issued Technologic Paper No. 52 dealing with "Electrolysis and Its Mitigation," by E. B. Rosa and Burton McCollum. The six parts deal with an introduction, general considerations, methods applicable to pipes, to railway negative returns, regulations and summary.

SOUTHWESTERN POWER.—Southwestern Power & Light Company, a subsidiary of the American Power & Light Company, has issued a 68-page report giving detailed financial and physical data pertaining to the company and its operating subsidiaries and many photographs of cities and industries served and of properties owned.

CANADIAN COAL.—The Department of Mines of Canada has issued "The Production of Coal and Coke in Canada During the Calendar Year 1914," giving statistics by provinces.

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FINANCIAL NOTES.

Consumers Power Company of Michigan, a subsidiary of Commonwealth Power, Railway & Light Company, has sold to Harris, Forbes & Company, New York City, $1,090,000 first-mortgage five-per-cent bonds.

Winnipeg Electric Railway Company has sold to William P. Bonbright & Company, New York City, $750,000 six-per-cent two-year collateral trust notes, which are being offered at par. Gross of the company for twelve months ended October 31, 1915, was $3,498,397 and net $978,065.

The Crocker-Wheeler Company, Ampere, N. J., has declared a quarterly dividend of 1.5 per cent on the common stock and the regular quarterly dividend of 1.75 per cent on the preferred stock, payable January 15, 1916, to stockholders of record at the close of business December 31, 1915.

The Electric Investment Company, of Boise, Idaho, represented by F. F. Johnson, of Boise, at public auction recently purchased all the property and holdings of the Great Shoshone & Twin Falls Water Power Company, operating in Southern Idaho, at a price of $2,000,000. This price was the minimum price set by the United States District Court after the company had passed into the hands of receiver in November, 1914.

Chicago Railways Company has sold to Harris, Forbes & Company an additional $1,500,000 first-mortgage five-per-cent 20-year bonds, making the total amount of these bonds outstanding $54,455,000. Chicago Railways Company's 59 per cent of the net of Chicago Surface Lines for the year ended November 30, 1915, was $6,415,614, equivalent to a balance of $3,692,864, after providing for interest on the first-mortgage bonds. Gross of Chicago Surface Lines for the year was $31,405,191, with net of $10,873,922.

J. P. Morgan & Company has purchased from the American Telephone & Telegraph Company $50,000,000 4.5-per-cent, two-year notes. Some of notes are direct obligations of the American Telephone & Telegraph Company and the others are obligations of its subsidiary companies, endorsed and guaranteed by the American Telephone Company. It is understood that practically all of these notes have been retained by the Morgan firm and their associates at an investment and will not be offered to the public. The American Telephone & Telegraph Company has done no financing during the past year. Construction at the rate of about 60 per cent of normal was taken care of out of existing resources. In 1916 the company expects to resume construction on normal lines established by the experience previous to the European war. To finance the associate companies this will require about $25,000,000 of new money. At least $30,000,000 of the new notes will be the application of the associate companies with the endorsement of the parent company, and the remainder the direct application of the American Telephone & Telegraph Company. The proceeds of the $50,000,000 new Telephone notes will take care of the maturity in April and May of $26,325,000 two-year, five-per-cent notes of several of the subsidiaries. The balance or, say, $23,000,000 will provide for new construction in 1916 and 1917.

Dividends.

	Term	Rate	Payable
Cities Service, pf.	M	0.5 %	Feb. 1
Col. Ry., Pw. & Lt., pf. Series B	Q	1.25%	Feb. 1
Col. Ry., Pw. & Lt., com.	Q	1.25%	Feb. 1
Crocker-Wheeler, pf.	Q	1.75%	Jan. 15
Crocker-Wheeler, com.	Q	1.5 %	Jan. 15
Elec. Bond & Share	Q	2 %	Jan. 15
Elec. Bond & Share, pf.	Q	1.5 %	Feb. 1
Elec. Util., pf.	Q	1.25%	Jan. 15
Lew'n, A., & Waterv., pf.	Q	1.5 %	Jan. 15
Manhattan Elec., com.	S	3 %	Feb. 1
Manhattan Elec., ex.	...	5 %	Feb. 1
Mil. Elec. Ry. & Lt., pf.	Q	1.5 %	Jan. 31
Montreal Tramways	Q	2.5 %	Feb. 1
Pub. Serv. Inv., pf.	Q	$1.50	Feb. 1
West Penn. Rys., pf.	Q	1.25%	Feb. 1

Reports of Earnings.

WESTERN UNION TELEGRAPH COMPANY.

The Western Union Telegraph Company has issued a report for the year ended December 31, 1915 (December estimated), which compares as follows:

	1915	1914
Total revenue	$52,356,286	$47,463,952
Maintenance, repairs and restoration, for depreciation	8,516,092	8,434,586
Operating expenses, taxes, etc.	32,286,225	32,320,729
Total expenses	40,802,317	40,755,315
Balance	11,553,969	6,708,637
Interest	1,335,588	1,337,242
Net income	*10,218,381	5,371,395

*Equal to 10.24 per cent earned on $99,786,759 capital stock against 5.17 per cent earned on same stock previous year.

AMERICAN TELEPHONE & TELEGRAPH COMPANY.

The American Telephone & Telegraph Company and associated, holding and operating companies in the United States, not including connected independent or sub-licensed companies, reports for the eleven months ended November 30, 1915, partly estimated, compared as follows:

	1915	1914
Gross earnings	$218,551,503	$206,710,452
Expenses	158,131,835	152,884,148
Net	$ 60,419,668	$ 53,826,304
Interest	16,670,957	17,341,567
Surplus	$ 43,748,711	$ 36,484,737
Dividends	29,978,831	27,767,324
Surplus	$ 13,769,880	$ 8,717,413

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 17	Jan. 10
American Tel. & Tel. (New York)	127½	127⅞
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	243	247
Electric Storage Battery common (Philadelphia)	64	66½
Electric Storage Battery preferred (Philadelphia)	64	66½
General Electric (New York)	175¾	173⅞
Kings County Electric (New York)	128	128
Massachusetts Electric common (Boston)	6½	5½
Massachusetts Electric preferred (Boston)	34	34
National Carbon common (Chicago)	165	165
National Carbon preferred (Chicago)	121	121
New England Telephone (Boston)	131½	132
Philadelphia Electric (Philadelphia)	28	28⅝
Postal Telegraph and Cables common (New York)	78¼	78½
Postal Telegraph and Cables preferred (New York)	66	66¼
Western Union (New York)	91¼	88⅛
Westinghouse common (New York)	67¼	68
Westinghouse preferred (New York)	76½	77

PERSONAL MENTION.

MR. A. S. LINDSTROM, representing the Thorgarson Electric Company, which had an exhibit in the Palace of Machinery at the Panama-Pacific Exposition, has opened an office in the Rialto Building, San Francisco.

MR. F. H. BETHELL, vice-president of the New York Telephone Company, has been elected a director of the Liberty National Bank, of New York City; and MR. FORD HUNTINGTON, also vice-president of the New York Telephone Company, has been elected a director of the Coal & Iron National Bank, of New York City.

MR. W. F. HOLT, who established the public utilities in the Imperial Valley, has disposed of his electric power plants, transmission lines and electric railway in the Imperial and Coachella valleys to the Southern Sierras Power Company of Riverside, Cal. The deal involved a momentary consideration of approximately $1,500,000.

MR. F. S. BURROUGHS, former chief engineer of the Washington Public Service Commission, has been employed by Corporation Counsel James E. Bradford as an expert engineer to assist in resisting the petition of the Puget Sound Traction, Light & Power Company of Seattle to be relieved of certain of its franchise requirements.

MR. J. ROWLAND MIX, former business manager of *Scribner's Magazine*, announces that he has opened an office at 16 East Thirty-third Street, New York City, to conduct a general advertising business. Mr. Mix has had exceptional opportunities for acquiring an intimate knowledge of the most effective advertising methods, as well as the best mediums. His wide circle of friends will one and all extend best wishes to him in his new field of work.

MR. L. H. CLARK, son of E. L. Clark, president of the Valentine-Clark Company, Minneapolis, Minn., one of the oldest concerns in the cedar pole business, was married on the evening of January 12, 1916, at Christ Church, St. Paul, to Miss Lucile Janette Beck, of St. Paul. Mr. Clark is a member of the firm of Valentine-Clark Company, and his many cedar friends from various parts of the country were present at the wedding. Mr. and Mrs. Clark are at present enjoying their honeymoon and on their return they will make their home at 3037 Knox Avenue South, Minneapolis.

MR. CHESTER A. GAUSS, who was recently appointed publicity manager of the Crocker-Wheeler Company, Ampere, N. J., is a 1912 electrical-engineering graduate of Lehigh University. Following his college work he served for several months in the testing department of the General Electric Company at Schenectady, N. Y., and later became one of the technical writers on the publicity staff of that company. In 1914 he was on the editorial staff of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN and is well remembered by his former associates. Following some text-book editing for the American School of Correspondence, he joined the editorial staff of the *Electrical World*, from which he resigned to assume his present responsibility.

MR. W. B. PIERCE, for the past six years connected with the Western Electric Company, Chicago, has accepted a position with the Hughes Electric Heating Company, Chicago, to take charge of sales in the New England territory, with

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headquarters at Boston, Mass. Mr. Pierce has had a wide experience in the electrical industry having been engaged in sales and promotion work continuously for 12 years. While with the Western Electric Company he was in direct charge of appliance sales and in this capacity inaugurated many noteworthy campaigns. He is particularly fitted for his new work and brings to the Hughes organization a fund of selling ideas and experience that will be of inestimable value in gaining greater recognition for Hughes heating and cooking appliances in the northeast.

OBITUARY.

MR. ALEXANDER W. MacDONALD, one of the founders of *Scientific American*, and one of the oldest editors in the country, died January 13, aged 93 years.

DR. JOSIAH SWEET, aged 60, one of the leading physicians of Litchfield County, Conn., and for many years coroner for the towns of New Hartford and Barkhamsted, died from pneumonia at his home in New Hartford, on January 13. He was president of the New Hartford Electric Light Company. He left a widow and three sons.

MR. FLORENTINE J. MACHALSKE analytical electrochemist, was found dead in his room in Plattsburg, N. Y., of heart disease on January 16. Since November, 1912, he had been experimenting with a new electrical process for manufacturing steel. In a statement made by him recently he declared he had a process virtually perfected that would entirely revolutionize the steel industry. He was a member of many scientific societies.

DATES AHEAD.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, January 25-27 Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago, Ill.

Electrical Contractors' Association of the State of Illinois. Semi-annual convention, Hotel Sherman, Chicago, Ill., January 27 and 28. Secretary, M. Blumenthal, 179 West Washington Street, Chicago, Ill.

American Electric Railway Association. Midyear meeting, Congress Hotel, Chicago, Ill., February 4. Secretary, E. R. Burritt, 8 West Fortieth Street, New York City.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary, Joseph Langan, 29 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Detroit, Mich., February 15-17. Secretary, F. Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

Record of Electrical Patents

Issued by the United States Patent Office, January 11, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,167,378. Ground-Terminal Connection for Electric Conductors. L. B. Buchanan, Woburn, Mass. For clamping conductor to water pipes and the like.

1,167,382. System of Electrical Distribution. F. Castiglionli, Wilmette, Ill. Combination of direct-current traction systems, at different elevations.

1,167,389. Generator Suspension. R. M. Dixon, assignor to the Safety Car Heating & Lighting Co., Newark, N. J. From car truck.

1,167,411. Circuit-Breaker. S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Adjustable, time-limit device.

1,167,423. Annunciator for Checkers and Similar Games. A. Nelson, St. Paul, Minn. Lamps in compartments of device simulating checker board are suitably controlled.

1,167,456. Ignition System for Internal-Combustion Engines. H. C. Well, New York, N. Y., assignor of fifty-one-hundredths to F. A. B. Meinhardt, New York, N. Y. Spark plug circuit made and broken by sleeve in cylinder rotated from piston rod.

1,167,473. Lamp Clamping Socket. R. B. Benjamin, assignor to Benjamin Electric Co., Chicago, Ill. Insulating body has internal flange laterally supporting clamp for lamp base.

1,167,474. Attachment-Plug. R. B. Benjamin, assignor to Benjamin Electric Co. Details of two-part plug.

1,167,481. Fusible-Link Heater. E. T. Copeland, New York, N. Y. Link has two separable members, one of which carries removable electric heating unit.

1,167,483. Ignition System. B. Dick, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Special arrangement of cam-operated and vibratory interrupters.

1,167,484. Production of Nickel Hydroxid. T. A. Edison, assignor to Edison Storage Battery Co., West Orange, N. J. For use in alkaline storage batteries, is precipitated from solution of a nickel salt.

1,167,485. Storage Battery. T. A. Edison, assignor to Edison Storage Battery Co. Cerium oxid is active material of depolarizing element of alkaline storage battery.

1,167,486. Starter for Induction Motors. P. R. Ellguths, Chicago, Ill. Automatic switch controlling windings of single phase motor having starting winding.

1,167,499. Primary Battery. W. E. Holland, assignor to New Jersey Patent Co., West Orange, N. J. Structure of zinc electrode plate.

1,167,501. Phonographic Apparatus. N. H. Holland, assignor to New Jersey Patent Co. Automatic control of electrically-driven record and electrically-operated sound box.

1,167,522. Electromechanical Selecting Mechanism for Telephones. C. Richardson, Boston, Mass. For party lines.

1,167,546. Automobile Tail Lamp. M. B. Danheiser, Huntsville, Ala. Colored translucent plate moved in front of lamp and out of light path electrically controlled by gear shift.

1,167,532. Process of Manufacturing Tungsten Anticathodes for Rontgen Tubes. O. A. Simpson, assignor to Siemens & Halske, A. G., Berlin, Germany. Annular piece of tungsten, formed from powdered tungsten is melted and welded to end of drawn tungsten rod.

1,167,579. Lamp Socket. A. C. Williams, South Bend, Ind. Details of film socket.

1,167,583. Safety Device for Moving Picture Machines. C. F. Mehl, H. B. Liebler, J. Nall and E. J. Nobbe, Cleveland, Ohio. Details of film drive controlling electric circuit.

1,167,594. Electrolytic Cell. L. E. Porter, Los Angeles, Cal., assignor to H. E. Stock, Casper, Wyo. Structural details of device having anodes inside cylindrical cathode.

1,167,601. Electrically Operated Sound Producer. C. J. Schwarze, assignor to Schwarze Electric Co., Adrian, Mich. Electromagnetic vibrator beats diaphragm.

1,167,602. Escalator Controlling System. W. C. Strang, assignor to Otis Elevator Co., New York, N. Y. Has plurality of motors, either of which may be connected to driving shaft.

1,167,606. Switch Mechanism. A. Wendleburg, assignor to Pittsburgh Electric Tool Co., New York, N. Y. Details of full operated switch for electric tools, etc.

1,167,608. Electric Coupling for Cars. P. Winsor, Weston, and C. Corliss, Boston, Mass. Corresponding conductors are connected regardless of end for end relation of cars.

1,167,613. Electrically Heated Radiator. P. F. Apfel, Seattle, Wash. Contains body of oil in which heating element is immersed.

1,167,631. Trolley Wheel. J. E. Crook, Chicago, Ill. Has hollow bearing to facilitate lubrication.

1,167,646. Machine Telephone Switching System. F. B. McBerty, assignor to Western Electric Co., New York, N. Y. Special arrangement of impulse-controlled, power-driven selector switches.

1,167,654. Self-Induction Coils for Duplex Telephone Connections According to the Pupin System. A. H. Olsson and H. B. M. Pleliel, Stockholm, Sweden. Two double loading coils in two double lines are laid together and loading produced by leakage flux between them.

1,167,657. Indicator. J. V. Potter, Louisville, Ky. Four vehicles; lever mechanism selectively throws sign plates in front of light.

1,167,663. Pulsation Device for Musical Instruments. G. B. Sinclair and G. I. Fiske, assignors to Choralcelo Mfg. Co., Boston, Mass. Pulsators electromagnetically connected with sonorous bodies.

1,167,677. System for Measuring Capacities. G. A. Campbell, O. B. Blackwell and E. H. Colpitts, assignors to American Telephone & Telegraph Co., New York, N. Y. For determining capacities between the elements of phantom circuits.

1,167,680. Automatic Generator. J. B. Dalbey, Nevada, Iowa. Electric igniting apparatus on fuel burner.

1,167,681. Spinning Device. H. Evans, Lewiston, Me. Relative speeds of bobbins electrically controlled by slack thread.

1,167,693 and 1,167,694. Artificial Line. R. S. Hoyt, assignor to American Telephone & Telegraph Co. First patent: For simulating impedance of actual loaded line. Second patent: For simulating impedance of actual uniform transmission line.

1,167,700. Process of Extracting Zinc from Its Ores. F. Laist and F. Frick, Anaconda, Mont. Cyclical process of extracting zinc from sulfid ores containing iron.

1,167,701. Process of Recovering Zinc from its Ores. F. Laist, and F. Frick. Modification of above.

1,167,705. Cathode for Electrolytic Cells. F. McDonald, Roaring Springs, Pa. Structure and mounting of graphite plate.

1,167,707. Portable Self-Contained Electric Lamp. F. W. Mebold, St. Louis, Mo. Attached to terminals of dry battery.

1,167,720. Machine for Winding Coils. A. D. Scott, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Details of machine for winding magnet coils.

1,167,721 and 1,167,723. Mandrel for Winding Coils. A. D. Scott, assignor to Varley Duplex Magnet Co. First patent: Expansible and contractible winding mandrel. Second patent: Has special wire guiding devices.

1,167,722. Method of Winding and the Product Thereof. A. D. Scott, assignor to Varley Duplex Magnet Co. Special disposition of turns and layers in magnet coils.

1,167,740. Method of Controlling the Humidity of Air Under Pressure. W. H. Carrier, assignor to Buffalo Forge Co., Buffalo, N. Y. Comprises electric heating arrangements.

1,167,749. Electric Heating Apparatus. W. S. Hadaway, Jr., New Rochelle, N. Y. Rod carrying resistor has attachment plug at one end.

1,167,750. Electric Heater for Laundry Rolls. W. S. Hadaway, Jr. Armored heater units extend into roll from plate secured to one end of it.

1,167,760. Lineman's Tool. S. Jones, Newark, N. J. Cable gripping device.

1,167,762. Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, Ohio. Combination battery and magneto arrangement.

1,167,772. Third-Rail Support. J. C. McGovern, and M. Cohen, South San Francisco, Cal. Attached to main rail.

1,167,780. Connector. E. Q. Moses, New York, N. Y., assignor of one-half to W. P. Hammond, Passaic, N. J. Conductor terminal comprising spring clip for attachment to binding posts of batteries, etc.

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1,167,804. Spark-Plug. A. A. Edey, Mobile, Ala. Cap for the spark points.

1,167,810. Storage-Battery Jar. B. Ford, Philadelphia, Pa. Special structure of cover to form tight closure. (See cut.)

1,167,815. Automatic Valve. E. E. Gold, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Electromagnetically operated.

1,167,820. Electric Cable Terminal. G. L. Herz, Vienna, Austria-Hungary. For attachment to spark plugs, etc.

1,167,821. Signal for Motor Cars. A. Holtz, Detroit, Mich. Automobile direction indicator; lamp operated by and mounted on arm on rock shaft.

1,167,839. Automatic Control for Ignition Devices. L. T. Rhoades, assignor to New York Coil Co., New York, N. Y. Thermostat opens circuit when timer stops with contacts together.

1,167,857. Photographic Printing Machine. E. A. Thorberg, Bismarck, N. D. Casing provided with battery, lamp, reflector, negative holder, etc.

1,167,868. Rheostat. G. M. Willis, assignor to Chicago Electric Meter Co., Chicago, Ill. Arrangement of contact clip sliding along resistor element.

1,167,872. Electromechanical Exchange System. F. G. Agrell, Stockholm, Sweden. Special circuit arrangements in system of character indicated.

1,167,878. Portable Electric Light. B. Benedict, assignor to Beacon Miniature Electric Co., New York, N. Y. Casing conforming to dry battery which it contains fitted with lamp, switch, reflector, etc.

1,167,879. Switch Box. J. Z. Bayliss, and C. Raus, Cleveland, Ohio. Gang outlet box.

1,167,880. Electrical Switch Mounting. J. A. Bennan, Chicago, Ill. Sheet metal structure for battery boxes, etc.

1,167,890. Electric Motor. F. S. Denison, assignor to Minneapolis Heat Regulator Co., Minneapolis, Minn. Has thermostatic control and automatic limit devices.

1,167,891. Electric Light Shifter. W. H. Eisenhart, York, Pa. Adjustable electric light bracket.

1,167,904. Apparatus for Treating Box Toe Pieces. W. A. Knipe and T. McKinney, Ward Hill, Mass. Electrically heated hand tool.

1,167,931. Electric Signal System. E. A. Reynolds and H. V. Reynolds, Anderson, Ind. For railway with electrically continuous track.

1,167,946. Starting and Accelerating Device for Motors. W. S. Smith, Cambridge, Mass. Electromagnetically-operated resistance controller.

1,167,949. Rigid Piece of Metal Insulated Against Electrolysis and Corrosion and the Process of Making the Same. P. M. Stewart, New York, N. Y., assignor of one-half to H. H. Robertson, Sewickley, Pa. and one-half to G. F. Stewart. Manner of covering structural steel shapes for purpose indicated.

1,167,961. Station Box for Watchman and Fire Alarm Signaling. F. Williams, assignor to Acme Register Co., Somerville, Mass. Central station has time and place recorders and signal stations send time and place signals simultaneously or independently.

1,167,962. Cable Splice. W. O. Wilson, Chicago, Ill. Manner of splicing lead covered cables.

1,167,964 and 1,167,965. Electrical Fuse. H. W. Young, Chicago, Ill. Cartridge fuses.

1,167,970. Internal Combustion Engine. R. J. Balz, Syracuse, N. Y., assignor of one-half to G. C. Meyer, Syracuse, N. Y. Base has battery chamber.

1,167,980. Indicator for Pneumatic Tires. S. F. Cole, Purcellville, Va. Circuit closed by decrease in air pressure in tire.

1,167,991. Illuminating Means for Telescope Cross Hairs. A. Grebe, assignor to Bausch & Lomb Optical Co., Rochester, N. Y. Particular arrangement of lamp socket and reflectors.

1,167,998. Process of Obtaining Metals Such as Lead or Zinc in an Electric Furnace. A. Helfenstein, Vienna, Austria-Hungary. Manner of obtaining metal vapors which comprises preheating before distillation and drawing of gases and vapors and also part of vapors in distillation zone.

1,167,999. Letter Opening Machine. E. T. Hender, Chicago, Ill. Mounting of electric motor for driving cutter.

1,168,003. Motor Controller. A. J. Horton, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Resistance control of field and armature.

1,168,005. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Snap switch mechanism for lamp socket. (See cut.)

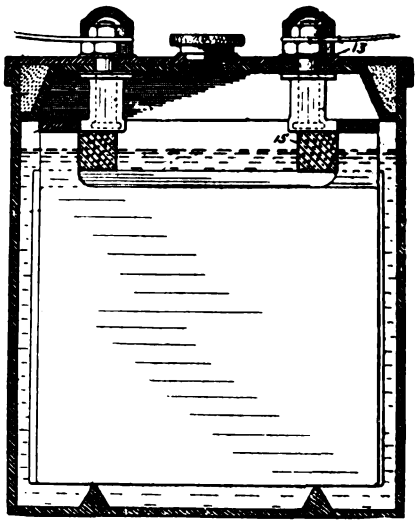
1,168,010. Automatic Train Control. J. Konsels, New York, N. Y., assignor of one-quarter to J. Havranek, New York, N. Y. Structure of wheel-operated contactor.

1,168,019. Pothead or Connector for Electrical Conductors. H. P. Liversidge, Pala, Pa. Comprises elements readily assembled and disassembled.

1,168,021. Brush Holder for Dynamo Electric Machines. C. B. Mills, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Structure of sheet metal brush box and holder.

1,168,031. Suspension Type Insulator. K. C. Randall, assignor to Westinghouse Electric & Mfg. Co. An insulator composed of alternately disposed conducting and insulating bodies.

1,168,037. Magnetic Connection. F. Short, assignor to General Electric Co., Schenectady, N. Y. For securing shaft of speed indicator to end of revolving shaft.



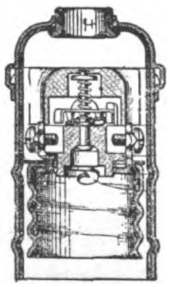
1,167,810.—Storage Battery Jar.

1,168,038. Control System. K. A. Simmon, and A. J. Hall, assignors to Westinghouse Electric & Mfg. Co. Rheostatic control of vehicle for acceleration and regeneration with provision for compensating for difference in diameters of wheels.

1,168,048. Motor Control System. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. Field resistance automatically controlled by current in dynamic braking circuit.

1,168,054. Electrical Protective Device. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. Rotative type relay has provision for regulating torque.

1,168,064. Search Light. V. Elsaesser, assignor to the firm of R. Bosch, Stuttgart, Germany. Relates to reflection and refraction.



1,168,005.—Electric Switch.

1,168,065. System for Distributing and Regulating Electrical Energy in the Form of Alternating Currents. W. M. Fairfax, Washington, D. C. Split phase motors operated from single phase circuit.

1,168,066. Switch-Lock. R. L. Girardot, Detroit, Mich. A cover is locked over key socket and fastenings of cover plate of switch casing.

1,168,074. Electric Resistance Material. M. A. Hunter, Troy, N. Y. Alloy of nickel, copper and chromium.

1,168,077. Incandescent Lamp with Concentrated Metallic Filament. H. J. Jaeger, Weehauken ,N. J. Filament mounting.

1,168,078. Terminal Seal for Batteries. E. W. Jefferson, Winnipeg, Manitoba, Can. Destructible dome encloses terminal to prevent discharge when not in use.

1,168,084. Illuminated Sign. H. F. Lowenstein, Washington, D. C., assignor of one-half to H. S. Hill, Washington, D. C. Displays designs selective by different colored rays.

1,168,090. Mechanical Horn. G. Marsico, New York, N. Y. Has diaphragm vibrated by electromagnet.

1,168,146. Electric Heater for Steering Wheels. G. H. Barnes, Dunham, Quebec, Canada. Flexible resistance heater pad laced to wheel rim.

1,168,170. Station Indicator. R. M. Craig, San Antonio, Tex. For vehicles; has electrically-driven and controlled band displaying street names.

1,168,177. Means for Labeling Radiographs. A. De Yoanna, New York, N. Y. Label of tin foil bears legend of different permeability to X-rays.

1,168,184. Circuit Closer. E. Flanagan, Philadelphia, Pa. Fire alarm signal comprising contacts adapted to be closed on dropping of fuse supported weight.

1,168,190. Electric Lamp Receptacle. G. A. Gauthier, assignor to Arrow Electric Co., Hartford, Conn. Structural details.

1,168,195. Circuit Closing Switch. W. Grunow, New York, N. Y. Switch opened and closed by horizontal momentum wheel moving up and down shaft.

1,168,227. Method and Means for Indicating Suspended Matter in Gases. W. A. Schmidt, assignor to International Precipitation Co., Los Angeles, Cal. For testing smoke, etc.; current between high tension electrodes in flue is measured.

1,168,241. Flash Light. B. Benedict, assignor to Beacon Miniature Electric Co., New York, N. Y. Details of switch.

1,168,247. Cut Out and Switch. J. J. Buero, Charleston, S. C. Comprises switch and fuse plugs with means for protecting from excess current at excessive voltage.

1,168,256. Means for Automatically Controlling the Speed of Railway Vehicles. F. T. Jones, assignor to Jones Safety Train Control System Co., Baltimore, Md. Car circuits controlled by contacts along trackway having time controlled connections.

1,168,258. Means for Insulating Lamp Sockets and the Like. M. Matson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Relates to insulating lining of cap and shell.

1,168,259. Telephone Exchange System. J. L. Wright, assignor to E. E. Clement, Washington, D. C. Message-registering system.

1,168,261. Commutator Bar. F. J. Baird, Cleveland, Ohio. Formed of two longitudinal parts, each comprising radical and longitudinal portions, the radial parts being recessed to receive conductor ends.

1,168,263. Automatic Load Adjuster. L. H. Flanders, assignor to Electric Storage Battery Co., Philadelphia, Pa. Regulation of storage-battery system.

Patents Expired.

The following United States electrical patents expired on January 17, 1916:

617,708. Conduit Electric Railway. R. W. Barkley, New York, N. Y.

617,714. Electric Condenser. C. S. Bradley, Avon, N. Y.

617,715. Enclosed Electric Switch. W. M. Brown, Johnstown, Pa.

617,726. Counting Mechanism of Electric Supply Motor Meters. S. Evershed, London, Eng.

617,783. Electromagnetic Home. T. R. Smith, Los Angeles, Cal.

617,793. Regulator for Constant-Current Dynamos. J. J. Wood, Ft. Wayne, Ind.

617,806. Electric Igniter for Explosive Engines. F. E. Canda, New York, N. Y.

617,837. Electric Railway System. E. B. W. Reichel, Berlin, Germany.

617,838. Electromagnet. M. Schlemann, Dresden, Germany.

617,839. Connection Counting Mechanism for Telephone Lines. C. E. Scribner, Chicago, Ill.

617,840. Lock-out Mechanism for Party Telephone Lines. C. E. Scribner, Chicago, Ill.

617,842. Method of and Means for Deriving Polyphase Currents. H. A. Wagner, St. Louis, Mo.

617,853. Electric Signaling. J. P. Coleman, Edgewood Park, Pa.

617,854. Relay. J. P. Coleman, Edgewood Park, Pa.

617,858. Magneto Circuit Closer. J. E. Fuller, New York, N. Y.

617,886. Electrolytic Regning of Copper. E. A. Smith, Anaconda, Mont.

617,890 to 617,892. Telautograph. G. S. Tiffany, Highland Park, Ill.

617,908. Galvanic Battery. C. T. Richmond, Cleveland, O.

617,938. Electrical Alarm Matting. A. D. Risley, Richfield Springs, N. Y.

617,958. Electrical Apparatus for Firing, Lighting or Extinguishing Gas Burners at a Distance. P. L. Guyenot, Aix les Bains, France.

618,042. Galvanic Battery. J. D. Darling, Philadelphia, Pa.

618,043. Zinc Electrode. J. D. Darling, Philadelphia, Pa.

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EDITORIALS

CONCENTRIC WIRING SYSTEM.

It is greatly to be regretted that in many discussions of the concentric wiring system the real questions in dispute are not made clear. If one assumes the doubtful points in any argument it is a simple matter to prove one's case. The principal considerations involved in the adoption of the concentric wiring system in this country are its safety and its cost. It seems likely that the system will prove less expensive in installation and unless this works out to be the case there will be little demand for it. This point, however, should not affect the question as to whether it should be permitted by the authorities. Their only justification for refusing to permit its use would be upon grounds of safety to persons or property.

The principal point of interest then with respect to making the concentric system permissible is the question of safety, yet in discussing the matter, advocates of the system frequently assume that the method is perfectly safe or at least just as safe as other methods now in use. This, of course, is really begging the question. Safety of an installation of concentric wiring really will depend very largely upon how it is grounded, at what points it is grounded and at how many different places it is grounded. If an installation be grounded at a single point and the ground connection be such that it may become broken in the course of time or is likely to be torn out in case of repairs, etc., then safety must depend upon inspection that will discover such conditions and prevent their continuation. Grounding at a number of points, say one for every room in the house, would make such interruption in the ground connection very improbable and would justify the claims of those who say there is no necessity for insulating conductors which are at the same potential as the ground. Where the neutral of an overhead distributing system is grounded, precautions are taken to ground at more than one point and one of the present Code rules prescribes that grounding shall be carried out at points not separated by more than a specified distance. What shall be the specifications for an inside wiring system? Upon such details probably hinges the entire question of whether a bare and supposedly grounded conductor is a menace.

Comparison of such a bare conductor to such grounded structures as steam radiators is entirely out of place. A steam radiator has a ground connection which is not easily broken, and when broken there is no agent which automatically raises the radiator to the maximum potential of the system, as may be the case with the bare conductor of a concentric system. Similarly other grounded systems do not present real analogies. Telegraph and telephone circuits are operated at low voltages which involve no hazard. Street-railway circuits utilize as a return conductor the earth itself and conductors in direct contact with it whose ground connections are not easily broken. The contingency in which the railway track may acquire the potential of the other supply wire is so remote that it seldom or never occurs.

The comparison with fire statistics in European cities in which the concentric system is applied contributes absolutely no evidence in the matter for the reason that other factors affecting fire prevention and fire hazards are entirely different in American and European cities. It is not to be assumed that the experience in European cities has led to the general approval of the concentric grounded one-wire system. In England, for instance, the facts are exactly the reverse of this. In many municipalities the system is not permitted at all. Where it is used it is principally for the sake of avoiding destruction to the decorations in old houses, and in cases where other methods of wiring would be too unsightly to be considered. While it is true that one of the fire insurance companies has wired its own building with this system, the results of experience have not been such that the underwriters are prepared to endorse it. On the contrary, such systems are not looked upon favorably and their use is not increasing very rapidly, but is claimed by some to be actually decreasing. The difficulty of maintaining good ground connections is fully realized, as well as the fact that much greater care and skill than are usually exercised are required to insure safety. In their catalogs, manufacturers specify how grounds on their respective systems should be made, but it is generally found that there is difficulty in maintaining proper ground connections. The system is not recommended by either insurance interests or government authorities, as the system with both wires insulated is considered safer.

If the concentric system is to be approved for general use in this country, it should be only after comprehensive rules have been drawn up specifying in detail how and where ground connections are to be made and these should be such as to remove any probability that a bare conductor will ever be found at a potential differing from that of the ground. If this result can be secured and the insulation of the ungrounded conductor is made sufficient, then it must be granted that the concentric system is safe. It should be remembered, however, that rules are not so closely followed in this country as in most European countries, where discovery and penalties usually follow swiftly upon the heels of a departure from authorized standards. Under these conditions the possibilities of abuse, as well as safety when properly installed, should be considered.

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CONSERVATION OF COAL AND UTILIZATION OF WATER POWER.

It is not generally realized that the extraordinary advance in our material civilization during the last century is due in a very large degree to the fact that use of coal as a source of energy has emancipated us from the endless drudgery that was the common lot of our forefathers and by giving us leisure has promoted mental development which resulted in broadening the horizon of human interests and activities. The extent to which the availability of cheap and good coal has been a factor in the industrial growth of communities, districts and even nations is also not commonly appreciated. An unbiased, scientific study of the subject, however, shows that nature's carefully preserved store of compressed energy has been an untold blessing to humanity.

Accustomed to taking things we come in contact with every day as matters of fact, we seldom give a thought to these truths: That coal has been mined commercially only about 150 years, that we are using it at a prodigiously increasing rate, that the remaining supply of coal is definite in extent and, in fact, so limited that it will probably be exhausted in about 300 more years, unless our use of it becomes less wasteful and more scientific. The thought that coal will be available for several hundred years immediately dismisses the subject from the mind of the average person, who has no deep concern for the remote future. A keen realization of our indebtedness to coal in any considerate fair-minded individual should at least arouse a desire to conserve its benefits to posterity as far as is reasonably possible.

In an address delivered in Chicago last week by Prof. J. Paul Goode and reported in this issue, comments were made on the history of coal and the availability of other sources of energy when the problem of finding a substitute for coal will become urgent. Dr. Goode believes that the utilization of wind power and the direct heat of the sun will doubtless be important sources of energy in favored localities, but that by far the most promising source is through the maximum possible development of the power of water falls and flowing streams. So ardent an advocate of water-power development is this advanced scientist that he favors the complete utilization of the tremendous power now going to waste at Niagara Falls and other good power sites which, while maintaining the scenic grandeur of these natural wonders, are putting a heavy burden on the future. Dr. Goode is optimistic regarding the total amount of water power that can be developed in the United States at recognized water-power sites and from the regulated flow of rivers, finding this to be several times the total amount of power now used. And this can be supplemented by wind-power and sun-power installations to a very large extent.

However, at the present, as well as doubtless in the future, what determines the source of power to be used is almost wholly the relative economy of the different power sources considered. Involved in this are such factors as fixed charges on investment, operating cost, and reliability of the power. These factors vary a great deal, however, in different localities and for the four sources of energy considered, including steam from coal. Plants for the direct utilization of solar heat are financially practical only where the percentage of sunshine is very high, as in our arid plains. Wind-power plants, on account of their need for energy-storing means to tide over periods of calm, are also high in fixed charges. In many parts of the country water power is not available, unless it be derived from numerous small developments taking advantage of the low heads created by a series of dams; the power derived in such cases is frequently too small for the necessary investment. Long-distance electrical transmission to districts not favorably situated as regards economical water power, wind power or sun power, may solve the problem, but not always as cheaply as if coal were available in efficient steam-electric plants serving such districts.

It is evident, therefore, that by the greatest reasonable conservation of coal it will be possible to provide energy for a long time, beyond the period of the general non-use of that fuel because of high price due to scarcity, for those districts not liberally blessed with other cheap sources of power. Sections where comparatively cheap power is not available in any other way are likely to decline, the inhabitants thereof moving to more favored parts of the country or even to remote foreign lands.

No mention has been made in the foregoing of oil, wood or other fuels, on account of their relative scarcity and more rapid exhaustion even than that of coal. The important fact to be emphasized is that, unless we conserve our coal intelligently, much inconvenience and even suffering may be caused in many parts of the country in the future. But conservation of coal means stopping waste and inefficient use, as well as the substitution for coal of any other energy source that is economically available.

Such a source is water power. Conservation of water power implies not preserving it undeveloped for future use, but, on the contrary, developing it intelligently to its utmost economical possibilities, for in general the greater the development of water power the greater the conservation of coal. Where fuel is scarce, as in our 11 western states, hydroelectric development is already well advanced and furnishes a large percentage of the total power used; in the three Pacific Coast states alone this percentage is even higher, as indicated in the special report of the Secretary of Agriculture, which is summarized in this issue.

The Secretary's report to the Senate also calls attention to the fact that in the three Pacific Coast states public service corporations now own about

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54 per cent of all the primary power utilized therein. This tendency toward community of interest is noted as being particularly marked and impliedly pernicious. The point is overlooked, however, that the most intelligent and the most economical water-power development calls for co-ordinated development and interconnection of electrical transmission networks so as to utilize both the water powers and the transmission lines to the best possible advantage with maximum efficiency and least investment.

A broad-minded consideration of the entire complicated problem of future energy supply at any rate makes these facts clear: Hydroelectric developments, both large and small, will become more and more general; they will be combined into large transmission and distribution systems; coal will continue to be used where hydroelectric power is not economically available until its cost becomes prohibitive. In the meantime, in order to put off to the remotest possible period this time of prohibitive cost of coal, let us conserve the coal as far as possible and let us develop our water resources liberally.

ELECTRIC SMELTING AND REFINING OF COPPER.

Many attempts have been made to smelt copper ore in electric furnaces, but their success has not been so marked as to result in its introduction upon a large scale. Experiments were instituted in 1903 by the Government of Chile on sulphide ores, which are plentiful in that country, whereas coal is scarce. Stephan experimented with Congo ores in a Girod furnace and found it necessary to use 500 kilowatt-hours of electric energy and 8 kilograms of electrodes per ton of ore.

Recent experiments have been conducted by Messrs. Lyon and Keeney, of the Bureau of Mines, using Michigan ores. Native copper predominates in Michigan, but other ores were experimented with as well. The fusion of native copper requires only a flux, and the neutral atmosphere of the electric furnace is suitable for this operation. These experimenters used a furnace of the Siemens type of small capacity. Concentrates containing up to 37 per cent of copper were smelted and copper of purity up to 99.5 per cent was obtained. A purity of 95 to 98 per cent could, no doubt, be secured in regular operation. It is stated that the electrode consumption need not exceed 10 pounds per ton of charge, although the experimental figures were greatly in excess of this. In a furnace of 750 kilowatts capacity the energy consumption should not exceed 625 kilowatt-hours per ton of ore. Experiments with sulphidic ores did not appear so promising, but showed the feasibility of smelting them. The matte produced retained most of the noble metals. Messrs. Lyon and Keeney conclude that the prospects for electric copper smelting are brighter than for the electric smelting of iron.

Turning now to the electric refining of copper, we find an operation which is firmly established, though still subject to slight modifications in its details. Electrolytic copper is now produced of uniform purity, so that it is equal, if not superior, to the best Lake copper, and the paying of higher prices for the latter has become a senseless procedure. Electrolytic refining also enables the more valuable metals to be separated very completely from the copper, and this recovery pays for the process. The cost of electrolytic refining exceeds the cost of furnace refining by not more than one-half cent per pound, and a recovery of $10 per ton in precious metals will thus pay for the refining process. Moreover, if the copper is to be used for electric purposes, where the conductivity is of importance, a gain of 2.5 per cent in conductivity by purification will pay again for the cost of refining.

About 70 per cent of the world's output of copper is refined electrically. Usually the matte, containing about 50 per cent of copper, is first treated in a Bessemer converter, which raises the percentage of copper to 97 or more. It then passes through a refining furnace, usually of the reverberatory type, from which it is run into the anode molds. The cast anodes usually weigh about 500 pounds each. The cost of converting a 50-per-cent matte to anodes is about 0.7 cent per pound of copper.

A highly refined anode is of more importance in securing pure copper than is a pure electrolyte. A good quality of anode has diminished the gold and silver losses in the kathode to a negligible amount. Both the series and parallel arrangements of tanks are in general use, but recent installations favor the latter arrangement, which is used for about 60 per cent of the output of American refineries. Lead-lined wooden tanks are universally used in the multiple system, and involve a considerable item of expense for repairs and maintenance.

The finished kathodes are melted down, blown with air, poled, and cast into wire bars, plates or other shapes.

The power required for refining must, of course, be in the form of direct current. A high amperage at low voltage is required and the load-factor is exceptionally high—approximately 100 per cent. An output of about seven pounds of kathode copper is secured per kilowatt-hour in the more efficient plants.

The total output of copper mined in this country in 1915 was, according to the best figures yet available, 683,000 tons. The output of the refineries was even greater, owing to the imports of raw copper, and is estimated at 823,000 tons. This is close to the total capacity of the refineries, which is approximately 840,000 tons annually, or 140,000,000 pounds per month. Of this total, a capacity of 100,000,000 pounds is comprised in plants located near New York Bay. The next largest installation is at Baltimore, while smaller plants are located at Great Falls, Mont., Hubbell, Mich., and Tacoma, Wash.

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Happenings in the Industry

Great Future for Central Stations Predicted by E. W. Lloyd—Secretary Houston Presents Important Report on Water Powers to Senate—Concentric Wiring Discussed by Inspectors In Annual Convention at Chicago—Important Meeting of Ohio Central-Station Men—Seattle Municipal Plant Report

President Lloyd Sees Great Future for Central-Station Business.

In a recent interview, E. W. Lloyd, president of the National Electric Light Association, said:

"In every line of manufacturing electricity is impressing itself more and more strongly and especially so since the European war has thrown into our hands opportunities for electrical manufacturing in which Germany, France and England formerly held the balance of power. Better steel is wanted and the demand for lighter parts has necessitated the use of electrically manufactured steel in increasingly large quantities.

"In a recent tour of the country looking after electrical matters I noted the great growth in the electrolytic production of metals, particularly zinc and copper. I feel quite certain in saying that there will be a tremendous increase in the demand for central-station power in the near future. Already the demand for manufacturing is such that individual consumers using 25,000,000 kilowatt-hours of current annually are quite common.

"The manufacture of chemicals by electrical power is already being done in this country, although but little is yet being said in regard to it, but plans based on production of these chemicals on a large scale are rapidly being matured. One of these chemicals is the chloride that is being so much heard of in connection with the war operations, but which in more peaceful times is used in making soap, to bleach cotton cloth and paper pulp and for other purposes. Norway is utilizing large amounts of water power in the electrochemical industries and Germany is now using electric current to obtain a supply of nitrates. The United States Government is being urged to utilize our available water power in the manufacture of nitrates as one phase of its program of preparedness."

Secretary of Agriculture Reports on Distribution, Comparative Development and Control of Water Power.

A special report submitted to the United States Senate on January 20 by the Secretary of Agriculture presents the results of an investigation of the water-power situation in the United States made by the Forest Service during the last year. In this connection, the summary of the annual report of the United States Forester, as given in our issue of December 25, 1915, is of interest.

The Secretary's report was made in response to a Senate resolution of the last Congress which called upon the Secretary of Agriculture to furnish the Senate with all the information in his possession as to the ownership and control of the water-power sites in the United States, showing what proportion of such water-power sites is in private control, and by whom owned, and any facts bearing upon the question as to the existence of a monopoly in the ownership and control of hydroelectric power in the United States.

In response to this resolution Secretary Houston has transmitted voluminous data in the form of more than 800 large-sized tables and charts, presenting in far greater detail than has ever been attempted before an exhaustive analysis of the general power situation. The inquiry was made thus extensive, the report itself states, "because only by this means can a clear understanding be had of the relation of water-power development to general power development and of the movement toward concentration of control in the electric power industry."

The report states that 18 corporations control more than one-half of the total water power used in public-service operations in the United States, while six corporations control more than one-fourth. The character of this control is definite and complete. Further relationships with eastern banks through common directors and principal officers are disclosed and tabulated. These data show, says the report, "a marked tendency toward association or community of interests, particularly between the principal holding companies."

"Of all the primary power employed in the electrical industries and in manufactures in 1902," says the report, "11.2 per cent was installed in commercial central stations. This proportion had risen to 23.8 per cent in 1912, more than doubling in the 10 years. The movement toward concentration is found in all sections of the United States. For the 10 years 1902 to 1912, the rate of concentration was highest in the south Atlantic states, which had three times as great a proportion of primary power in commercial stations in 1912 as in 1902. The extent of concentration was greatest in the western states. Fifty per cent of all primary power of all kinds in the mountain states in 1912 was owned by public-service corporations; 54 per cent in the Pacific states. In California the proportion was three-fourths. Today, only three years later, public-service corporations own 90 per cent of all the primary power in these two groups of states."

Revised figures of the potential water-power resources of the country place them, says the report, at the minimum of 27,943,000 horsepower and the maximum of 53,905,000, the minimum representing the amount of power that could be developed from the use of the average annual minimum stream flow for the lowest two consecutive seven-day periods of each year, while the maximum represents the amount that could be developed from the use of the average maximum continuous stream flow available for six months during the year. The national forests are stated to contain 30.4 per cent of this minimum and 31.3 per cent of the maximum, while over 72 per cent of the country's total is found in the mountain and Pacific states and 42 per cent in the three Pacific coast states. National forest water power amounts to 42 per cent of the minimum and 43 per cent of the maximum estimated power resources of the western states.

While 80 per cent of the total installed power from all sources in 1912 was steam power, and while nearly three-fourths of the total primary power installed in commercial and municipal central stations (or establishments for the sale of power) and in street and electric railway plants was steam power, the preponderance of steam power is found, according to the figures given, in the eastern states; and the per cent of increase in water-power development for public-service use in the three years since 1912 has been three times as great as in steam power. Primary power installation from all sources and for all uses in-

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creased in the 11 western states 240 per cent from 1902 to 1912, or more than two and one-half times as rapidly as in the remainder of the United States. This includes primary power used directly in manufactures, 94 per cent of which is found in the central and eastern states.

Primary electric power increased in the western states between 1902 and 1912 at the rate of 440 per cent, as against 226 per cent in the remainder of the United States, or nearly twice as rapidly, while the development per capita in the western states in 1912 was two and one-half times as great as in the remainder of the United States. In installed water power per capita the western states had more than four times as much in 1912 as the remainder of the United States. There is at the present time a considerable overdevelopment in nearly all the power centers of the western states.

Private power interests reported in 1912 a total investment, as represented by the item "cost of construction," of over two billion dollars, equivalent to $21.97 per capita and to an average of $301 per horsepower of primary power installation. Municipal stations reported an aggregate cost of $77,000,000 and a cost per horsepower installed of $138, or considerably less than one-half of the reported cost of commercial stations. This wide apparent discrepancy in favor of publicly owned enterprises is explained as probably due in main to financial statements by the commercial stations in which "cost of construction, equipment, and real estate" represented not actual outlays but the amount which will make assets balance liabilities. "In the majority of cases," says the report, "it would be more nearly correct to call this item 'assumed present value of properties,' than to call it 'investment in' or 'cost of' such properties."

The power developments which utilize national forest lands have 42 per cent of the total developed power of the western states, 30 per cent through occupancy with some part of the immediate generating plant and 12 per cent through storage reservoirs. An additional 14 per cent either occupies public lands outside the forests or depends directly upon storage reservoirs upon such lands, making 56 per cent of the total developed water power of the western states dependent upon the use of public lands, taking place under existing laws. Plants either now under construction or for which final permits have been taken out will provide a further increase equivalent to 20 per cent of the total present western water-power development.

Telephone Traffic Problems Discussed in Chicago.

On the evening of January 24 a joint meeting was held in Chicago by the Electrical Section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers. An election of officers of the Electrical Section was held which resulted in the selection of Carl A. Keller as chairman, William J. Crumpton as vice-chairman, and Edward N. Lake as a trustee for three years.

H. N. Foster, superintendent of traffic of the Chicago Telephone Company, gave an illustrated talk on telephone traffic in Chicago. The average number of calls made per day in Chicago is 2,400,000, which is greater than in any city in the world. These calls come from 410,000 telephones and are handled by 6,000 operators. Mr. Foster spoke of many problems in the handling of this immense traffic, explained the welfare work done on behalf of the operators, and answered many questions on the subject. A romantic five-reel motion-picture play entitled "The Modern Seven-League Boots" was shown. This was produced entirely by Chicago Telephone Company employees and illustrated much of what Mr. Foster had described.

ANIMATED DISCUSSION OF CONCENTRIC WIRING MARKS MEETING OF INSPECTORS.

Annual Convention of Western Association of Electrical Inspectors.

Active discussion of the subject of concentric wiring took up an entire session of the annual meeting of the Western Association of Electrical Inspectors, which was held at the Hotel Sherman, Chicago, January 25 to 28. A brief favoring concentric wiring was presented by R. S. Hale, representing the central-station view of the subject, while the opposition was presented by C. W. Abbott, who represented the manufacturer's viewpoint. The general discussion of the subject indicated that the majority of the inspectors are at the present time opposed to this innovation. Mr. Hale is connected with the Edison Electric Illuminating Company of Boston and is chairman of the Committee on Wiring of the National Electric Light Association. Mr. Abbott is connected with the American Conduit Manufacturing Company, of Pittsburgh.

Mr. Hale pointed out the evolution in Code requirements with reference to grounding. In former times the grounding of either side of a circuit or of the neutral was prohibited. Later, grounding was made permissible and at the present time grounding of the neutral is obligatory. Other rules in the Code which were desirable when grounding was prohibited have not been changed to correspond with the requirements of a grounded system. He then traced the development of the movement for concentric wiring in this country, which started from the observation of its use in Europe and its results in certain European cities in extending service to small consumers. According to available statistics, the foreign methods are as safe as ours and perhaps safer, since they have less fires and less accidents to persons. The old rule requiring the neutral wire to be insulated is no longer rational. The principal reason for changing the rules so as to permit an uninsulated neutral wire is the question of expense. This is a point which touches the consumer principally and the various electrical interests have not felt the impulse of their own advantage in pushing this matter. The central stations, however, want to get the new system for the sake of increasing their business, and contractors also should realize that it will mean an increase in their business collectively, even if not in individual cases. Inspectors are interested from the standpoint of safety, and if there is a saving in cost by eliminating useless insulation and protection, there will be a margin for increasing the safety at real danger points. Insulation between two bodies at the same potential is entirely unnecessary and involves useless expense. One might as well insulate a steam radiator as to insulate a grounded return conductor. In the concentric system the potential wire is better protected than in the conduit system. He pointed out the difference between the bare concentric system and the one-wire system in which the ground itself is actually used for a return circuit. The concentric system is still being considered by a sub-committee of the Electrical Committee of the National Fire Protection Association. The cost for installing this system will undoubtedly be less than for other systems as soon as the workmen acquire the necessary experience, for it is not a thing that can be installed by unskilled persons. No one should object to the concentric system, because it is safe and practically successful.

Mr. Abbott pointed out that the opposition of the electrical manufacturers to concentric wiring was at first caused by the panic incident to the proposition of the new system and the prophecy that it would entirely supersede the old methods. This condition has passed, however, and what opposition there is today is based solely upon the question of merit. He pointed out the dangers which would arise from the uncontrolled use of this material

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which would follow in this country. He showed the necessity for efficient grounding and pointed out the difficulties in the maintenance of good grounds. Although the introduction of concentric wiring has been advocated mainly in view of low cost, it is necessary, in order to get a good job, to have a skilled workman and even then he had noticed defects in a sample installation. Most of the endorsements which the system has received from central-station men have been given without thorough investigation and he questioned whether it would turn out to be of any real advantage to them. It seems to involve the abandonment of the old idea of impressing the public with the safety of electric service.

In the discussion which followed, many questions were asked and many points brought up in regard to specific cases. Among others who participated in the discussion were F. G. Waldenfels, S. E. Doane, H. B. Gear, W. S. Boyd, F. P. McGough, H. R. Markel and V. H. Tousley. Mr. Doane explained that in Europe there are very detailed rules governing the use of this system. The resistance of the ground connection is not important, but the important part is to have all metallic structures within the building connected together and to the sheath. There are some parts of Europe in which this system is not permitted.

Mr. Tousley challenged the central stations to introduce methods which would decrease the cost of making service connections, metering, billing and collecting, if they really wish to make the use of electric service cheaper. He pointed out the necessity for a large factor of safety in electrical work and showed how conditions in Germany and the United States differ in the enforcement of rules. The unapproved use of concentric wire could not easily be controlled in this country and this is where the greatest hazard would be involved.

The first session was opened Tuesday morning at 10 o'clock by H. M. Maxwell, president. He introduced Mr. Miller of the city prosecuting attorney's office, who on behalf of Mayor Thompson welcomed the delegates to Chicago. He spoke of the interrelationship of the Electrical Inspection Bureau of Chicago with other city departments and the harmony existing between them. His cordial address of welcome was responded to by Ben W. Clark, of Detroit, who, in following the trend of Mr. Miller's remarks, said he regretted that the relationship of the electrical inspection department to other city departments was not as close in other cities as it was in Chicago. Among other considerations he suggested that means of relief be secured from the attachment of blame to electrical inspectors for so-called defective wiring fires as reported in the public press.

Following the roll call, President Maxwell delivered a brief address in which he reported the progress made during the past year. The report of the Executive Committee was read by Secretary W. S. Boyd, and reviewed the activities of the organization during the year. The addition of 17 new members was announced. Also that a committee had been appointed to aid the Bureau of Standards in preparation of the National Electrical Safety Code. The Secretary's report stated that fire hazards were being more fully investigated and more publicity given them. He urged the Association to lend the Bureau of Standards every aid and to assist in the enforcement of the National Safety Code. Following the reports of officers, W. H. Merrill, of the Underwriters Laboratories, gave a short talk.

The afternoon session of the Association was devoted to three very interesting addresses on widely different subjects. The first paper was by Leon Hornstein, assistant corporation counsel of Chicago, on "The Legal and Ethical Responsibility of the Electrical Inspector." This paper very fully outlined the duty of the inspector to the public, as well as to the contractor, and stated his responsibilities. He said besides skill, tact, discretion and good judgment the inspector should possess moral uprightness, courage and firmness.

E. B. Rosa, chief physicist of the Bureau of Standards, spoke at some length on "The Electrical Safety Code." He gave the history of the work done in preparing the code, the methods used, difficulties met with and ways of adjusting differences of opinion, and explained the manner in which the code would be presented to the public. The code will be printed in two or three months, and will be sent out for preliminary use and final adoption.

H. E. Clifford, in speaking on "Fuses, the Electrical Safety Valves," gave a brief statement of the standardization of inclosed fuses. He suggested that refillable fuses that can be tampered with, causing fire hazard by being inoperative, should be replaced by nonrefillable fuses or by a type that can be refilled very easily and not invite tampering. The efficiency of fuses, as determined in the field and under the eyes of the inspector, was recommended as preferable to test efficiency. He also recommended the Bureau of Standards as an impartial and tactful tribunal for the adjustment of disputes.

The Wednesday afternoon session was devoted to questions concerning the regulation of motion-picture theaters, papers being presented by Major M. L. C. Funkhouser on "The Film Censor," by S. R. Todd on "The Regulation of Operators," and by J. E. Latta on "The Labeled Film." Other questions of wiring and fixtures received consideration. Thursday was occupied with reports of committees, and inspection trips were made Friday to the Underwriters' Laboratories and other places of interest. Among the social features of the meeting was the Association banquet Tuesday evening, theater parties Wednesday evening and a banquet given by the Chicago electrical inspectors on Thursday evening.

Minnesota Contractors Oppose Concentric Wiring.

The midwinter meeting of the Minnesota Electrical Contractors' Association was held January 24 in the Builders Exchange, St. Paul. An instructive and interesting program of articles on live topics was provided. Among the reports and papers presented were: "Facts About Concentric Wiring," "Ideas for the Man Who Sells Electrical Goods," "Lighting an Art Gallery," "Report on National Convention Proceedings," "Changes in the National Code," "Cause and Effect of the Rise in Prices of Electrical Material and Prospects for the Future." A banquet was held in the evening.

Following the report on concentric wiring, W. I. Gray offered a resolution which was unanimously passed that the Minnesota Section transmit to the National Association its views opposing the concentric system.

Electrical Prosperity Week for 1916 Assured.

At a meeting of the Board of Directors of the Society for Electrical Development, held in New York City on January 24, is was voted to hold an electrical week during the present year, the date and official name to be decided upon later. There were general felicitations over the success of the recent Electrical Prosperity Week and several committees were appointed to assist in furthering the work of the Society. At the meeting it was shown by a report that the Society has a total membership of 1,170 and its finances are in good condition.

Henry L. Doherty, president of the Society, presided at the meeting which was attended by the following members of the Board. W. H. Johnson, A. W. Burchard, Frank S. Price, Fred Bissell, W. E. Robertson, Gerard Swope, J. R. Strong, G. M. Sanborn, Ernest Freeman, Charles W. Price, J. Robert Crouse, Thomas A. Wynne. L. A. Osborne was represented by S. L. Nicholson, Ernest McCleary was represented by John R. Galloway and Hugh M. Wilson, by J. H. McGraw.

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OHIO CENTRAL-STATION MEN MEET AT AKRON.

Meter Committee, New Business Committee and Transmission and Distribution Committee Discuss Problems.

New-business topics, problems of central-station transmission and distribution and developments in meter design were discussed by members of the Ohio Electric Light Association at a three-day convention held at Akron, O., January 18, 19 and 20. The session on January 18 was held under the auspices of the Committee on Transmission and Distribution, the session on January 19 under the auspices of the Committee on New Business Co-operation and on the last day the Meter Committee was in charge of the program.

The new-business meeting brought out many good ideas, particularly in regard to selling appliances on the installment plan, ways of inducing minimum-charge customers to use more energy, the amount which companies can afford to spend to secure new business, and also electric furnaces.

Transmission and Distribution Convention.

The transmission and distribution men's meeting, consisting of representatives of the operating companies of the State of Ohio, was called to order by Chairman M. H. Wagner, transmission engineer of the Dayton Power & Light Company, Dayton, Ohio.

W. E. Salber, superintendent of lines, of the Northern Ohio Traction & Light Company, read a paper on "The Value of Periodic Transformer Testing." This paper dwelt on the advisability of testing all distribution transformers before putting them to service. The transformer should be examined mechanically. Great stress was laid on the necessity of keeping records up-to-date in order that a definite demand, characteristic of the vicinity to be served, might be known, to determine the capacity of the transformer to be used. The value of periodic testing of transformer oil was disclosed. A novel method of simplifying the periodic inspection was outlined and which centered about a wagon equipped with a pump and oil containers. The oil in each case being removed from the transformer for test. It is to be regretted that most of systems permit a transformer to operate year in and year out without any inspection. This paper was very broadly discussed.

The next paper was "The erection of a High-Tension (Steel Tower) Transmission Line" by Frank Howard, general superintendent, Wheeling Electric Company.

A. O. Austin, chief engineer, the Ohio Insulator Company, gave a talk on "The Porcelain Industry," particularly on the selection of the insulator for a line. The absolute need for greater insulation protection on all lines necessary to introduce a greater reliability and therefore a greater income, was clearly shown. Emphasis was placed on the fact that the higher the voltage insulated for, the less the lines are affected by lightning. A comparison of the cost of the insulator as compared with the remainder of the construction, showed that insulator expense might well be increased and still be economical. The advance of the insulator design was pointed out. A most impressive fact brought out was the fact that the insulator should be designed for lightning and not ideal operating conditions.

This paper was followed by a luncheon at the Howe Hotel and later a trip through the Ohio Insulator Works, Barberton, Ohio.

The Transmission and Distribution Committee consists of M. H. Wagner, chairman, S. M. Rust, W. R. Powers, W. S. Smith and H. W. Hough.

Convention of the Meter Committee.

There were 72 representatives present from all parts of the State. The convention was opened by an address by Prof. Ayer, of the Engineering School of the Akron Municipal University, who talked on the subject of "Relation of Industry to Education." He advocated very strongly a system of co-operative education, as to his mind it is the ideal method of applying the real meaning of the word "Education," that is "drawing out" instead of "hammering in facts," as in the old methods.

William Bradshaw then described the Westinghouse Company's demand meters, including a new integrating curve-drawing type, which has recently been developed and which will be placed on the market soon. It will be known as the type "R A."

J. A. Haraden then described and explained the operation of the General Electric Company's line of demand meters, all of which are on the market at the present time. He pointed out some very good improvements which have been made upon the various types.

Among those who entered into the discussion were John Gilmartin, Detroit Edison Company; A. J. Reinhart, Westinghouse Electric & Manufacturing Company; H. B. Bixler, Northern Ohio Traction & Light Company; Prof. H. B. Dates, of Case School of Applied Science; R. L. Goudy, Springfield Light, Heat & Power Company; W. E. Salber, Northern Ohio Traction & Light Company; Mr. Rypinsky, Westinghouse Electric & Manufacturing Company, and R. S. Graves, General Electric Company.

There were about 35 companies represented, of which 16 use the demand method in their rate schedules.

Associated Manufacturers of Electrical Supplies Form New Sections.

At the recent meeting in New York of the Associated Manufacturers of Electrical Supplies, the manufacturers of cutout boxes, conduit boxes, covers and accessories decided to form a separate section to be known as the Outlet Box Section.

R. B. Corey, of the R. B. Corey Company, was elected secretary of the Section, and Frank W. Hall, of the General Electric Company, was elected treasurer. At the meeting of the Board of Governors of the Association, held the same evening, N. L. Otis, of the Chicago Fuse Manufacturing Company, was appointed chairman of the Section. The Section will have the following standing committees, each consisting of three members: Outlet Boxes, Switch Boxes, Fittings for same. Membership in the Outlet Box Section is confined to members of the Associated Manufacturers of Electrical Supplies engaged in the manufacture of outlet boxes, switch boxes and fittings for same.

On the same day the manufacturers of porcelain products held a meeting for the purpose of forming a Section in the Associated Manufacturers of Electrical Supplies. Representatives were present from about 25 of the largest porcelain manufacturers throughout the country, and on motion made and seconded it was unanimously voted to form a section to be known as the "Porcelain Section."

J. W. Cleveland, of the Locke Insulator Company, Victor, N. Y., was elected secretary of the Section and Herbert Sinclair of the Star Porcelain Company, Trenton, N. J., was elected treasurer. J. E. Way, of the R. Thomas & Sons Company, was appointed chairman of the Section.

The Section will have the following standing committees, consisting of three members each: Line Porcelain, Standard Porcelain, Special Porcelain. Membership in this Section is confined to members of the Association engaged in the manufacture of electrical porcelain.

Chas. L. Eidlitz, of the Metropolitan Electric Manufacturing Company, was appointed chairman of the Panelboard and Switchboard Section of the Associated Manufacturers of Electrical Supplies.

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REPORT SHOWS SEATTLE MUNICIPAL PLANT INADEQUATE.

Statistics On Contemplated Developments.

In a report to city officials, J. D. Ross, superintendent of lighting, has submitted a preliminary review of the electrical situation in Seattle, showing that the present municipal plant is inadequate and recommending an additional plant of 22,500 kilowatts capacity. The first electric power plant of the city lighting system, a hydroelectric development at Cedar Falls, was placed in operation in 1905. It consisted of two 1,200-kilowatt units with overload capacity of 3,500 kilowatts, space being left for another 1,200-kilowatt unit. In 1907 the plant became overloaded and instead of the intended 1,200-kilowatt unit an 8,000-kilowatt unit was installed and placed in operation in 1909. Overload conditions again taxed the plant and in 1914 a steam plant, designed for emergency use, relieved conditions until the present time. The capacity of the two plants is 19,600 kilowatts delivered in Seattle, 10,000 kilowatts being the maximum capacity of the steam plant and 9,600 kilowatts the capacity of the hydroelectric plant. The machine installation at the latter plant is capable of producing 13,500 kilowatts, but the pipe line limits the actual output to 10,700 kilowatts, giving approximately 9,600 kilowatts delivered in Seattle.

There are 41,000 private customers dependent on the system for light and power, this figure including 4,500 factories and business houses. Present industries are increasing in size and output with the growth of the city and new ones are coming, all of which brings a steady increase in demand. Many appliances are being introduced for the home and the public is educating itself to these improvements. Electric heating is increasing and only waits for a somewhat better rate when an entire plant's surplus day load could be sold as off-peak load. The Puget Sound Traction, Light & Power Company, which has installed 53,000 kilowatts in water power and 16,400 kilowatts in steam power plants, distributes about twice the amount of power the city does. This company has only one-half the number of customers, the city supplying the distant suburbs, while the privately owned plant draws in to the central business district and extends only into the central parts of some of the richest residence districts.

It is estimated that a plant of 22,500 kilowatts capacity should be installed as the next addition to the city system, leaving a reserve of 10,000 kilowatts in steam plant capacity for emergency only and as a guarantee of uninterrupted service. The present Cedar River plant will permit greater development, but at considerable cost and delay. The building of a new plant at a different location has the advantage of affording independent transmission which would not be subject to trouble at the same time as the present line and would give more security of continuity of operation.

Although the water power sites in the state of Washington are plentiful, yet those capable of development to give permanent service at a reasonable cost are comparatively few. Estimates from various sources point to the conclusion that there is only one site available that would produce more than 50,000 kilowatts continuously. This project is on Skagit River and lies in government reserves, but has been filed on by the Puget Sound Traction, Light & Power Company for future development. Other sites within a 100-mile radius of Seattle available for development and purchase by the city of Seattle are those at Elwha, Cushman, Deer Creek, Packwood Lake, Suiattle and Sauk Suiattle. Proposed estimates of developments of these sites have been prepared and have been submitted to the city for consideration. A summary of the development and power costs of the various proposed water power and steam plants is given in the following table, power cost figures being based on a 40-per-cent station-factor, with transmission at 15,000 volts:

Development	Kilowatts at Seattle	Miles of Transmission	Total Cost	Cost per Kilowatt
Elwha	32,000	184	$ 4,018,700	$125.58
Elwha	110,000	184	11,268,915	102.44
Cushman	27,000	92	4,132,500	153.06
Cushman	54,000	92	5,607,208	103.84
Deer Creek	27,000	54	3,853,770	142.73
Deer Creek	40,000	54	4,568,220	114.21
Packwood Lake	25,000	93	3,463,900	138.55
Packwood Lake	55,000	93	7,444,962	135.36
Suiattle	30,000	75	4,315,000	143.83
Sauk-Suaittle	125,000	75	16,000,000	128.00
Steam plant in Seattle (oil at 80c)	7,500	0	378,357	50.45
Steam plant (coal at $1.55)	7,500	0	413,357	55.12
Steam plant at mill (refuse at $1 per unit)	7,500	0	418,357	55.78
Steam plant at mine (coal at $1)	30,000	11	2,601,500	86.72

Energy Sources of the Future After Coal is Used Up.

An optimistic future respecting energy supply after coal becomes extinct was predicted by J. Paul Goode, professor of geography at the University of Chicago, at the weekly meeting of the Electric Club-Jovian League, held at the Hotel Sherman, Chicago, on January 20. Dr. Goode's address was entitled "When the Coal is Gone, What Then?"

It was only about 150 years ago that coal began to be used and since the invention of the steam engine its use has increased by leaps and bounds, the rate of increase in the last few decades approximating geometrical progression. The extraordinary achievements of the last century are due to a very large extent to the economy of time and labor brought about through utilizing coal as a source of energy in place of the muscles of men and beasts. Two men operating one of the modern freight locomotives that can haul 100 loaded cars accomplish as much work in one day as 1,000,000 Chinese coolies, said Dr. Goode.

Geologists know that the coal strata have taken millions of years to form and their total extent is therefore definite and limited. If the present increasing rate of coal consumption is maintained, it seems highly probable that coal will be practically extinct in about 300 years. The fields of lignite, peat and other poorer grades of carbonaceous deposits will not begin to meet the fuel demand. Nor will the forests that are rapidly being razed; scientific reforestation, however, may supply the demand for the carbon needed in the chemical processes of metallurgy and the arts. The supply of mineral oil and natural gas is also definite.

Utilization of the energy of the waves has been attempted without much success. Wind power has been employed and is capable of greater use where the unreliability of the winds can be compensated for by some energy-storing means. Direct utilization of the sun's heat has been accomplished in a few places with apparent success; it is capable of great development in those places blessed with almost daily sunshine. The greatest hope for the future, however, lies in useful development of the energy of water falls and stream flow. Dr. Goode pointed out the great waste continually going on at Niagara Falls and other more or less well known falls. He strongly urged the development thereof to the greatest possible extent. Rivers should be developed not only for minimum flow, but through proper river control for average continuous flow. At present the entire power demand of the United States is about 37,000,000. Through the development of all our available water powers we could produce 300,000,000 horsepower without using any fuel. Through long-distance electrical transmission, the energy developed could be distributed over a wide extended area, thus supplying parts of the country remote from power sites.

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Difficult Submarine Crossing at Waco.

An interesting piece of construction work is illustrated in the accompanying view of the method used in laying

Cofferdam Built Across Brazos River, Tex., for High-Tension Cable Crossing.

submarine cables under the Brazos River at Waco, Texas.

A cofferdam structure was built and the ditch in which the cables were to go excavated to the required depth. The cables were then placed in the trench and the ditch was then filled with gravel and earth.

Due to frequent rises in the river during the construction work, considerable difficulty was experienced at times and one of the floods in particular did quite a lot of damage.

There are four circuits of No. 6, four-conductor, lead-sheathed cables and nine circuits of No. 3-0, three-phase, lead-sheathed cables. These circuits serve the city of Waco from the East Waco generating station of the Texas Power & Light Company.

Further Hydroelectric Developments on Deerfield River.

An important step in the development of water powers on the Deerfield River, in Massachusetts and Vermont, is the recent completion of Plant No. 5 of the New England Power Company. The station is about three miles above the east portal of the Hoosac Tunnel and is 104 feet square, with an average height of 40 feet. A crib dam 140 feet long and about 30 feet high is located on the Deerfield about 17,000 feet above the power house, and water is conveyed to the station by means of tunnels, concrete conduits, an open canal and penstocks. There are two tunnels, 1,050 and 300 feet long, respectively. The concrete conduit is about 5,000 feet long and required 11,000 cubic yards of concrete in construction. The canal is nearly two miles in length.

The electrical and hydraulic apparatus in the station comprises three 7,000-horsepower horizontal water wheels, two of them direct-connected to double generating units on the same shaft. The station was designed for three motor-generator sets, the motors rated 3,000-kilowatts, 300 revolutions per minute, 2,300-volt, 60 cycles, and the generators 4,300 kilovolt-amperes, 11,000 volts, 25 cycles, this being normal 40-per-cent rating, subject to special rating for intermittent duty. During the construction of the hydraulic works connected with this plant, these motor generators were run with 60-cycle energy from the system of the company already installed, comprising three plants lower down, and the 25-cycle energy produced was utilized by the Boston & Maine Railroad Company for the electrical operation of trains in the Hoosac Tunnel. Recently the water wheels were installed, connected to the end of the shafts, driving the machines as double generators as noted, the 60-cycle energy produced being supplied to the transmission system and the 25-cycle energy being furnished to the railroad. The head available is 234 feet, and the supply of water is equalized from season to season by a reservoir on the east branch of the Deerfield, in Somerset, Vt., where a dam 2,100 feet long and 110 feet high at its maximum impounds about 20 billion gallons. From the

New Hydroelectric Plant of New England Power Company on Deerfield River.

tailrace of No. 5 the water flows to plants 4, 3 and 2 in succession, being utilized four times in the course of this rapid flowing stream.

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Electric Drive in a Cement Plant

Details of the Motor Equipment of a Texas Cement Plant With a General Summary of the Advantages of Electric Motor Drive and Central-Station Service for This Industry

Industrial Power Series—Article No. 152

The constantly increasing use of concrete for building has enormously increased the demand for cement and when it is considered that, as stated by authorities, fully nineteen-twentieths of all Portland cement used at the present time is artificial, it will be realized how great is the number of mills required to supply the demand.

In general, Portland cement is made by thoroughly mixing together, in suitable proportions, clay and finely pulverized carbonate of lime (either chalk, marl, or compact limestone), burning the mixture in kilns at high heat, and then grinding the burnt product to a fine powder between ordinary mill stones. There are two methods of manufacture, both well adapted to the character of the materials used, and known respectively as the wet process and as the dry process.

Wet Process.

Clay and chalk are mixed together with a large quantity of water, in a circular wash-mill or basin provided with heavy harrows attached to the horizontal arms of a revolving vertical shaft. By this means the chalk is thoroughly pulverized and incorporated with the clay in a semi-fluid state. The proportions are about one of clay to three of chalk by weight. When a thorough mixture of the ingredients is thus effected, the liquid mass, resembling whitewash in appearance, is conducted into large reservoirs called backs, where it is left to settle.

When the heavier material, or raw cement, has settled to the bottom, and the surplus water has become clear on top, the latter is drained off. By subsequent evaporation, the drying process is continued until the raw cement has attained the requisite stiffness.

During the time the mixture remains in the backs, samples of it are taken from time to time and made into cement by burning in sample kilns, in order to test the accuracy of the proportions. When by evaporation, the raw mixture has attained the consistency of stiff clay, it is taken out of the backs by shovelfuls and in that form and condition is removed to rooms and artificially heated or spread out around the tops of the kilns and further dried.

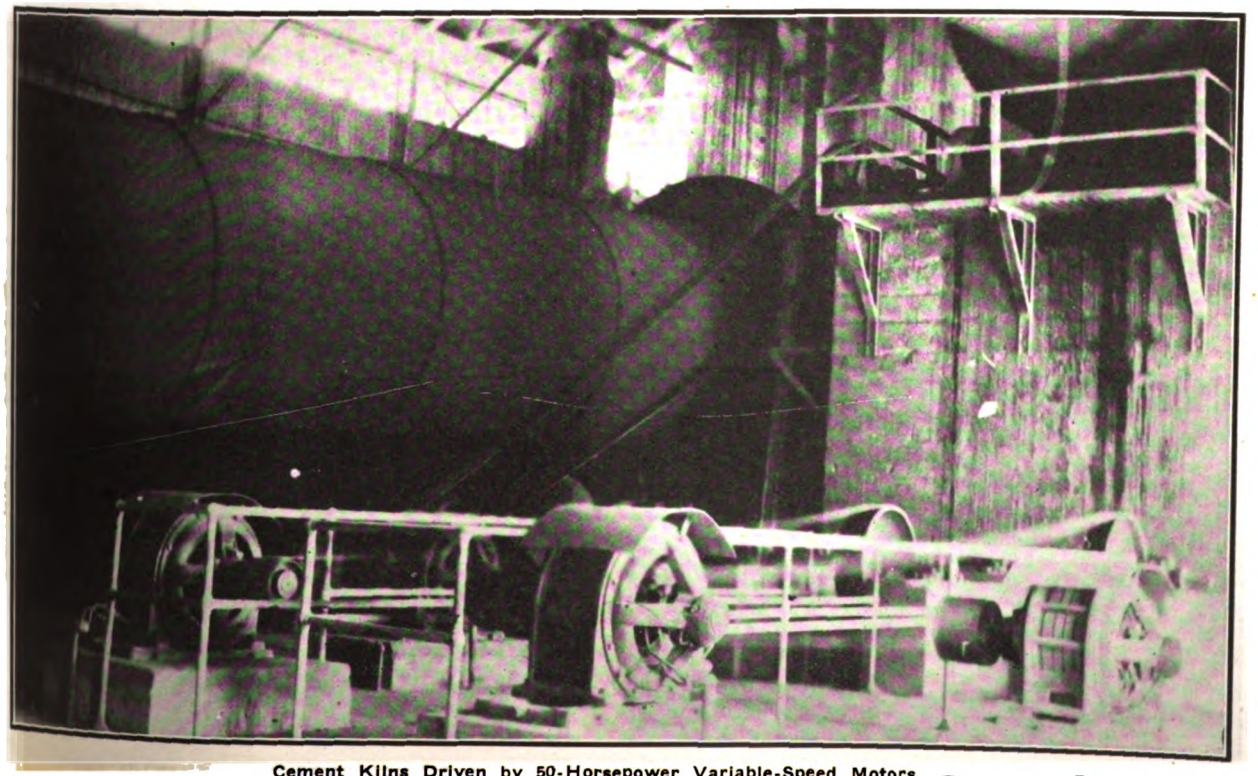
After being dried, although it is not necessary to expel all of the moisture, the cement is burnt in suitable kilns to nearly a white heat, just below the point of incipient vitrification. The kilns may be intermittent or perpetual, the latter being most economical in operating expenses, though somewhat more costly in outlay for construction.

When properly burnt, the pieces of cement called clinker, are of a greenish-brown color, contorted and much shrunken from the heat. The cement clinker is then finely ground between ordinary mill stones, packed in barrels, each containing about 400 pounds net and sent to market.

Dry Process.

By the dry process any of the compact lime stones, as well as the chalks and marls, may be used in making Portland cement. The raw materials, the carbonate of lime and the clay are kiln-dried at 212 degrees Fahrenheit, in order to expel the moisture and prevent caking in the kiln, and otherwise facilitate grinding and sifting. After drying, the clay and the carbonate of lime are mixed together in suitable proportions and reduced to fine powder. In most localities the proportion will vary from 20 to 23 per cent of clay and 77 to 80 per cent of the carbonate.

One kind of machine will not suffice for grinding the raw material economically. Three machines are generally used in the dry process: A stone-breaking machine of the kind usually employed in breaking stone for roadways or



Cement Kilns Driven by 50-Horsepower Variable-Speed Motors.

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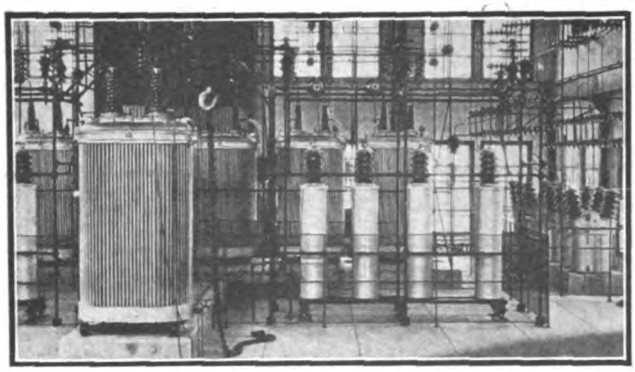
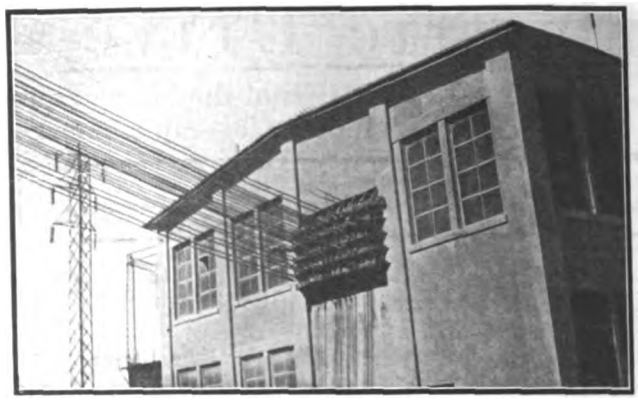


Interior of Cement Company's Substation.



Exterior of Substation Showing Leads to Mill.

for concrete. Through this the dried and mixed materials are passed, issuing therefrom in pieces varying from the size of a pea to that of a hen's egg. A further reduction is effected by a vertical mill or edge-runner. The material is then finely ground between horizontal mill stones.

The powdered material is then tempered to a rather stiff paste in a brickmaking machine, and made into bricks of suitable size for burning. During this mixing the material is kept warm and the water used for tempering is rendered strongly alkaline by adding 3 to 6 per cent of calcined soda and an equal amount of newly burnt slacked lime. The bricks are dried by artificial means and then burnt at a high heat and ground to a fine powder as in the wet process. The same number of mills is necessary for grinding the cement as for pulverizing the raw materials. The clinker is first put through a stone-breaking machine, then into a vertical mill or edge-runner, and lastly is ground to an inpalpable powder in a horizontal mill.

Description of Typical Mill.

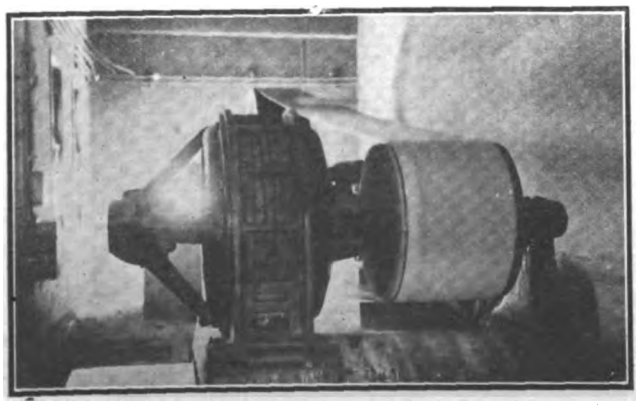
The very bigness of the modern cement mill makes it peculiarly adapted to the application of electric drive. Covering a large area of ground and having a large number of component parts which of necessity must be operated independently, it is impossible to use steam units on account of the large investment that would be necessary and further on account of the tremendous loss that would result in the transmission of steam to various parts of the plant. It comes down then to a case of electric drive with power manufactured in a private plant or electric drive using purchased central-station power.

It is interesting to note that in the mill here described a private generating plant consisting of producer-gas engines and low-frequency generating equipment was first installed, but this was later abandoned in favor of central-station service. Later operation proved the wisdom of this choice and the management of the mill is well pleased with the service and the results obtained from an economical standpoint.

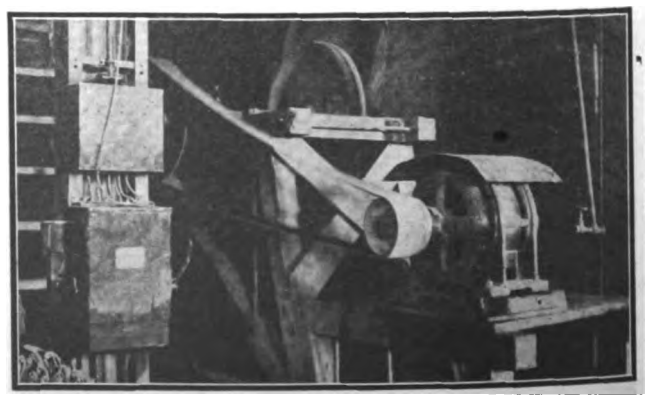
The quarry of the plant in question is the only place where electricity is not employed. Here the shale is obtained by blasting and is loaded into cars by means of a portable steam shovel. This shovel scoops up the shale, a yard at a time, and dumps it into small cars. A small engine handles a string of these cars which are shunted onto a track leading directly into the storage bins. One at a time the cars have their load dumped into the bins and are automatically returned to a track parallel to that on which they came in.

An elevator system removes the shale from the bins and conveys it at a uniform rate into what is known as the gyratory crusher. This is the first stage of the process and here the chunks of shale in varying sizes are ground into smaller pieces. A 150-horsepower motor is used on this part of the mill and due to the variation in the size of the lumps the load on this motor fluctuates continually. From the gyratory crusher the shale is fed into the Williams mill where it is ground into still smaller lumps and then conveyed into the rock storage. In the rock storage the shale has a chance to age and dry out to a certain extent. The next process in the manufacture is the tube mills. There are five of these mills, each one operated by a 150-horsepower motor. These mills are cylindrical and about 20 feet long. They are filled with steel balls which break up the pieces of shale as the cylinder is rotated. From the tube mills the mixture is placed in mechanical mortars and ground to a powder.

All is now ready for the burning process which takes place in several long cylindrical kilns. A review of the kilns and the 50-horsepower variable-speed motors which drive them is shown in one of the accompanying views. The upper end of the kilns, where the mixture is fed in is higher than the lower end and the hard pebbles which are formed by the intense heat gradually roll down to the lower end. A hot blast, made by burning oil atomized with air, is forced into the lower end of the kilns and carried through the entire kiln and out the upper end through tall stacks which make the draft. As the hard pebbles come out at the lower end of the kiln they drop into another intermediate



200-Horsepower Motor Driving Williams Mill.



Sack Shaker Driven by 10-Horsepower Motor.

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storage place, but are taken out immediately and put through the coolers. These coolers are cylindrical in shape and look very similar to the kilns. When the hard pebbles have been cooled they are then put through several processes of grinding and finally conveyed into the cement storage. Automatic sackers and weighers prepare this cement ready for shipment.

In the mill in question there are a total of 68 motors installed aggregating almost 5,500 horsepower. Due to the deteriorating effect of the cement dust on motor bearings, the motors have been placed in concrete sheds along the sides of the mill. One of the illustrations shows this method very clearly. Group drive is employed throughout since the mill machinery is operated in independent groups.

From a service standpoint or from a standpoint of production there is no argument in favor of central-station service and the whole problem comes down to a matter of cost in dollars and cents. If the mill puts in enough generating equipment to insure service in case one unit breaks down this necessarily increases the cost of the installation and the fixed charges.

The load is a good one from the load-factor standpoint, being practically continuous throughout the 24 hours.

Service is furnished this mill by means of a 60,000-volt transmission line of the Texas Power & Light Company, the source of power being about 27 miles away.

Following is a list of motors installed and the machinery which they drive:

Number.	Horsepower.	Speed R. P. M.	Application.
2	500	400	North Griffin Mills.
1	300	514	Williams Mill.
4	200	450	Griffin Mills.
1	150	450	Gyratory Crusher.
10	150	450	Tube Mills.
1	150	450	One Kiln Air Compressor.
1	150	450	Two Kiln Air Compressors.
1	150	450	Pumps.
1	150	450	High-Pressure Air Compressor.
1	100	514	Shale Williams Mill.
1	100	514	Coolers.
6	50	300-720	Six Kilns.
1	50	1,800	Pump.
2	35	720	Packing Machines.
3	35	720	Coolers.
2	35	720	Elevators.
1	35	720	Gyp Williams Mill.
14	15	720	Overhead Conveyors.
6	10	720	Warehouse.
1	7.5	1,800	Well Drill.
8	5	720	Scattered.

The number of men employed is 200. The capacity of the plant is 4,000 barrels per 24 hours.

Oscillograph Used in Demonstrating Long-Distance Telephone Waves.

The first use of the oscillograph in connection with telephone circuits for public demonstration occurred at a meeting of the Boston Section, American Institute of Electrical Engineers, at the Franklin Union Hall, January 14. About 700 persons were present and witnessed the recording on a screen of electrical waves conveying the inflections of the human voice, the notes of a graphophone and the pulsations of the surf over a 5,000-mile line of the American Telephone & Telegraph Company's system, extending from San Francisco via Portland, Ore.

The oscillograph, which is a combination of sensitive galvanometers having a minute mirror, which is suspended on a fiber, was connected in on the telephone circuit. A beam of light reflected by the mirror from an electric lamp was reflected in turn on an 8-sided revolving mirror, from which it was reflected on the screen. By this means two motions were procured, which reproduced the varying sound waves in remarkable forms. A special telephone transmitter had been mounted at the rocky shore of the Pacific Ocean, near the Cliff House, and the beat of the waves was clearly reproduced through the oscillograph. Music was likewise reproduced in electric waves.

Members present were provided with individual telephone receivers, and heard the sounds produced at the other end of the line, which at the same time were recorded through the oscillograph. H. G. Bates, commercial representative of the Pacific Telephone & Telegraph Company, spoke from the general office of the company in San Francisco, and later the line was connected with the meeting place of the New York meeting of the Institute, whence Michael I. Pupin, inventor of the loading coil, and John J. Carty, chief engineer of the American Telephone & Telegraph Company, spoke to the Boston audience.

Practical demonstrations on the oscillograph were made with electric bells, automobile horns and music, and photographs were taken of the waves produced.

Annual Report of the Bureau of Standards.

The annual report of the director of the Bureau of Standards, Washington, D. C., gives an interesting account of the activities of that government bureau during the fiscal year 1915. The standards with which the Bureau has to deal are standards of measurement, standard values of constants, standards of quality, standards of mechanical performance and standards of practice. The relation of the Bureau's work to the public is clearly discussed, especially the Bureau's part in aiding industrial progress. During the year, 154,000 tests were made and 1,800,000 lamps inspected at the factories.

Color standards, the development of energy-measuring instruments sensitive enough to measure the heat of the stars, studies of the causes of failure of railway materials, exact determination of the data required in the refrigeration industries, and other important researches have made excellent progress during the year. An examination of the report shows that the year was the most active and successful in the history of the Bureau.

Of particular interest to manufacturers and testing laboratories are the Bureau's investigations of industrial materials, such as metals, clay products, glass, cement, textiles, papers, rubber and paints. The Bureau issued 47 new publications during the year, making a total of about 400 scientific and technical papers, circulars and miscellaneous publications issued to date.

Of special interest to the people is the work of the Bureau in connection with public utilities, particularly in establishing definite standards of service, preparing safety rules, assisting in local studies as to service, acting as referee in cases of dispute and serving as a clearing house of information on all public utility and associated engineering questions, helping to secure uniform methods of accounting where public service commissions are not yet established, and getting out laboratory tests and investigations to answer difficult questions connected with the telephone, gas, electric light and power, electric railway transportation, and miscellaneous utilities other than steam railways.

Wireless Suit Dismissed.

The wireless patent infringement suit brought by Samuel M. Kintner and Halsey M. Barnett, receivers of the National Electric Signaling Company, against the Atlantic Communication Company, which operated the Sayville wireless station, was dismissed on January 7 by Judge Mayer in New York. It was complained that the defendant had infringed two claims of a patent granted in April, 1909, to Reginald A. Fessenden, and four claims of another patent which applied to the manufacture of wireless apparatus.

The musical note emitted in using the wireless was one of the points upon which it was claimed that the Fessenden patent had been violated, but Judge Mayer pointed out that he could not hold that Fessenden had been the original discoverer of its value. As he was working out his idea, De Forest was actually operating commercial stations with it and was working at the method in his own way.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Municipal Plant at Monett Discontinued.

The Ozark Power & Water Company has contracted to furnish light and power to the city of Monett, Mo., which will shut down its municipal plant. There will be installed a 250-kilovolt-ampere frequency changer with necessary switching apparatus, and feeders to furnish power from the 25-cycle lines. One of the customers will be the Frisco shops at Monett. The service will be fed from the 66,000-volt transmission line of the Ozark Power & Water Company which has a hydroelectric plant at Powersite, Mo. The lines are connected at Joplin with the lines of the steam plant of the Empire District Electric Company.

Free Wiring and One Month's Trial to Boost Cooking.

In its effort to stimulate the use of electric ranges the Glendive (Mont.) Heat, Light & Power Company is selling Hughes electric ranges at cost, installs all necessary wiring free of cost to the customer and in addition permits the range to be used for a trial period of one month, energy being supplied free during the trial. If at the end of the month the customer is dissatisfied, the company agrees to remove the range and all wiring and the customer has incurred no expense. A typical advertisement used by the company in the campaign is shown.

A Christmas Present

It isn't often in this era of war and war prices that you can get something for nothing, but we are making you that very offer.

By special arrangement with Hughes Electric Co. of Chicago, we are able to offer you an electric range at cost. We do even better than that—we will wire your house free of cost—a saving of ten to twenty-five dollars to you. We still have a trump. We will furnish you service to try range absolutely at no cost to you for one month. At the end of that time if you don't like the stove we will take it back. We will be glad to go further into detail in this offer—to explain the range to you or install it for your own investigation.

Is Our Offer Fair?

You wonder why we do this? Well, we make more electricity than you use, twice as much; and when it isn't used it's wasted. If we can double our consumption we save that waste and in the end it makes it better for us and at the same time gives you a bargain.

We solicit your investigation of above offer and will send a representative to call on you if you are interested.

We do this gladly and it puts you under no obligation to us.

GLENDIVE HEAT, LIGHT AND POWER COMPANY

A Generous Offer to Encourage Electric Cooking.

Minneapolis Company Makes New-Business Record.

During the year 1915, the Minneapolis General Electric Company increased its number of electric customers more than 7,000, its lighting load by 9,400 kilowatts, and its power load by 5,000 horsepower. During the year 1,990 already-built houses were wired under contracts secured by the company's sales department, and 11,178 electric appliances were sold by the dealers and the company.

The following is a comparison of the company's connected load on December 31:

	1915	1912
Total number of customers	38,660	20,766
Total kilowatts, lighting load	58,014	30,348
Total kilowatts, power load	37,775	22,423
Number of old houses wired	1,990	* 775

*Represents number of already built houses wired in 1913; no record of this class of business having keen kept in 1912.

Advantages of Electricity Graphically Displayed.

An effective advertisement, in the form of an acrostic, is the work of the advertising manager of the Central Maine Power Company, Augusta. The initials of Safety, Utility, Cleanliness, Comfort, Economy and Sanitation are combined to spell "Success," and each attribute of electricity is described in detailed elaboration.

ELECTRICITY

Safety, Utility, Cleanliness, Comfort, Economy, Sanitation —SUCCESS

SAFETY—Electricity does not explode. Does not set fire to the hair, clothing or curtains. Does not cause sickness, asphyxia or in any way vitiate the atmosphere. Is not dangerous to have in the home where there are children. Is fool proof.

UTILITY—Electricity requires no attention. Is always ready for instant use. Increases efficiency of the employed. Is more flexible than any other form of light, heat or power. Is inexhaustible. Ease, safety and simplicity are factors of its transportation.

CLEANLINESS— Electricity leaves no ash. Does not discolor wall paper or ceilings. Leaves no black smudge or carbon on utensils. Permits the elimination of belts and shafting (dust and dirt circulators) in factories; thus improves health conditions. It gives off no odor.

COMFORT—Electricity gives much or little power, heat or light right where you want it, and when you want it. Is always at the finger tips for instant use in any quantity. Applicable as a convenience and for comfort in many different ways.

ECONOMY—Electricity already is not as expensive as other forms of power, light or heat. Its use stops all extra cost. It cheapens manufacturing costs and living costs because it conserves health and energy. It is extremely economical when used in large quantities.

SANITATION—Electricity, properly applied insures freedom from over-work. Eliminates increased opportunities for germ propagation, because it is dustless and it eliminates dark corners. It is perfectly sanitary to handle, to manufacture, to transport, and to use.

SUCCESS—Electricity indicates success, as well as helps to success. The electrically lighted store is a good place to buy. The electrically lighted street insures freedom from thieves and thugs. Come to us with your lighting and power problems, we will furnish you complete and accurate information free to you. We want your installation to be a success.

Central Maine Power Co.

ELECTRICAL SERVANTS OF THE PEOPLE

Catchy Advertisement Pointing Out Advantages of Electricity.

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A Model Home in Gardiner Shows Wide Use of Electricity.

One of the most complete installations of electrical household apparatus and most extensive collections of telephone instruments in the country is in a Gardiner (Me.) home, whose owner has for years been an enthusiast in this line of activity.

The installation extends from cellar to garret and enables the family to perform almost every function susceptible to electrical operation by this means. The front door is opened by electric control from four rooms in the house, and as the family has a special ring for door bells, the device represents a considerable saving of time and considerable comfort in cold weather. The bells and opener are operated from a 30-volt transformer, off the lighting circuit. A calendar clock strikes the hour and half hour on single-stroke bells also operated from the transformer.

In a front room an entire wall is covered with various systems of fire alarms. One box is a Gamewell, which is on the city circuit, and other patterns are Stevens, Pearce & Jones, Star, and Viaduct. A model city central-alarm station is reproduced, with gong, indicator and tape record.

An intercommunicating telephone system connects all the rooms in the house. There are several switchboards, one being of the owner's own devising, which operates on either the magneto system or on batteries, with facilities for change-over in an instant.

The sewing room is equipped with a motored sewing machine with a six-speed range, and an adjustable sewing lamp. In the dining room, located on a special table, are a coffee percolator, toaster, grill and frying pan, ready for the preparation of a quick meal.

The bedrooms are provided with heating pads and electric hot-water heaters, and in the kitchen are electric flatirons and a motored washing machine with wringer attachment, with which the week's washing is done in seven minutes. Tell-tale ruby lamps are installed in connection with this machine and with the irons.

The installation was made by Edgar E. Ramsdell, who is connected with the telephone company and who has been in electrical work since boyhood. He was in the employ of the Salem (Mass.) Electric Lighting Company for 14 years, part of the time as night superintendent.

Testimonial Letters Collected in Louisville for Sales Work.

An interesting collection of testimonials is being made up by the Louisville Gas & Electric Company, consisting of letters from large power consumers on the lines of the company, in which the writers state their impression of the character of service they are getting and their satisfaction with it. The idea was suggested by two or three unsolicited letters which were sent to the office of Robert Montgomery, commercial manager, at New Year's, with the season's greetings. Subsequently Mr. Montgomery wrote 50 of the larger customers, asking for expressions as to the service. Forty customers replied immediately and in considerable detail, all but one of them being exceedingly outspoken in expressing their appreciation and satisfaction. The fortieth customer wrote that the service was reliable, excellent and satisfactory in every respect, but observed that it did not represent the saving to the customer that the company's salesman had promised it would. Others of the 50 are being heard from at intervals and the letters are being collected in an album for reference. Such a variety of enterprises is represented, it is stated, that there should be conviction in some of these letters for any man who was in doubt otherwise about central-station service.

Pittsburgh Company Honored by City Council.

During Electrical Prosperity Week the Duquesne Light Company beautifully decorated the principal business streets of Pittsburgh with electric streamers, at the same time coloring the globes of arc lights with the Christmas colors. The effect was so startling that at the conclusion of the week's festivities a committee of the most prominent merchants, including officers and directors of the Pittsburgh Chamber of Commerce, requested James D. Callery, president of the Duquesne Light Company, to permit the decorations to remain until after Christmas. It was stated by the merchants that the beautiful street lighting would stimulate business for the holidays. The Duquesne Light Company agreed to maintain the decorations free and as a result many of the large department stores published letters of thanks in their display advertising. At a meeting of Pittsburgh Council, January 10, the following resolution of thanks was unanimously adopted:

WHEREAS, The Duquesne Light Company, at its own expense, has illuminated the central business section of our city with variegated electric lights during the holiday season; and

WHEREAS, This generous display has been beneficial to business interests and has rendered patriotic and civic good; therefore, be it

RESOLVED, That this Council, representing the people of Pittsburgh, express its appreciation to the Duquesne Light Company for its liberal manifestation of civic and commercial pride.

Cold Weather Stimulates Sales of Grills and Irons in Kansas City.

The Electric Shop of the Kansas City Electric Light Company, although conducting no special sales, nevertheless in January did almost a record business in electrical devices. The shop had ordered 1,000 grills, which were practically all disposed of, as well as a large number of electric irons. There was a heavy demand for tailors' irons, also. The stress of custom sprang largely from the excessively cold weather, and the nearly complete failure of the gas supply. About the middle of the month the temperature reached 14 degrees below zero, unusually cold for Kansas City, and the people were not prepared for it. Hundreds of families that had been depending on gas for heating, had to get coal hurriedly. And those who depend on gas for cooking were seriously affected. It was from this contingent that the demand came for grills, with which breakfast could be prepared. The tailors who had been using gas irons discovered a useful substitute and recourse in their dilemma, in the electric irons. There were thousands of homes where the gas failure became a jest, because it forced the pleasant use of the electrical equipment.

New York Edison Bureau Sells 5,599 Appliances in 1915.

An interesting example of giving the public service and the proof that it pays is shown in the 1915 report of the Heating Bureau of the New York Edison Company, just completed by the manager, C. N. Lewis. The report shows that members of his bureau made 17,537 calls during the year and installed 4,444 electrical devices on trial. The total number of articles installed during 1915 as a result of this bureau's activities reached 5,599, representing 56,836 50-watt equivalents. This breaks all records and is an increase over 1914 of 965 devices or 9,000 50-watt equivalents. This bureau was instituted by Arthur Williams, general commercial manager, more than 10 years ago. It has recently been expanded so as to handle repair work on various electrical devices.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

HOW THE QUESTION OF WOOD REFUSE WAS SOLVED IN A LOUISVILLE PLANT.

Shaving Baled and Sold at a Figure That Permitted Central-Station Service to Be Purchased at a Saving Over Previous Operation.

One thing that everybody who operates a woodworking plant must provide is a means to dispose of waste. There are always quantities of sawdust and other offal produced in the process of reducing the raw material worked with to dimensions. If no provision were made for getting rid of this waste the average woodworking plant would simply be overwhelmed in a short time with its own offal.

The simplest method of waste disposal is the furnace which produces the steam required for power. So it is a general practice, or always heretofore has been, to install wood-burning furnaces under the boilers. Waste is discharged in such a way that it can readily be shoveled or chuted or conveyed into the fire-pit, and the resultant ashes are comparatively easy to lose.

That is one reason why steam has been tenacious as the motive power in lumber mills and woodworking factories And as woodworking concerns have electrified they have to a considerable extent installed their own generating equipment. First of these were naturally direct-current plants, but in later years those factory and mill owners who have electrified have been equipping with alternating-current motors to a large extent. This development may be attributed largely to the lessened fire risks thus obtained.

But for the most part these establishments have installed their own isolated plants. "We have to have a certain amount of steam for our dry kilns, or for our steaming and bending processes," they say. "We have the fuel which is waste from our operations. We have got to get rid of it and we find that it is most economical to burn it in our own power plants."

A typical case, in many respects at least, is supplied by the Embry Box Company, of Louisville, Ky. This plant has recently contracted for service from the Louisville Gas & Electric Company. Previously it had been paying the company $500 a year for a "break-down" service; now it is on the books as a customer buying about $5,000 of service every year. The connected load is 525 horsepower.

This plant is about nine years old, alternating-current equipment having been specified by the engineers, who had an eye to the lessened fire hazard and to the trend of the times electrically. As long ago as five years representatives of Louisville power companies approached the company to change over to central-station service.

It was a comparatively simple proposition to make the tests necessary to show the amount of power needed. It was not difficult to show the members of the company that there were many advantages to be gained by use of the central-station power; in the way of reliability, immunity from the exacting attention to the isolated power plant, etc. The $100-a-month salary of the engineer, plus the $500 for the throw-over service, elimination of the charges which had to be made for depreciation of the generating outfit, and the other items figured out all in favor of central-station service. What to do with the waste was the one and only stumbling block. And the proposition of the company stood as a challenge to the salesmen of the Louisville Gas & Electric Company, and its predecessors, for five years.

Of course the waste is "waste" in a technical sense only. In a city of 300,000 population, shavings and sawdust and ends of boards are of real value. But getting them to the market on a basis that would show profit seemed to be a problem without solution. Now in this particular plant, practically everything is planed. Every side of every piece going into a box must be true, all the more so because machinery does most of the work. Again, in making boxes practically everything is used, so there is a minimum amount of blocks suitable for firewood, such as may be produced in various other establishments. A lumber mill, for instance, makes many firewood blocks.

The market for this company's waste was a market for shavings from the planers. There was no demand for the sawdust. In order to be able to offer shavings free from lumps and suitable for bedding, the company had installed a blower. This carries the light, flat shavings further than it carries the sawdust and blocks, effectually separating. There was nothing to do with the sawdust except to burn it. But this was no problem, inasmuch as the Embry Box Company needed some steam anyway for its dry kilns and the sawdust supply and the dry kiln requirements virtually balanced each other.

Shavings accumulate in the shavings bin at the rate of about six tons a day. From the outset the company had been selling them at the rate of 50 cents for a 666-pound load, the odd weight being the average arrived at through a weighing test. Wagon owners and customers who sent to the plant for their shavings bought them at 50 cents a load. Where shavings were sold, delivered, the company added $1.25 for hauling charges, which was cost as closely as it could be figured. This included the stable man's wages of $60 a month. The hauling charge was the big item here, and when it is figured that the volume of shavings amounted to between four and five wagon loads a day, it will be seen that this was a big item. Also it was an item which increased the difficulties of marketing the by-product.

The proposition put up to the electric company salesmen was, then, to find a customer who would buy at a figure which would show a profit on the shavings, and to reduce the cost of marketing them. When the problem was reduced to this basis the method of procedure was clear. Find the customer, or find the market. Eventually inquiries turned up one company which was importing three carloads of shavings a week from Cincinnati, more than 100 miles away, and paying freight on them. This concern gladly agreed to buy its shavings where it could buy more cheaply.

Some study of woodworking plants and methods of handling the waste here and there gave the salesman who handled the deal an idea to present to the box company. A shavings baler, electrically driven, was the solution he offered and that was the solution which the company accepted. It is operated by a five-horsepower motor and cost complete $325. It is tended by the same man who

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formerly shoveled sawdust and shavings into the two gaping furnace maws. He still fires the boiler which supplies steam for the dry kilns, though where heretofore he had to keep the gauges at 120 pounds or better, he now has one gauge to keep at 40 or 50 pounds. Incidentally this same man has displaced the stable boss and finds no difficulty in looking after the horses.

The baler compresses the shavings, as they accumulate in its hopper direct from the blower, into bales which average 100 pounds. These sell at the even rate of 10 cents a bale, or 65 cents for 666 pounds, instead of 50 cents as before. And instead of having to make a trip on deliveries at the rate of $1.25 for each 666 pounds or thereabouts, one wagon load of the shavings baled makes two tons, or 40 bales. The cost remains at $1.25 for the load.

Figuring that the plant produces at the rate of six tons of shavings a day, this would mean three deliveries every two days, or delivery costs of $2.50 for every $24 worth of shavings. Under the old system the cost of delivering those 12 tons of shavings would have been within a few cents of $45.50—it would have required 36.36, plus trips to make the deliveries at $1.25 a trip.

These circumstances are subject to presentation in some ingenious figures. The electric company salesman took a production rate of three tons a day as a basis for figuring. Under the old and then existing dispensation these three tons were sold at $4.50—nine 666-pound loads—plus the charge for hauling, at $1.25 per load, which was $11.25, making the total $15.75.

With the baler in use this same quantity of shavings would sell for $6, at 10 cents per 100-pound bale, plus the cost of a load and a half haulage, which is $1.88, the total collected from the purchaser being $7.88 per three tons. By the electric company's salesman it was contended that right here the box company would save the difference between $15.75 and $7.88, which is $7.87. If that would be an actual saving on three tons of shavings, it would follow that central-station power would represent a gain to the box company of $2.62 on each ton produced.

Whether there is a real saving or whether the figures are fallacious depends on how the proposition is considered. It might be contended that the only gain was the difference in the net selling price of the shavings baled, and not baled, which works out to the advantage of the baled shavings at the rate of about 50 cents a ton, which, of course, might be considered to represent the cost of baling. There would be a further gain through extension of the market by reducing the gross price to the purchaser who would also have to pay for hauling.

But the box company was using its own teams for this hauling, which was charged for at cost, while at the same time there is always plenty of other work which these same teams can be put to. At any rate the reduction in the cost of haulage of shavings, together with the releasing of the teams for other purposes, elimination of the $500 annual charge for the throw over, $1,200 annually for the engineer and $720 a year for the stable man, proved more than sufficient to satisfy the requirements of the factory owners, and the contract for the central-station service was written.

At this time there are several other more or less similar problems waiting for solution of electric company salesmen in Louisville, as elsewhere. There is one plant in particular, which not long ago was completely and elaborately electrified but which lies out some distance from the city. This is not a box plant, though it is a woodworking establishment. Remnants of boards, "lumber mill ends," they might be called, are more bulky than in the case of the box factory and the proportion of shavings or material which might be converted into shavings is only a small part of the total, which can be burned to make steam for generating energy at the isolated plant.

Aluminum Company to Develop Water Powers in Tennessee.

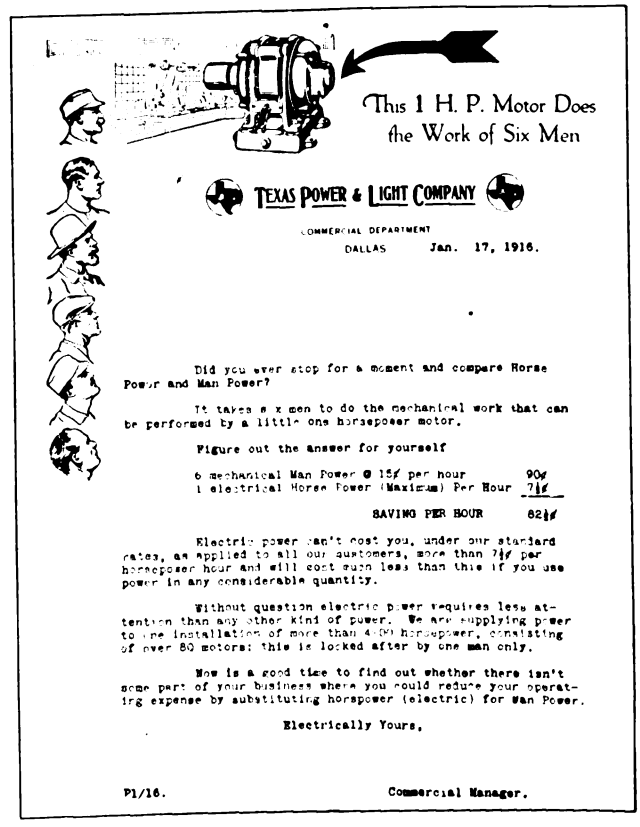
Aluminum Company of America, which controls the water-power rights on 40 miles of the Little Tennessee River, is now preparing plans for development of the first site for generation of hydroelectric energy. It is estimated that the power sites controlled by the aluminum company have a maximum of 400,000 horsepower. The company some time ago purchased the water rights and charter of the Knoxville Power Company and later further rights on the river were bought. While the development of power sites would submerge the old right of way of the Southern Railway from Chilowee, Tenn., to Fontana, N. C., which has never been used, a satisfactory agreement with the railroad has been reached. The company now has an aluminum plant at Marysville, Tenn., employing about 600 men. As it owns 700 acres of land at Marysville, it is evident the present plant is only a beginning. A cement plant to manufacture the cement for the construction of the dams is being erected. The company now secures electric power for operation of its Marysville plant from the Tennessee Power Company, a subsidiary of the Tennessee Railway, Light & Power Company.

A Letter That Produces the Business.

The letter shown herewith has been found extremely effective in a campaign for small power business conducted by the Texas Power & Light Company. A feature of the letter is the attractive and pertinent letterhead which makes use of an electrotype furnished by one of the large manufacturers. The letterhead is printed in two colors, which also adds to its attractiveness.

This idea might well be used by companies who are doing direct advertising to power prospects, where their mailing list of these prospects is small and the expense of drawings and cuts would be prohibitive.

Direct advertising can in this way be efficiently dovetailed into the company's newspaper advertising.



This 1 H. P. Motor Does the Work of Six Men

TEXAS POWER & LIGHT COMPANY

COMMERCIAL DEPARTMENT

DALLAS Jan. 17, 1916.

Did you ever stop for a moment and compare Horse Power and Man Power?

It takes six men to do the mechanical work that can be performed by a little one horsepower motor.

Figure out the answer for yourself

6 mechanical Man Power @ 15¢ per hour	90¢
1 electrical Horse Power (Maximum) Per Hour	7½¢
SAVING PER HOUR	82½¢

Electric power can't cost you, under our standard rates, as applied to all our customers, more than 7½¢ per horsepower hour and will cost much less than this if you use power in any considerable quantity.

Without question electric power requires less attention than any other kind of power. We are supplying power to one installation of more than 4,000 horsepower, consisting of over 80 motors; this is looked after by one man only.

Now is a good time to find out whether there isn't some part of your business where you could reduce your operating expense by substituting horsepower (electric) for Man Power.

Electrically Yours,

P1/16. Commercial Manager.

Reproduction of Letter that is Bringing Results.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Switchboard Features in a New Boston Substation.

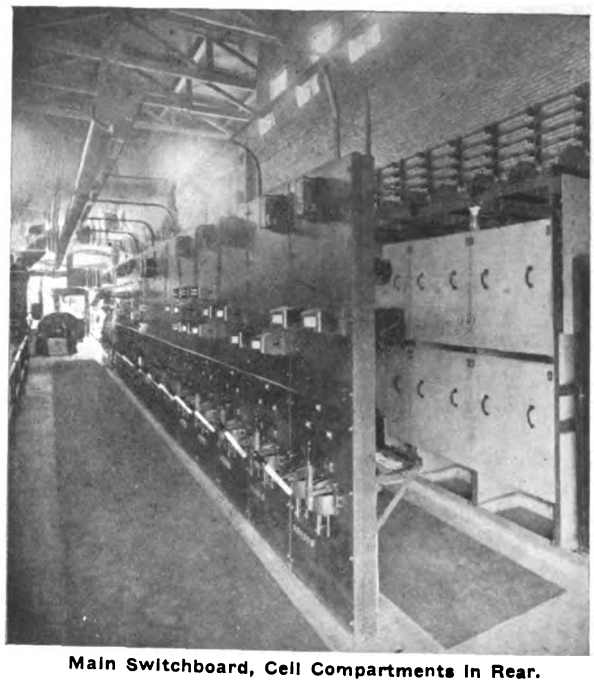
The type of construction which has been carried out in the new 2,300/4,000-volt Somerville station switchboard of the Boston Edison Company includes several features which represent a marked advance over former construction. The same general layout prevails as that in the most recently constructed stations, those at Roslindale and Lexington, but changes in detail have been made which give greater simplicity of cell construction, improved faculty for removal of parts, reduction in the amount of inflammable material, and improved protection of apparatus.

The installation consists of the usual arrangement of switchboard panels, on which are mounted the switch fronts, indicating and recording meters and the automatic apparatus required for alternating-current distribution. The details of construction are described by George E. Seabury, in the company's publication, *Edison Life.*

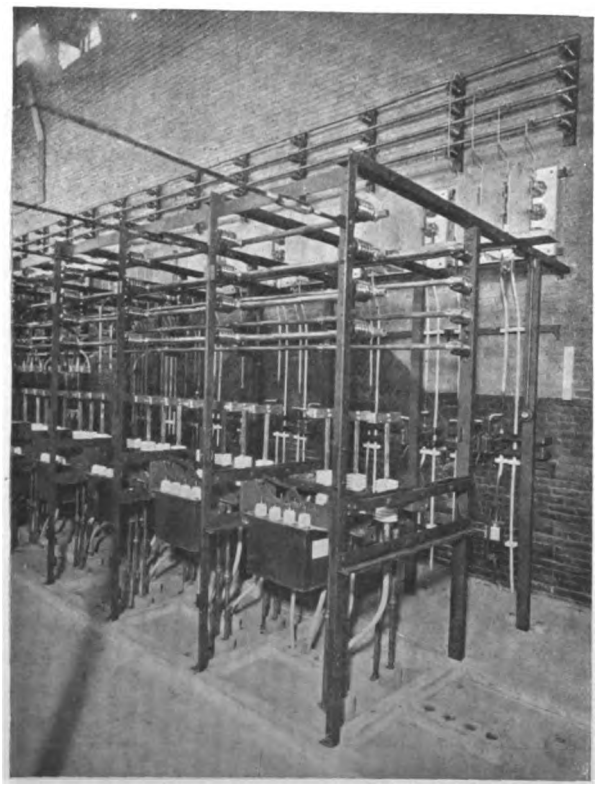
In the rear of the panels, with a 42-inch aisle between, is a double row of cell compartments containing the mechanical remote control oil switch. The cell frames also support the double set of main busses.

Back of the switch cells, with a three-foot aisle intervening, is another set of cell compartments attached to the building wall. These contain the potential and current transformers. Each cell has a cover in front, with handle, and hung so as to be easily removed if necessary, and is clearly marked so as to facilitate the replacing of renewed parts.

Six-inch curbing form the foundations of the cell superstructure and prevent oil from spreading from one cell to another in case of explosion or leakage. The superstructure is composed of steel frames to which are attached asbestos panels 0.5 inch thick, forming walls between compartments. The oil switches connecting to the main busses are secured by a clamping device, and the end supporting columns and operating rods are jointed with flush-faced unions, enabling the switch to be readily removed from the cell, after its load has been transferred, with the bus still in service. Another device enables the separation of electrical connections while still alive.



Main Switchboard, Cell Compartments in Rear.



Method of Locating and Supporting Oil Switches.

Bare copper is used for conductors wherever possible. Both sets of main busses and the transfer bus are of bare copper tubing, supported on clamp insulators attached to the steel frames. Connectors between oil switches and main busses, and between disconnecting switches, and the tees and connectors on the line side of the oil switches, are all of bare copper, the only insulated wire used being in the runs from the tees and regulators to the disconnecting switches and outgoing cables, as well as control and secondary wiring.

The bare copper tees between the double row of angles are held in place by porcelain tubes into which they are cemented and to these tees are connected the line side of the oil switches. From the lower end of the tees the insulated cables run to the regulators and small cells, and thence to double-throw disconnecting switches, on the wall above the cells. Above these are the transfer busses, and bare copper leads connect them to the disconnecting switches.

The oil switches are connected to the main busses and to the line tees by bare copper, jointed connectors, the upper half closely clamped to the bus and the lower half bolted to the switch terminal. Long mica sleeves, fitted into a saucer-shaped seat at the bottom, insure safety.

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At the top, the sleeves are held central by a split shouldered bushing, closely fitted to the connectors.

The connectors are separated by means of a brass lug with one side planed and fitted with tap bolt and washer, soldered into the upper portion. The lower part is flattened at the end and has a slotted hole which engages the bolt in the upper half. For disconnecting, a long insulated wrench is used to remove joint bolts.

The panels of the switchboard are of black Monson slate. At the top, in front, are contact-making voltmeters; below these are indicating amperemeters and voltmeters, and below these, potential-testing buttons for voltmeter testing. On the lower panels are the switch fronts or operating levers and tripping solenoids for the remote-control automatic-trip oil switches.

Below the levers are current clips for checking amperemeters. On the back of the panels are line-drop compensators, voltmeter resistance and relay switches. The illustration showing the front of the board also shows the covered cell compartments.

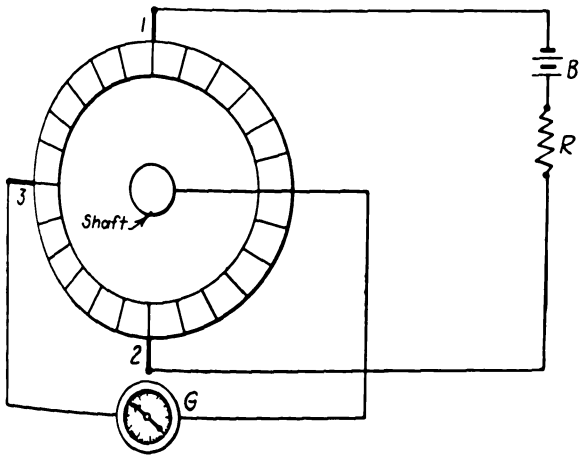
Simple Method of Locating Grounds in Armatures or Rotors.

The operating electrician is often confronted with the problem of locating grounds in the armatures of generators and motors without the use of expensive instruments and with such facilities as are usually at hand.

Faults of this character generally occur when a coil of the armature becomes connected with the frame or the core and therefore shaft. A ground of this nature is not likely to do much damage as long as it is confined to one coil, but as soon as another ground develops in the machine or in the circuit connected with it serious trouble may occur.

By the method described below and illustrated in the accompanying sketch a damaged coil can be located without unsoldering the coils from the commutator, which without proper tools is a difficult task. In the diagram *B* represents battery or dynamo circuit giving a current of a few amperes through the armature by its own brushes *1* and *2*. At *G* is placed a roughly made current indicator or galvanometer, to carry about 25 amperes, one terminal being in connection with the shaft of the armature, and the other attached to a movable brush *3*. As the galvanometer is to show simply a deflection when current is passing and to mark zero when none, a coil of thick wire with a pocket compass in the center will do. The same should be far enough from the armature so as not to be affected by its magnetism. In case any form of ammeter suitable on alternating-current circuits is available, it may be used in place of the galvanometer *G*.

The way to make the test is as follows: Suppose a steady current is flowing from *B* through the armature. Touch the commutator with brush *3* and a current will flow through *G*. Slowly turn the armature or the brush *3* until the galvanometer *G* shows no deflection. The coil in contact with *3* will be found to be the grounded coil.



Wiring Diagram for Locating Grounds.

A resistance *R* may be connected in the battery circuit to control the current passing; a bank of lamps connected in parallel to give sufficient current-carrying capacity may serve as this resistance.

It is frequently possible to repair the trouble without disconnecting any of the wires, if the exact position of the fault is found. C. R. Rickard.

Kitchen Wiring As An Entering Wedge for More Business.

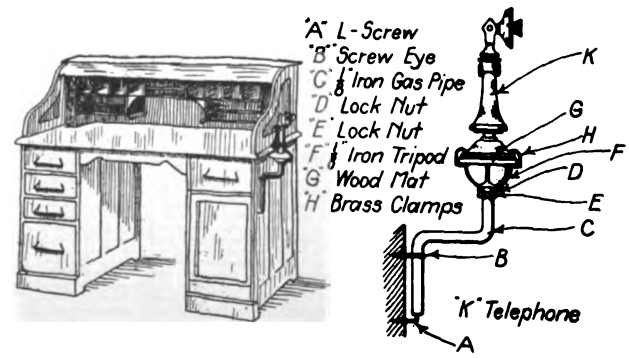
Following the suggestion of the local central-station company, the Electrical Maintenance Company, electrical contractors of Youngstown, Ohio, instituted a wiring campaign providing for the installation of an outlet in the kitchen for an electric iron and one drop light in the kitchen, including standard iron and double-branch cutout in iron box with service switch, and iron conduit service from the outside of the building to the cellar, complete for $11.98. The purpose of the company in making this low rate was simply to open the way for more elaborate wiring after the customer had become accustomed to the use of electricity and in many instances advantage was taken of this initial offer to have the entire house wired. In practically all of these cases a fair margin of profit was made by the company.

Without the additional business which may be expected, the wiring at the advertised rate was in most cases done at a loss, although as an advertising expenditure this loss has been found to be thoroughly justified. In commenting on this feature of the campaign the company says:

"We obtained probably 75 or 80 contracts and on most of them we have to report a loss, inasmuch as our labor at 52.5 cents an hour soon ate up the profit. Then, again, the city inspection charge for 10 lights or less is $2.00 and it was impossible to have this fee changed in this instance, so in order to make good our advertising we were compelled to install the work that came to us at these prices. As an advertising scheme we believe it is good, but when business is good we think it would be unwise to continue or for any firm to inaugurate a campaign without having at least $2.50 more for the work.

Telephone Bracket for Desk.

The accompanying illustration shows a telephone mounted upon a desk by the use of a home-made bracket, and also the details of this bracket. The tripod supporting the telephone is mounted upon the end of a piece of small iron pipe which is bent twice at right angles. This pipe is supported by means of two screws which are screwed into the frame of the desk. One of these is L-shaped and serves to carry the weight. The other is a screw-eye and serves as a guide. The telephone when needed is pulled around in front of the desk, and when not in use is pushed back to one side of the desk. J. C. Walsh.



Convenient Telephone Bracket.

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Estimating Hints for the Contractor

By George W. Hill

A specific system of records for compiling and perpetuating estimating data is described in this article. In order that the greatest value may be derived from the suggestions made, the author will, upon application, send copies of any of the forms recommended to those interested so that a similar system can be adopted. Another article by Mr. Hill on "Salesmanship" will be published in an early issue.

Estimating in the electrical contracting business means the assembling of costs in order to be able to establish an intelligent selling price. Please note the words "intelligent selling price," which means a selling price that carries with it a profit. Profit is what one obtains for an article in excess of all costs.

The first step toward securing a contract is a proposal to the owner or agent to do certain things for a certain amount of money. The sum of money represents the cost of the various materials, which will be required, the cost of labor which will be required to install the material, the overhead or operating expense and the profit.

In order to obtain the desired result, it would seem that the estimator or contractor should have some well-defined system of bringing this information together in order that he may be able to set an intelligent selling price.

From my experience in traveling in the interest of better conditions, if there was anything more apparent than another, it was the lack of system in the offices of the contractors. My attention was called to the lack of any real system for keeping the records of the estimates which were made. Without this system of keeping a record of one's own experience it is a difficult matter for contractors to form a judgment, and it is for this reason that I am giving the readers of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN the benefit of my experience in the field. I gave the proposition of an estimating system considerable thought and study and finally put it up to one of the most experienced detail men in this country on mechanical contracting accounting, C. A. Walker, of Rock Island, Ill., who produced what I believe to be the most simple, yet comprehensive estimating system that has ever been designed.

This system so records and preserves the estimates that it is possible to refer to them readily, and they are in such concrete form that they may be studied carefully, thus forming the true basis of judgment.

This system comprises a loose-leaf binder of the post variety, indexed from A to Z, which contains sheets 9 by 12.5 inches, punched or bound on the nine-inch side.

Pasted on the inside of the front cover is a "Remind List," which is classified according to the progress of the usual electrical installation. The front cover may be removed entirely in order that the list of reminders may be laid on the desk for ready reference. A view of this reminder sheet is shown herewith.

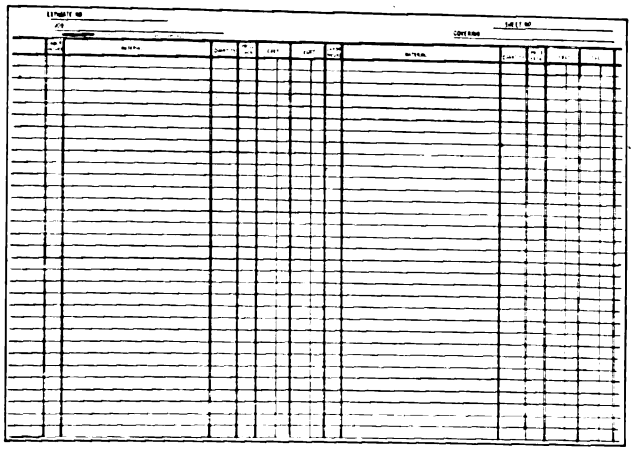
We will now take up what is called the white, or estimating sheet proper, reproduction of which is also shown. This sheet is white in order to readily distinguish it from the "Recapitulation Sheet" which is yellow in color and which will be described later.

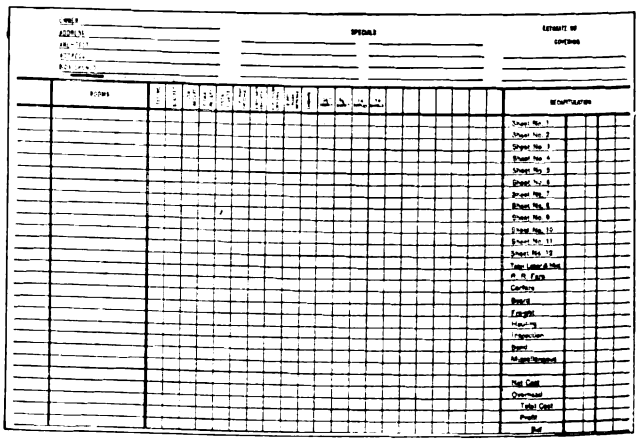
By scrutinizing this sheet carefully it will be observed that the first column is for the estimated labor-hours for the installation of certain quantities of material, which should be based upon a unit labor-cost system, which should be kept in connection with the regular productive labor records. The second column is for writing in the kind of material, the third space for the quantity, the fourth column is used for the purpose of entering the unit material cost, the fifth for the total cost and the sixth for the extension or footing of the fifth column. It will be seen that this is a double page, the right half being a duplicate of the left half, which has just been described. These sheets contain 148 lines or spaces for writing in different kinds of material as they are printed and ruled on both sides.

The recapitulation sheets are ruled and printed on one side for there is but one recapitulation sheet used for each job estimated.

By closely observing this sheet it will be seen that this sheet contains a great deal of valuable information with reference to the job in question.

As soon as the estimator has finished his estimation on the white sheets, and made the extensions of the footing for each page, he merely carries the totals of the estimating sheets as per their number to the column on the extreme right-hand side of the recapitulation sheet, in the space corresponding with the number of the estimating sheet. It will be seen that besides the amounts which are carried from the estimating sheets, which represents the total cost of labor and material, that there are a number of items mentioned which are so arranged as to be added directly to the cost. These items are railroad fare, car fare, board, freight hauling, inspection, bond, miscellaneous, net cost and then one of the most important items of any business, overhead. Following the addition of the over-





Two Forms Suggested for Compiling and Recording Estimating Data.

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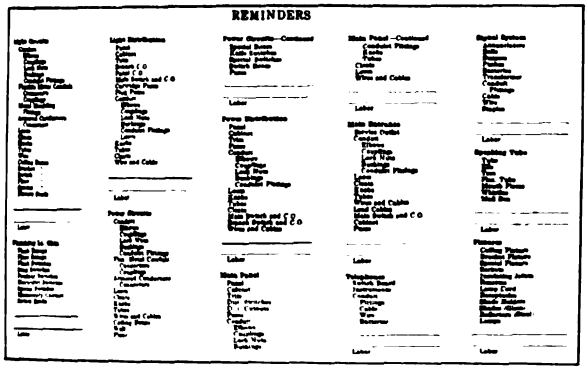
head is the timely suggestion that there should be a profit added, and the net result is then the amount which should be written as the price to bid. This bid is then based upon an intelligent survey of the costs, and not upon what you think the general contractor, your customer or your competitor thinks it is worth, for the general contractor may be deceiving you, or your competitor has no records and is therefore in no position to pass intelligent judgment as to the cost.

You will notice that this recapitulation sheet contains a full electrical schedule, as well as other valuable information. It will be seen from this arrangement that in order to refer to a job which has been estimated, that it would only be necessary to open the book under the initial letter of the name of the job, and turn to the recapitulation sheet to find a complete record of the entire estimate on this one sheet, properly worked out and filed. This is considered by those who have examined it carefully to be the best estimating method yet produced. It is simple, yet comprehensive and contains just such information as will have a tendency to assist the contractor to avoid the pitfalls of estimating and will tend to improve his judgment. It is a simple matter for any contractor to produce a similar system for his business as the forms are here given and there is no copyright or patent on them so he is at liberty to do so.



A Convenient Tabulation to be Used When Estimating.

There seems to be a disposition on the part of many contractors to inject more or less of the "Faro Bank" into estimating. There is a certain amount of the element of gambling in estimating anyhow, and instead of injecting more of this element, there should be a decided effort to eliminate as much of it as possible.

I have heard many contractors say that there was no use in trying to find out their costs on a certain job. That it was merely a game of chance. I want to say that the reason there is so much of the gambling element in the mechanical contracting business is because the contractors make it so.

We all know that there are men who are physically lazy, and I contend that they are no more damaging to the progress of this country than those who are mentally lazy.

Mental laziness is one of the greatest drawbacks to any business man. Do not be lazy. Find out a few things about your business. Business success depends upon your ability to analyze yourself, your business and to know the other fellow, which is, of course, character analysis.

Make records. Look these records over. Analyze them, and let this be the basis of your judgment. Judgment is gained from experience. Judgment comes from the knowledge of test truth, classified common sense, which is the true basis of science and business and especially the electrical business is a science.

The most successful contractors in this country are those who make records, and who are going over these records continually in order to refresh their memory. The man who makes records and then analyzes them finds out why this or that unfavorable condition exists in his business and he straightway proceeds to adopt some method which will have a tendency to eliminate this unfavorable condition. This is truly a constructive policy and the only one upon which a man may safely pin his faith if he hopes to become a master of his business or profession. Know yourself, know the other fellow, and then know your business and then know that you know it. Make marks, then study them and you will succeed in business.

There is another type of contractor who goes about in the role of a "Sherlock Holmes," the contractor who spends all of his time and energy in an effort to learn what the other fellow is going to ask for a particular job, rather than to learn from his own experience what this job is going to cost him. It does not make any difference to you what it is going to cost the other fellow. If it costs him less money than it does you, and he is satisfied with the same percentage of profit that you are, he will get the job anyhow.

I have this to say to the contractor who is gumshoeing around in an effort to learn the price which the other fellow is going to ask. He will usually find what he is looking for. Most men do. I know of instances where conversations have been overheard by the price cutter, which were intended for his ears in order to induce him to put a ridiculously low price on a certain job, that perhaps it was known by the real contractors that there was not one chance in one hundred of any of them getting it at a profit, so they get together and handed it to the price cutter at a loss, for they figure that the more below-cost jobs they can hand this man the sooner the field of competition will be cleared of the most undesirable business man in the world—the fellow who allows his customer, the competitor or the general contractor to set his prices. This price cutter forgets that when he cuts a price he i doing himself as much injury as he is doing his competitor. He establishes a low price, and that price prevails just as long as there are men in the business who continue this bad practice of "Hunting for Prices" rather than to improve their own efficiency learning their costs and studying methods of reducing their overhead.

In conclusion I desire to say that if you will get down to brass tacks, learn your business, learn your costs, install some simple, yet comprehensive, cost and estimating system in your business, base your price upon your records, and be determined that you are in business to make money, and not merely to do business, have a strong determination to furnish the material specified, do good work, turn out a first-class job or in the words of Sheldon, the great business philosopher, render service to the end of satisfaction, you will win.

Making Waterproof Flexible Conduit.

In wiring three exhaust fans in a dye house, it was undesirable to use conduit owing to the position of the fans, also because the steam and acid fumes would soon corrode and rust the conduit.

A flexible loom (Alphaduct) was used. The wires were drawn in and then the whole length was taped with two layers of friction tape, after which it was given two coats of waterproof insulating varnish which presented a slickered appearance on the outside. This was done in each of the three cases. The first was installed about one and one-half years ago and is still in good condition. It is perfectly flexible and will withstand the steam. It can be revarnished or shellacked at any time and altogether it makes an economical and flexible installation.

William T. Estlick.

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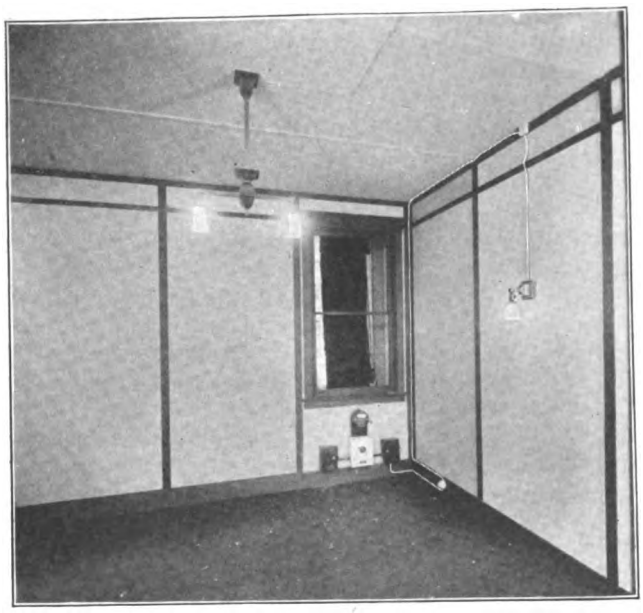
Concentric Wiring Exhibit at Western Electrical Inspectors' Convention.

A cottage wired for service with concentric wiring and fittings was a conspicuous exhibit at the annual meeting of the Western Association of Electrical Inspectors at the Hotel Sherman, Chicago, January 25 to 27. The wiring and construction work was done by the Commonwealth Edison Company.

The cottage was wired with meter, outlet boxes, wall outlet, wall fixture, drop fixture, drop light, wall snap switch and the necessary junction fittings. The wire and fittings were of General Electric Company manufacture. The wire used is



Concentric Wiring Exhibit in Chicago.

one-quarter inch in diameter, the sheath, or grounded side of the circuit, being of tinned copper. The other side of the circuit is the center wire, which is No. 14 solid copper. The insulation is braid and rubber. The wire is bent into shapes to conform to the contour of the walls and is attached by means of straps, which are nailed to the walls and then bent over the wire.

The illustration serves to give an idea of a concentric wiring installation, and the exhibit has received the attention of the convention delegates, who are greatly interested in the many questions concerning concentric wiring.

All-Conduit Wiring Required in Louisville.

May 1, instead of July 1, will be the date on which the all-conduit system of electric wiring installations will be effective in Louisville, Ky., according to an amended order which has been issued by the building inspector at the instance of the Board of Public Safety. The original order had provided that all contracts entered into before February 1 would not be affected, but as amended no date is taken into consideration. The change was made at the instance of the contractors themselves and was in part due to the alleged fact that solicitors had been representing to house owners that they should lose no time in signing contracts, as installations ordered after February 1 would be at a largely increased cost. Public statements issued by the inspector called attention of property owners to the fact that the all-conduit construction represented only a little increase in the cost, while the security was much greater.

The most important rule provides that panel cutouts may be used up to six circuits, while for more than this number of circuits an approved panelboard must be employed.

Among the Contractors.

The F. O Engstrum Company, Los Angeles, Cal, was the successful bidder for the installation of a lighting system in Azusa, Cal.

The W. A. Mullens Electric Company, Tacoma, Wash., has been awarded the contract for the installation of the lighting system in the new depot of the Oregon Railroad & Navigation Company at Olympia. After February 1 the Mullens Company will be located at 931 Broadway, Tacoma.

The F. E. Newberry Electric Company, Pasadena, Cal., was awarded the contracts for lights on Colorado and other streets.

R. T. Marriott and B. B. King, of the Marriott Electric Company, Sault Ste. Marie, Mich., have purchased the store and business of the Northern Electric Company, and will consolidate the two companies, although both stores will be operated under their present names.

W. S. Hanbridge, formerly secretary of the Electrical Contractors' Association of California, has opened an electric supply house in San Francisco, Cal. J. W. Redpath has succeeded Mr. Hanbridge as secretary of the Association.

The Hamilton Company, Dallas, Tex., has been awarded the contract for installing the new court house at El Paso. The installation will cost $15,000.

Frederick M. Shepard, president of Cates & Shepard, electrical and mechanical constructing engineers of Philadelphia, Pa., and head of the Jovian Electrical League in that city, expresses the opinion that prospects point to the coming twelve months as being the most prosperous the electrical industry will have experienced in Philadelphia's history. The firm of which he is head has closed contracts for $50,000 worth of electrical construction work during the past week. Among the contracts, which include the erection of engines, generators, motors and equipment, are the following: Schmidt Building, Philadelphia; Bennett & Aspden, factory, Manayunk, Pa.; Music School Building, Philadelphia; Vim Motor Company, factor, Philadelphia; John B. Stetson Public School, Philadelphia.

The Southwestern Engineering Company of Bristol, Tenn., has been awarded the contract for constructing and equipping the hydroelectric plant of the Federal Dyestuff & Chemical Company, Kingsport, Tenn., at an estimated cost of $250,000.

The contract for the installation of the electric wiring and fixtures in the new high school at Bellingham, Wash., has been awarded to the Page-McKenna Company, Seattle, Wash.

Cleaning Commutators.

Vaseline is about the best material to use in cleaning commutators while machines are in operation and under load. This should be applied to the commutator on a piece of heavy canvas tied firmly on the end of a flat stick of wood. It is necessary that heavy cloth like canvas should be used because the lint and threads from the lighter material would likely get on the commutator and brushes and cause trouble. The length of the stick of wood to be used is gauged entirely by the distance that the operator must stand away from the commutator while making the application. Vaseline should always be used sparingly.

A. B. Broggini.

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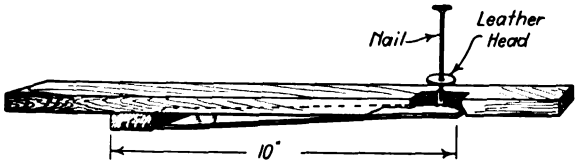
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necesary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Putting on Leather Heads in a Hurry.

The recent edition (1915) of the National Electrical Code still permits the use of nails "with washers," or as electricians would say "with leather heads."

A home-made arrangement here illustrated I have found useful in saving time with leather heads on a knob or cleat job. The device consists of a 3-by-1-inch piece with a



Device for Putting Leather Heads on Nails.

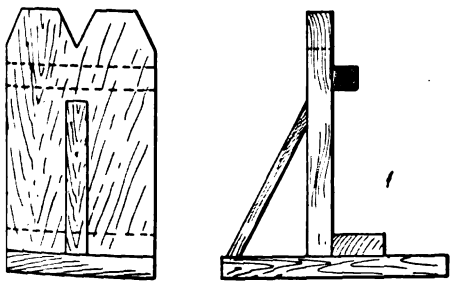
3-by-3-inch block nailed to the under side near one end of the piece. To this fasten with two wood screws a strap of spring steel one thirty-second-inch thick, one inch wide, and about 10 inches long, bent as shown in the illustration. Through the wooden piece drill a smooth hole large enough so that the nails used will drop into the hole easily. With the metal spring strap in place, the nail will drop into the hole only the thickness of the wooden strip.

By placing the device so that the ends only are supported leather heads can be picked up on the end of a nail and with one stroke of the hammer the nail is driven against the spring, setting the leather head up against the nail head, and at the following instant the spring throws the nail out of the hole.

E. Vandervest.

An Armature Rack.

A cheap and convenient rack for small armatures that



Armature Rack.

can be made from ordinary box wood is shown in the illustration. Two of these racks are required for each armature. They permit the armature to be easily moved and handled.

A. R. Hearvey.

Fishing Flexible Cable.

In snaking in wire over a hanging ceiling and partition I managed to put in the snake from the floor up through the partition and fish the same out through the ceiling outlet. After I had attached my BX cable, I was trying to pull the same in place. I could not do so as the snake pulled the cable to the edge of the partition and no farther. I took a short piece of steel snake and put the same alongside of the BX cable over the conductor, and about 6 or 8 inches over the steel fishing snake and taped the same firmly. This made it quite stiff. Then I could pull the cable easily without any trouble.

E. Kalkau.

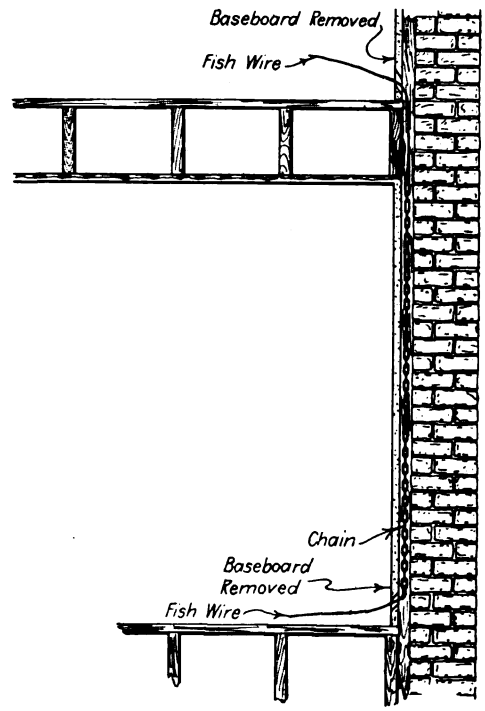
Installing Flush Switches.

In your issue of November 27, 1915, I see a Dollar Wiring Kink in regard to installing switches and receptacles when the switch box is set back and is not flush with the face of the wall. Instead of the 6/36 machine screws and washers or burrs mentioned, I simply use leather heads and slip them on the screw that is to hold the switch in place. They will not fall off and do not require the 6/36 machine bolts, thus saving lots of time and trouble.

Elmer E. Davis.

Clearing Plaster from Wall.

In fishing flexible conduit through a wall where the brick is close to the lath the excess plaster forced through often stops the passage of the flexible conduit. Where the fish wire has been sent through, attach a chain to end of fish



Using Chain to Rake Plaster Off.

and another wire to chain. With one man at each end, and an up and down pull, an opening is readily cleared.

R. W. Johannis.

Threading Wire Through Loom.

To push an insulated wire through a long piece of loom is often quite a job, especially when the loom is a trifle small for the size of wire. Much time may be saved when a number of such wires are to be loomed up, by running a piece of No. 12 or No. 14 iron wire through the loom and splicing it onto the copper wire. Fasten the iron wire to some solid object or have some one hold it; the loom is then easily pulled over the insulated wire.

A. R. Steinhaus.

Blanking Holes in Knockout Box.

If often comes in handy to carry a few tin caps used for roofing paper in your kit. Use one of these on either side of the hole and a stove bolt through the center drawn tight. I find this makes a fairly good job.

Walter S. Fretz.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

THE ELECTRICAL CONTRACTOR AS A DEALER.[1]

By B. L. Burdick.

From the time Edison invented the incandescent lamps and Thompson the arc lamp and Edison, Thompson, Brush and others developed generators and apparatus necessary to produce electricity, tremendous strides mark the progress of the electrical industry and the expansion has created various branches to the electrical business.

Originally manufacturers either promoted or financed the central station and even contracted for the installation of the system including the wiring of buildings as a means of marketing their product.

The central station acting as the representative of the electrical business, continued the installation of apparatus and the wiring of buildings until the growth of the business coupled with the risks and responsibilities of wiring contracts caused the separation of electrical contracting from their business.

The electrical contractor as a cast-off unit of the manufacturers and central station, accepted the diploma of risks and responsibilities and some of the contractors can recall the obstacles dealt with and are entitled to credit for the progress made.

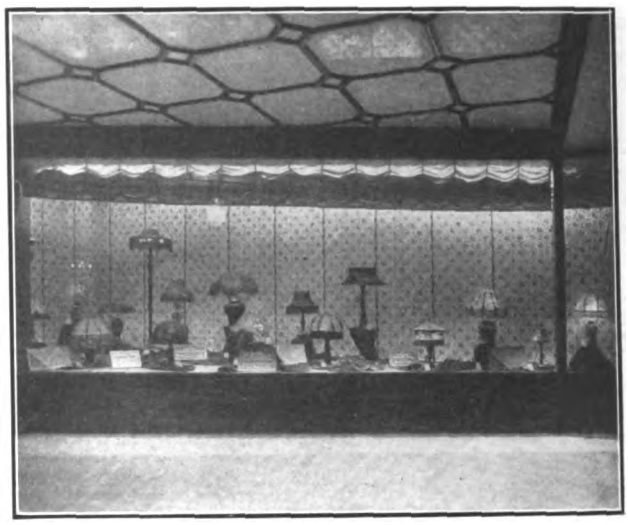
The jobber as a supply house for the central station and contractor, was eventually conceived, thereby completing the present commercial channel for the electrical industry.

It is argued that the province of the manufacturer is to devise and manufacture apparatus and material, the jobber to distribute the manufacturer's product, the central station to supply the electric current and the contractor to promote the use of electricity and to furnish the necessary installation, but these branches of the electrical industry must work in harmony, if satisfactory results are to be obtained.

Many electrical contractors are men of ability and competence and their reputation as contractors has been more than the value of money. However, we must admit that it has been too easy for the man of pliers and the fly-by-night concerns to enter the electrical business due to extended credit by the manufacturer and jobber.

The contractor that is prepared to furnish service and quality will remain in business after the cheap price, cheap material and cheap workmanship contractor has gone out of business. Cut-rate competition and cheap installation not only reduce your profits, but lower the standard of the contracting business. No one questions the right of the electrical contractor to a fair profit and if you will pursue a policy of fair charges combined with honest and intelligent workmanship, you will obtain results justifying your efforts. Factors necessary for success in the electrical contracting business are honesty, sincerity and efficiency, combined with publicity in the form of advertising, association with other business organizations and having the good will of your employees.

That the electrical contractor is the logical dealer is advanced by the fact that the contractor is familiar with the Underwriters' and cities' requirements, has a fair knowledge of building contruction, knows where to obtain the proper materials at the right price and foremost, has a business relation with the consumer, having installed the original installation.



A Notable Window Display of Electric Portable Lamps.

The jobber asserts that he prefers to deal directly with the consumer for the reason that the average electrical contractor is very poor pay and contends that the contractor does not understand the merchandising business, and furthermore conducts a place of business unsuited for the purpose. Of course, this is not altogether true, but we must admit that the contractor may be negligent in these respects, but this does not give the jobber the right to treat the contractor as he does.

Any special concessions extended the jobber by the manufacturer may be legitimate business, but we must take exception to the jobbers policy with the contractor of no special concessions and soliciting the consumers' trade in competition with the contractor. Should it be legitimate for the jobber to be protected over the contractor, then it is legitimate for the contractor to be protected over the consumer, and our failure to obtain the desired results in this direction, should move us to some action?

Do you contractors realize that the field of contracting is materially reduced by the jobber and others continually soliciting from those having an electrical installation? Do you contractors realize that the jobber and others are responsible for many concerns doing their own electrical work?

The demand for an electrical contractor is more limited when the consumer is educated to the fact that material can be purchased at the same prices paid by the contractor. Do you call these tactics fair?

Perhaps the time has passed when any co-operation to adjust the conditions between the jobber and others and the electrical contractor serves in any useful purpose, but there is a sentiment that these parties ought to work in

1 From a paper read at the thirteenth annual meeting of the Electrical Contractors' Association of Wisconsin, held in Milwaukee, January 17 to 19.

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harmony and how to accomplish the results is the problem for you to consider. Let us remember that the electrical contractor is engaged in a legitimate business—entitling him to some trade protection in order that he may exist.

Most of the obstacles in the way of the electrical contractors' success are merely on the surface, some of them having been placed there by himself, and practically all of them may be overcome by concerted effort.

There is only one way to properly handle existing conditions and that is by inducing the majority of the electrical contractors to join an organization for the protection of their interests.

As a factor of safety from further criticism, let us be right with ourselves, give more attention to our business, improve our credit, study the art of show-window dressing, and advertising, and co-operate with the central station in promoting the selling of current-consuming devices.

The present antagonistic feeling between the electrical contractors themselves must vanish before we can hope for the success of our business, and this condition of affairs accounts in a great measure for the present predicament of the electrical contractor, and this is one reason why the knock-out dope has been prescribed.

How much more satisfactory the result would be if there were a more friendly feeling and co-operation between electrical contractors. What school of business teaches us to oppose our own interests? Perhaps we lack the business ability necessary for success and are justly entitled to the criticisms. Did it ever occur to you that great possibilities are within the contractors' own sphere of business? My message to the electrical contractor is for united action or co-operation, applied in every phase of the business, for the purpose of better control of the electrical contractors' and dealers' business.

Sales-Making Features Embodied in Duluth Fixture Store.

An electric fixture and appliance store is essentially a display room, and to be able to show goods to the best advantage is one of the first requisites of successful merchandising. To afford the customer a "mind" view of a fixture as it would appear in his own home and to afford active comparisons of different articles of the same line yields quicker and more satisfying sales. These considerations and others the Northern Electrical Company, 210 West First Street, Duluth, Minn., embodied in the plans for a fixture sales room which the company added to its retail store a few weeks before the holiday season. The company does a jobbing business in electrical supplies and machinery, and manufactures and sells electric and combination fixtures.

The fixture sales room is 23 feet wide and 70 feet long. Near the front of the store a wide archway was built, opening into the retail store next door. As a result, every one who enters the retail store to buy electrical supplies of one kind or another must see the electrical fixture room. The interior of the room has been conveniently wired in conduit throughout. Instead of making a false ceiling, fixtures were dropped to the proper height by means of iron pipes, the latter being attached to conduits in the pipe runs. The ceiling and all pipe work were painted a pure white, while the wide walls were painted a light neutral color.

Each fixture is connected to the circuit by means of a "special quick" detachable connector so that a fixture may be removed and another replaced with the least possible loss of time. As far as possible all of the fixtures are grouped together to show the same general type of fixture in one group or line. Five outlets in each line are controlled by a pull switch hung in the ceiling, from which is suspended a long cord down to within reach. Receptacles are conveniently placed all about the room and underneath tables, affording connections for all portable lamps.

The rear wall of the room has shelves upon which are displayed samples of the various kinds and styles of glassware carried in stock, while one shelf is wired and has receptacles placed at regular intervals with a lamp extending upwards in order that shades may be placed on the lighted lamps and shown to the best advantage. Just above the glass shelves, about nine feet from the floor, there is another shelf upon which are shown various styles of ceiling glassware and holders.

Around the greater portion of the room there is shelving which affords the display of samples of different kinds and bowls, while on the west wall there is a shelf about nine feet long extending outward at a slight inclination. In the illustration there are shown resting upon this shelf four bowls, under each of which there is a lighted lamp controlled by a separate switch. By means of this arrangement a prospective customer may more easily select the type, shade and color of bowl which he would like. Along the west wall, suspended from the shelf at the proper room heighth, are shown various styles of the older-style showers, while along both west and east walls, at a somewhat lower level, are shown various styles of brackets. On the east wall these brackets are permanently connected, while on the west wall, which shows a more exclusive type, each individual bracket is placed on a

Two Views of Fixture Sales Room of the Northern Electrical Company, Duluth, Minn., Where Fixtures Are Shown to Best Advantage.

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piece of ornamental, framed compo-board and so arranged that it can be disconnected and lifted from its support and a new bracket put in its place in the shortest possible time. The front portion of this store is given to exhibits of washing machines, vacuum cleaners, electrically-driven mangles, electric ranges and other household devices.

The cost of lighting a room of this kind is considerable unless a great deal of care is maintained. One of the illustrations shows the installation of a single industrial type unit in the rear portion of the room, this installation being for the purpose of reducing the power consumption.

The manager of this store has his desk in the southeast corner, and he has as an assistant a young lady who makes up silk shades for portable lamps during her spare moments.

Western Electric 1916 Fan-Window-Display Contest.

A prominent feature of the fan season last year was a window-display contest conducted by the Western Electric Company. It will be remembered that six prizes, amounting to $100, were given to the dealers who, with the material given them, trimmed windows that attracted the most genuine interest to electric fans. The base of the display, a cut out, featuring a wave-beaten beach, was given to all the contestants and around that all the displays were made.

The contest created a great amount of interest and comment. As a matter of fact, the Western Electric Company considers the results sufficiently encouraging to conduct a similar contest for the 1916 fan season. The contest for this year calls for the use of a cut out similar to the one used in the 1915 display. There are 10 prizes offered this year, amounting to $250. They are as follows: first, $100; second, $50; third, $25; fourth, $15; also six prizes of $10 each. In addition to these prizes, one dollar will be paid for every photograph submitted. The contest will close October 1, 1916, at which time a board of judges consisting of representatives of the leading electrical papers and of the Society for Electrical Development will award the prizes.

The possibilities of the display are almost limitless. The dealers realized this and will realize it again. Beside the incentive of a prize, there is the fan business always resulting from an attractive window display, to be considered. The wide-awake dealer will start now to plan a window that will be a prize-winner. There are any number of attractive combinations he can make with his flashers, motors and fans, all of which will give action, and action makes for interest, which is the basis on which all prizes will be awarded.

Contractors to Exhibit at Good Homes Exposition in Springfield.

An electrical house will be a feature of the Good Homes Exposition which will be held at Springfield, Mass., early in April. Electrical contracting firms will have on exhibition the very latest electrical domestic apparatus, which will be demonstrated for the benefit of Springfield housewives.

The promoters of the Exposition point out that electricity, properly utilized, will now perform more than half the household tasks that were accomplished by hand a half century ago.

Contractors in Paducah Join Building Association.—Electrical contractors of Paducah, Ky., are co-operating with others in the building trades field in organization of the Paducah Builders' Association. There are forty-eight concerns or individuals eligible.

Timeliness in Appliance Advertising.

There is, of course, a very general understanding among dealers in electrical appliances that there is a certain element of timeliness in sales work, which if adhered to will facilitate easy disposal of goods. During the spring house-cleaning season vacuum cleaners find a ready sale, while the most appropriate time to push the sale of fans is when the first hot spell has gripped the city. So, also, it is well realized that heating pads, radiators, griddles, etc., are more easily sold in the fall than at other seasons.

This feature of timeliness in sales campaigns is, however, capable of much greater adaptation than is generally supposed and many live dealers have enjoyed prosperous business because of their faculty for properly appreciating this important phase of merchandising.

Advertisement of a Springfield Dealer During Grip Epidemic.

Among the latter class is the Brown-Gates Company, of Springfield, Mass., whose advertisement, which was recently run in the local daily papers, is shown herewith. Springfield, like many other cities throughout the country, experienced a grippe epidemic and the local newspapers gave considerable space to statistics showing the number of those afflicted. With a full realization of the real value of electrical appliances in the sick room the Brown-Gates Company immediately inaugurated a campaign to push such devices as heating pads, water heaters, vibrators, radiators, dim-a-lites, etc., and it is reported that its efforts in this respect have been handsomely repaid. Special prices were offered on a number of appliances each day of the campaign.

Fuel Scarcity in Russia.—As a result of scarcity of fuel in Petrograd, Russia, a movement has been officially set on foot to reduce the consumption of electric current for lighting restaurants, theaters, motion-picture houses, etc.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Facilitating Customer's Development.

To the Editor:

Referring to the article in issue of January 15, on the subject of central-station service to large customers, the success of a central-station company depends to a great extent upon public opinion, and favorable public opinion can be engendered only by the adoption of a broad policy in matters of this kind.

Details of policy adopted, however, depend greatly upon local conditions. Take for instance the proposition covered by your article. In this place the customers are served by means of high-tension lines, requiring very expensive transformers to reduce the voltage to voltage desired by customer. Small transformers for this voltage cost considerably more per kilovolt-ampere of capacity than do large transformers, so that it is undesirable to install a bank of small transformers when the customer is first connected up and increase the transformer capacity later by the installation of a second small bank. The highest voltage in our territory is 33,000 volts, and we have comparatively few customers fed at this voltage. A majority of our customers are supplied from our 2,300/4,000-volt distribution lines.

We have rates covering the furnishing to customers of low-tension current, of proper voltage for motors, and rates covering the furnishing of current at local distribution voltage; the difference in these two rates taking into consideration transformer losses and investment necessary for customers to make in the event of their purchasing current at local distribution voltage, be it 2,300/4,000, 12,000, or 33,000 volts.

As a power contract is about to be executed with one of our larger prospects, the matter is brought to my attention; I study the conditions and have our salesman make recommendations to prospect as to the scheme under which we believe they would earn the best rate.

C. W. PenDell,
Engineer, Contract Department, Public Service Company of Northern Illinois.

Chicago, Ill.

Electric Welding.

To the Editor:

Referring to your article in issue of January 8, regarding comparative cost of electric arc welding and oxy-acetylene welding, it is a rather difficult matter to give a figure which will apply to all cases as the ratio of cost varies with different kinds of work.

So far as boiler plate is concerned the figures given in the table published, under the title "Comparative Cost Data Acetylene and Electric Arc Welding" are of service. However, as a usual practice the cost per foot of welding is seldom as low as the cost given for either the oxy-acetylene or the electric arc. The reason for this is that no time or cost is allowed for handling the plates to be welded in the figures given. In other words, the plates to be welded by either the gas or arc process at the cost figures given would be a problem of welding and no time for handling allowed.

The saving effected by the use of the electric arc process as compared with the oxy-acetylene welding arises in the saving of labor and the saving in producing heat. The saving in labor, of course, is due to a slightly increased speed in the operation and the saving in heat is due to the fact that the given quantity of heat can be produced on the plates to be welded at a lower cost when produced by the arc than when produced by the oxy-acetylene flame.

The notes at the bottom of the table show why this is a fact. In other words, knowing that the value of acetylene if 1,555 British thermal units per cubic foot, and that one kilowatt-hour is equivalent to 3,413 British thermal units, the comparative cost of each given, the amount of each can be figured.

In addition to the fact that the heat of the electric arc is cheaper to produce, it is also better adapted for welding purposes owing to the fact that it is produced in the metal to be welded rather than external to it. For that reason, three times the welding can be done with the given amount of heat produced by the arc process as compared with the amount which can be done if the heat were produced by the oxy-acetylene process.

Robert E. Kinkead,
Lincoln Electric Company.

Cleveland, O.

Electrification of Steam Railroads.

To the Editor:

I read with a great deal of interest the editorial in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for December 11, 1915, in reference to the Chicago report on electrification, and feel that this editorial has done a lot of good in calling the attention of people not only in the railway business, but in any business where power is required to the fact that a great amount of original capital can be saved by tieing up with a central-station company rather than putting in an isolated power plant.

It was particularly interesting to me to note in the daily paper a few days after reading the editorial, a statement coming from B. F. Brush, receiver of the Missouri Pacific-Iron Mountain Railway System, referring to a statement in which he said that it would not be many years before steam locomotives would be abandoned in favor of electric locomotives, his prediction being that all railways throughout the American Continent would be operated with electric power instead of steam.

We all appreciate, I think, that the field for electrical power in the railway business is tremendous, and particularly in the inter-mountain and western states where there is so much undeveloped water power. I think it is an undisputed fact that every attempt at electrification of steam railways has been a marked success. Here in California, the Southern Pacific Company operating over the Siskiyou Range to the north and the Sierra Range to the east, affords opportunities for electrification that are particularly interesting, for the reason that water power can be developed along the route of each of the lines in sufficient quantity for complete operation, and at a reasonable cost.

One of my thoughts in commenting on this at this time is to urge you to give more publicity to this idea, not only as affecting situations such as exist in Chicago, but for the main railway lines throughout our country.

S. V. Walton,
Manager Commercial Department, Pacific Gas & Electric Company.

San Francisco, Cal.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 325.—Capacity-Factor of Central Station.—In a town of 10,000 or less, having a fair day load, the peak being composed of store and residence lighting, what is the proper ratio between peak load and rated capacity of the station? I am supposing that the central station makes little or no effort to increase the power load and absolutely no effort to push appliances.—F. H. G., Columbus, Neb.

No. 327.—Reducing Glare from Table Lamps.—I have observed that practically all table lamps cause eye strain to children reading or playing on the table by shining glaringly directly into their eyes, if the children are not sufficiently tall to have their eyes screened by the shade or dome. Can anything be done to reduce this glare, aside from using full-frosted lamps?—P. M. C., Lockport, N. Y.

No. 330.—Installing Concentric Wiring.—In bending a sample of the new concentric wire in a certain direction, I notice that the seam in the outer sheath is easily opened. Is this not likely to cause short-circuits, if such wire is installed in damp places where water may enter the insulation at open seams? How can this be prevented?—L. T. K., Chicago, Ill.

No. 329.—Telephone Test Set.—Could an ordinary test magneto of 50,000 ohms be used for a telephone test set? If so give description of plan for use and wiring diagram for attaching a head-type receiver and transmitter or a microphone set to the magneto to use in telephoning, also the batteries for the current. My idea was to use this temporary rig for use in testing transmission-line troubles on a small line of eight to ten miles in extent without a regular telephone system, the company not buying anything as expensive as a regular test set. Could it be used for talking to powerhouse over one wire of transmission line (line dead), using a grounded return for six or eight miles?—C. D., Glenwood, Minn.

Answers.

No. 324.—Circuit-Breakers for Motors.—In some cities the use of circuit-breakers in place of fuses, or without auxiliary fuses, is permitted where there is efficient supervision. What constitutes "efficient supervision" under these circumstances?—C. E. U., Chicago, Ill.

The exclusive use of circuit-breakers under specific conditions as satisfactory protection for motors is now accepted by many of the local underwriters' associations in various states, though it is doubtful if it will be encouraged or approved in general practice.

Formerly it was considered essential that under any or all conditions fuses should be installed as additional protection, particularly with regard to failure of a mechanical circuit-breaker to act, but owing to later developments and improvements in circuit-breaker construction, and the extended application of the oil-immersed types this opinion has been somewhat modified.

In some lines of work, where the primary consideration is continuity of service, and the absolute protection of the motor or load is of secondary importance, the circuit-breaker with time-limit features has proven invaluable in applications of such a nature that momentary short-circuit conditions or overload periods of short durations are likely to be experienced.

While the inherent character of direct-current apparatus often demands that more attention be given adequate protection without introducing much time element, it has been found satisfactory, when conditions warrant it, to protect only with time-element circuit-breakers. In alternating-current work, however, the additional advantage obtained by virtue of the choking effect produced by a short-circuit condition renders the motor free from such attention.

The writer has been instrumental in installing without fuses, within the past three years, motors aggregating over 1,000 horsepower, both alternating-current and direct-current units ranging from 5 to 50 horsepower in various parts of the country, and although failure was often predicted and it was sometimes difficult to secure the underwriters' co-operation, I can happily state that each individual case has given satisfaction.

The question of what constitutes "competent supervision" must be determined by the local underwriters' association having jurisdiction over the territory concerned. In accordance with the writer's experience, this expression was taken to mean an operator sufficiently familiar with the control of electrical current to intelligently use the device under proper conditions. The operator is one usually designated for that particular duty, and does not ordinarily apply to promiscuous persons. He need not necessarily be an electrician, switchboard man, or mechanic, though logically they would be preferred.—M. K., Passaic, N. J.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

There is a difference of opinion concerning whether it is best for the jobber to sell a given product under his own name or trade-mark, or under that of the manufacturer. The writer would say that the answer depends largely on the product, whether it is advertised or not, and the extent to which the manufacturer co-operates with the jobber and the retailer.

Let us take the case of the manufacturer who is marketing a product of high quality. By means of consistent advertising, this product, which let us say for example is batteries, has become widely and favorably known not only by dealers but by consumers as well. If these batteries are of high quality and the manufacturer advertises that fact, and is willing to back up his claims, is it not better to market these batteries under the manufacturer's trade name? The writer thinks that it is, because this money, which is being spent by the manufacturer in advertising these batteries in the jobber's territory can act as an effective medium in increasing the jobber's sales for this particular product. If he were to take these same batteries and place his own labels upon them he would have a hard time convincing the retail dealer the product was "just as good." And the dealer in turn would have similar difficulties when his customers called for the batteries by the manufacturer's advertised trade name.

The writer does not believe that the practice of some jobbers to place their own private trade names on certain products is a good one. The average dealer has become skeptical of "special brands" and "private labels." The dealer has no way of knowing whether the jobber is going to continue to buy his goods from the same manufacturer, and thus maintain the quality of the product.

Although pushing a product under the manufacturer's trade name helps the manufacturer in the popularization of that product, it also pays the jobber because it facilitates the selling of that product and not only that, but it also increases the volume of business by virtue of the demand having been stimulated by a consistent advertising on the part of the manufacturer.

If a manufacturer is specializing on one grade of goods he ought to concentrate his efforts on one trade name for each product. To have a large number of names means that no one of them can have sufficient attention paid to it with the result that all of the names bear little weight. On the other

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hand a manufacturer can easily build up a good reputation about a single trade name.

A well known trade name has almost unlimited market value. It is hard to estimate the money value of names like Columbia batteries and Mazda lamps. The public has faith in widely advertised goods because only high-quality goods can stand the test of national publicity. When a manufacturer places his trade-mark on a product, the jobber, the retailer, and the consumer each accepts it as a guarantee of the quality of the goods.—C. A. B., Cleveland, O.

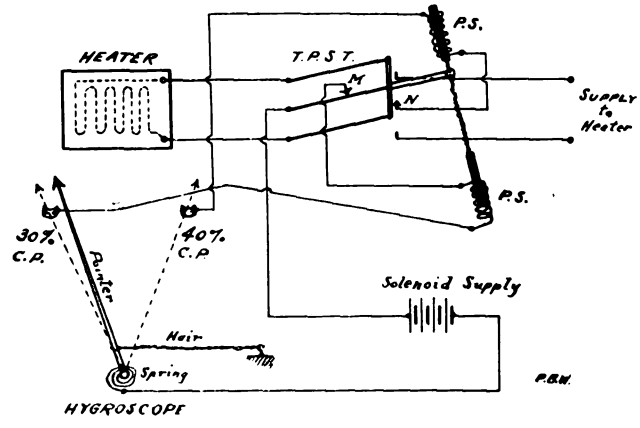
It is decidedly poor business policy for a jobber or dealer to place his name on an article of merchandise in such a manner as to disguise the name of the real producer. No it does not promote sales; to the contrary, it has a greater tendency to drive a certain class of trade (the better class, who know what they want) to the competitor across the street or in the next block who sells the goods under their rightful name or brand. When a customer calls for Columbia batteries, Mazda lamps, Westinghouse fans or Western Electric interphones, it generally shows that the customer is well posted as to the merits of the article for which he calls, and four times out of five he is going to have that very article undisguised, though the dealer may offer him the very article for which he has just called, with his own name placed over that of the producer. Yes it does injure the interests of the manufacturer to have his goods sold under anonymous names. It is to the interest of manufacturer, dealer and consumer that articles should be sold under their rightful names. In no other way will the dealer profit by the advertising done by the manufacturer, or will Mrs. Doe know she is getting the electric iron she saw advertised in her favorite magazine. However, it is a very good idea for a dealer to place his name under that of the manufacturer in connection with the words "Local Distributor," or some similar phrase. In this way the dealer is in a position to be benefited by the manufacturer's advertising campaign and is also establishing himself in the minds of the public as the local distributor.—K. L. S., Middlebrook, Va.

No. 326.—Automatic Electric Humidification.—Are any automatic means available through which an electric water-heater could be controlled from a humidity instrument so as to cause the heater to boil water when the relative humidity has dropped to, say, 30 per cent and be cut off when the humidity has been raised to 40 per cent? Would such a device be practical and reliable?—M. T., Lansing, Mich.

As far as the writer can find, no such application as named in the above question has been made. However, it is probably not impossible that with some research and experimentation the following arrangement could be perfected into a fairly reliable means for automatically controlling the humidity of air, in localized limits, of course. However, the degree of reliability can hardly be foretold definitely, in view of the varying factors of temperature, convection, pressure (dependent itself upon altitude above sea level and weather conditions), diffusion, etc., all more or less variables of which humidity is a function; also, the humidity instrument used can not be guaranteed to indicate with exactness, as later stated. Instruments for measuring humidity come under the generic term hygrometer, of which there are several different types. It is evident that only that of the "hygroscope" type can be used in the following plan. The hygroscope, a qualitative meter of changes in the humidity, depends for its action upon the contraction or extension of substances exposed to varying degrees of moisture; catgut, hair, twisted cord, and wooden laths, all of which contract with an increase in the humidity, and extend with a decrease, are the most favored materials. Very highly recommended (especially by Pernter) is the hair hygrometer, the very best forms of this type acting very well for a time.

Now, remembering that such instruments give directly the relative humidity or the ratio between the moisture in the air and that which it would contain if saturated, whatever form we use can (by comparison with the ventilated psychrometer, which itself must be dependent on the standard dew-point apparatus) be so calibrated as to give us definite points corresponding to the relative humidities of 30 per cent and 40 per cent. The definite points are then made coincident with two contact points and the indicating hand made to perform an armature function; a sliding contact would be best, to keep the hair from stretching when the pointer passes beyond 40 per cent saturation. Two circuits, governed by the last system, control two corresponding plunger-solenoid contrivances, of which the one closes, the other opens, a suitably modified triple-pole, single-throw switch controlling the electric heater circuit, and a further make-and-break arrangement (*M* and *N* in the diagram) inserted in the solenoid circuits to prevent extended flow of current in them while the hygroscope pointer stands at point of contact. See the accompanying diagram, which shows condition of the general circuit just preceding the moment when the relative humidity becomes 30 per cent.

Care should be taken that the solenoids be not actuated with a heavy supply, as the attendant arcing would damage the pointer or overheat it. It is possible that the heat of the pointer will affect the action of the hair; anyhow, it might be well to investigate this. The force necessary to "wedge" (close) and "unwedge" (open) the main switch can be found with the help of a spring balance. Having the force for each operation and the current limits for the solenoid circuits, the proper solenoid dimensions can be found according to the formulas and suggestions in any good book on electromagnets. Details of connecting the plungers to the handle of the main



No. 326.—Automatic Electric Humidifier.

switch, erecting the contact *M*, and other fine points are left to the ingenuity of the querist.

While the present suggested plan is somewhat crude, it is much less expensive than would be a more elegant one, and furthermore, with proper experimenting and testing, it can be refined and made to fulfill requirements as well as the various limitations already alluded to will allow. The writer can not say off-hand as to the practical nature of automatic humidification.—P. B. W., Verbena, Ala.

No. 328.—Flame Arcs.—Where series flame arc lamps, such as those used for Chicago street lighting, feed at intervals much less than one minute is it due to poor adjustment of the lamps or to some inherent characteristic?—B. D., Chicago, Ill.

In answering this question let us first inquire whether flame arcs of the type used in Chicago do actually feed at intervals less than one minute. A new trim of carbons for this type of lamp consists of a ⅞ by 12-inch upper and a ⅞ by 6-inch lower. At the end of a life of a trim the upper stub is 6 to 7 inches long and the lower about an inch. In the succeeding trim the stub of the upper is made the lower and a new upper used. These burn down to very nearly the same length stubs. The amount of carbon burned is therefore 6 inches of upper plus 5 inches of lower, or 11 inches. The minimum life of these carbons is 100 hours of

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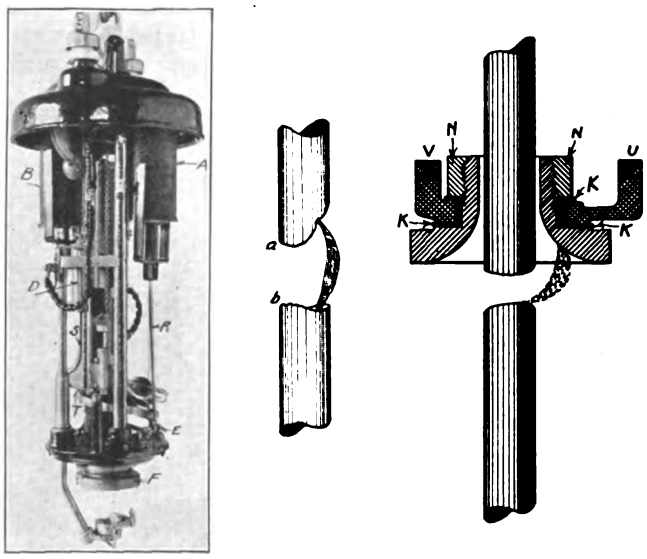
burning, and if they were left in the lamps until completely burned out they would average well over 110. The burning-factor is thus very close to 10 hours per inch of carbon. It is therefore evident that the feeding of the carbons is so slow as to be absolutely imperceptible. As a matter of fact, in normal operation the carbons actually feed not more than once or twice an hour. If then the lamp in question apparently feeds several times a minute, it can only mean that something is wrong with the lamp, causing the arc to break with that frequency and not that the carbons are actually feeding.

Fig. 1 is from a photograph of the mechanism of the lamp. This lamp has a coil of large wire, *A*, in series with the arc and a differentially wound shunt coil, *B*, across the arc. In each of these coils is an armature connected to the lever mechanism, *R S T*, the member *T* being pivoted on the lamp frame at *X*. As slight changes in arc voltage occur, due to variations in burning conditions in the arc, the armature of one or the other of the coils will be more strongly attracted, and the arc regulated. The feeding mechanism is also actuated from these armatures, and when the arc becomes too long, due to the burning away of the carbons, so that the available voltage is not sufficient to maintain it, a dog is released and the carbons are allowed to feed. Tracing



No. 328.—Flame-Arc Trouble.—Figs. 1, 2 and 3.

out of the main circuit then, when the arc is in operation the current flows through the series coil, through the frame to the lower holder, through the arc to the upper carbon, from there through the magnetic blow-ring to the cutout, and thence back to the other terminal. If now something goes wrong with the lamp, the armature of the series coil will drop and the cutout will make contact. The main circuit then passes from the terminal through the starting resistance, across the cutout and back to the line at the other terminal. As soon as the cutout acts, the carbons, of course, come together and a shunt circuit is formed through the series coil, the two carbons, the magnetic blow-ring and the cutout. If the trouble is but momentary, the series coil will immediately act, its armature breaking contact at the cutout and separating the carbons so that the arc is again established.

Passing now to the lamp troubles that could cause the breaking of the circuit several times a minute, there are in general seven causes of this so-called jumping: (1) High arc voltages. (2) Worn or loose dashpots. (3) Carbons out of alinement or unevenly trimmed. (4) "Flaming" or creeping of flame up the side of the upper carbon. (5) Excessive variations in line voltage. (6) Worn clutches. (7) Magnetic effect of conductor near arc.

Taking these up in order, briefly, (1) high arc voltage and (5) excessive variations in line voltage would rarely occur in large installations, such as the Chicago system, where the regulation is so close; (2) worn or loose dashpots would not have a very serious effect in this particular type of lamp, because the two opposing coils regulate the arc, and the dashpot is simply to make the action a little more sluggish. If the carbons were out of alinement (3), jumping would be caused to a greater or less extent, depending on how much they were out of line.

A more probable cause is shown in Fig. 2. When for any reason an arc burns for any length of time on one side of a carbon, it rarely wanders back, but usually tends to remain in the same spot and aggravate the trouble. Fig. 2 shows such a condition. As time goes on the carbons will be entirely burned away on the right-hand side, leaving two projecting tips *a* and *b*. As the feeding mechanism regulates the length of the arc proper, there will come a time when these points, *a* and *b*, will come together, thus short-circuiting the arc and causing the cutout to operate. The series coil will immediately pick up, striking the arc, which will be too long to be mantained by the available arc voltage. The coil attempts to remedy this by feeding, which will again cause the points, *a* and *b*, to touch, and the cutout will again operate. This will cause the jumping mentioned in the question.

A worn clutch is another very likely cause of jumping, for if the carbon slips in the clutch it will gradually shorten the arc until the carbons touch, thereby short-circuiting the lamp and causing the cutout to close. The mechanism will again pick up, separating the carbon and drawing the arc, so that the cycle will be continuous, and jumping will occur just as often as the upper carbon slips down and touches the lower.

It is well known that a very slight degree of magnetism is sufficient to affect an arc very seriously, and it is usual in modern lamps to provide a uniform magnetic field of low intensity, so as to keep the arc centered. In this type of lamp this is done by the magnetic blow-ring *F*, Fig. 1. In Fig. 3 the construction is shown more in detail as a cross section. It consists of a ring of copper or composition fitting loosely around the economizer and entirely insulated from it, as shown at *K*. A nut, *N*, holds it solidly in place. The wires are connected at the terminal posts, *U* and *V*. The current enters at one terminal, passes around the ring proper, forming a uniform field at low intensity within it, and passes out at the other terminal. If now, due to the bowing of the arc, the economizer becomes very hot, the insulation, *K*, may be broken down and the magnetic blow-ring comes in contact with the economizer. Should the arc now start burning sideways, as in Fig. 2, even if not sufficiently to cause actual short-circuiting by the carbons themselves, the arc could easily jump off the upper carbon and form between the economizer and the lower carbon, which would immediately short-circuit the upper carbon and cause the lamp to cut out. As in the preceding cases it would again pick up and a cycle would be established of short-circuiting, going out and picking up, that would easily explain the trouble mentioned in the question.

Summing up, the cause of the trouble will probably be found under one of the following heads: Worn clutches, side-burning of carbons, or broken down insulation in the magnetic blow-ring.—V. A. C., Cleveland, O.

New Hydroelectric Plant Projected in Maine.

The Rangeley Electric Light & Power Company, Rangeley, Me., has been making a survey of the Kennebago Falls, where it is planned to locate a generating plant, with transmission line to Oquossoc and Rangeley Village for the supply of commercial and domestic light and power.

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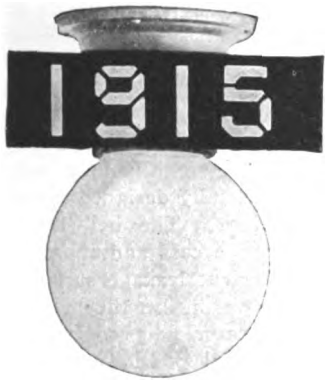
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Lindred Mechanical Appliances

Illuminated Porch Number.

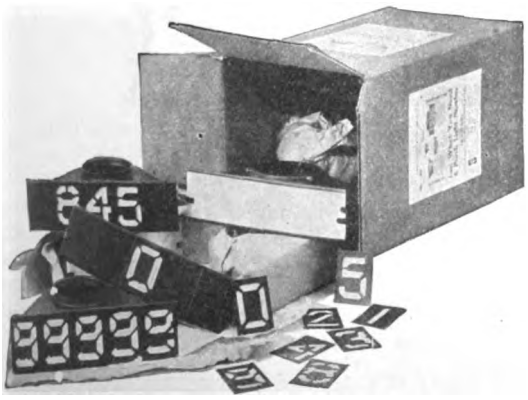
For a long time it has been recognized that the illumination of house numbers is not only a great convenience in locating any particular house on an unfamiliar street, but that it is practically a necessity so as to facilitate the location of the house without disturbing the neighbors in the middle of the night. A very simple device for attaining this object has now been developed; it is known as the Whitlock illuminated porch number. The device itself is extremely simple, consisting of a light rectangular framework, into which removable number units can be placed. This frame accommodates as many as five figures. The



Illuminated Porch Number.

figures are translucent, and the frame has secured to it a small ring by means of which it is attached to any of the common porch lights now so generally installed.

The appearance of the outfit is shown in the accompanying illustration. The light from the illuminated globe or shade makes the translucent figures stand out boldly against the dark background. The ring referred to above is inserted into the globe-holder of the porch light after the globe has been taken off. The lower portion of the ring is made in the form of a shade holder, and into this the globe or shade is inserted. This does not appreciably disturb the relation of the globe or shade to the fixture. The outfit is



Assortment of Frames, Numbers and Porch Rings.

very easily installed and low in cost. It is made for either 3.5 or 4-inch porch rings.

This outfit is being placed on the market by Stanley & Patterson, 23 Murray Street, New York City, N. Y.

Improved Cover for Vehicle Storage Batteries.

At its exhibit at the Chicago Automobile Show this week, the Electrical Storage Battery Company, Philadelphia, Pa., is showing the latest improvement that has been made in its Ironclad-Exide battery for electric pleasure and commercial vehicle, storage-battery mine locomotive and industrial truck services.

This latest development in electric vehicle batteries consists of an air-tight cell cover and filling-plug construction which has many new and distinct advantages. It absolutely prevents dust or other impurities from getting into a cell. The cover is made flush with the top of the jar, leaving no space for the collection of moisture or dust.

This type of filling plug in an ingenious manner limits the amount of water that can be put into a cell to the exact amount needed to replace that lost by evaporation. The result is a clean, dry and attractive battery with the chance of short-circuiting, rotting of battery trays or corrosion of metal parts eliminated.

The cover is fastened around the cell terminals by special sealing nuts, which are threaded to the terminals, and

Section of Battery Cover, Plug Removed.

Section of Battery Cover With Plug in Place.

rubber washers used in connection with the sealing nuts make air-tight joints.

This type of cover and filling-plug construction has already been used in hundreds of thousands of Exide starting batteries in which it has proved very successful. It is also used in connection with the Exide batteries which the company is furnishing to the United States government for modern submarines. This improved construction has been limited in its electric-vehicle-battery application to the type MV Ironclad-Exide battery, because this type of battery is by far the more widely used.

New Type of Service Entrance Cap.

Where overhead service wires enter a building through conduit mounted on the rear or side of the building, the Code requirements are that a special approved fitting shall be put on top of the conduit which will protect the wires and the inside of conduit from weather conditions. In the entrance fittings now in general use this is accomplished by

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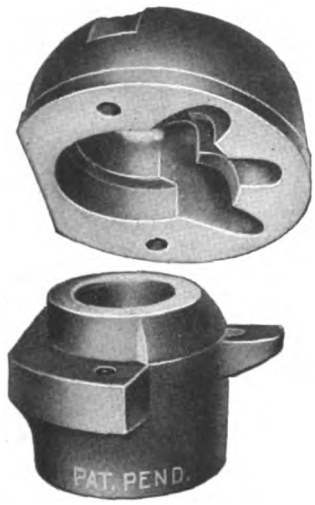
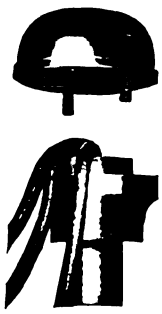
providing inclined grooves for the wires, which must be threaded through these while the fitting is being installed.

To overcome this extra work a new type of entrance bushing and cap has been placed on the market known as the type F-M caplet. This, as shown in the accompanying illustrations, is made in two parts. The body is secured to the conduit and a separate cap with appropriate grooves for the wires fits over this base. Both parts are made entirely of a very tough high-grade insulating material that is not easily broken. This material is entirely weatherproof, and does not rust or corrode.

The cap of the fitting is provided with three grooves. If it is to be used for a two-wire service, the middle groove is closed by a lip which projects from the base of the device. When used for a three-wire service, it is necessary merely to remove this lip, which is easily done by striking it a sharp blow with the pliers or screw-driver handle; it can thus be readily broken off, leaving the groove for the middle wire free. In installing the outfit, the base part is screwed to the top of the conduit and the latter secured to the building. The wires are then drawn in and bent down at their upper ends. The cap piece is then placed over the wires, each of which lies in its separate groove. The cap is fastened to the base part by means of two screws inserted from the top so that they cannot drop out. This fitting is made for one-half, three-fourths and one-inch conduit. It is manufactured by



Two-Part Service-Entrance Fitting.



Wires in Place and Cover Ready to Screw Down.

James C. Phelps, Springfield, Mass., and is being marketed exclusively by L. E. Frorup & Company, 232 Greenwich Street, New York City.

Weatherproof Combined Potential and Current Metering Transformers.

The practice of generating electric current at a centralized station and distributing it over relatively wide districts at high voltage and selling it to rural customers, villages, towns, coal mines, mills and other power consumers has created a demand for weatherproof outdoor substation equipment, weatherproof high-voltage transformers and weatherproof metering transformers. The two former classes of apparatus have been developed in many types since the introduction of this practice. To fill the demand for weatherproof metering transformers the Packard Electric Company, Warren, O., has perfected a line of combination potential and current single-phase metering transformers.

Fig. 1 shows an external view of one of these transformers. Figs. 2 and 3 show sectional and top views. Both elements are mounted within homogeneous light gray cast-iron cases, which have received two coats of flexible black enamel baked on. All the cases have lugs and hangers for standard crossarm mounting.

The elements are entirely immersed in oil for cooling and insulating. The coils are form-wound with double-cotton-covered wire, each layer properly spaced for the operating voltage with treated varnish cloth of Packard make. Top turns of the coils are reinforced with flexible mica pads wound in between coil layers, to give additional insulation to protect against line surges which may be caused by high-tension switching or lightning. The cores are made of silicon alloy steel of double cruciform section which gives 16 oil-circulation ducts between coils and core.

Fig. 1.—Packed Combination Metering Transformer.

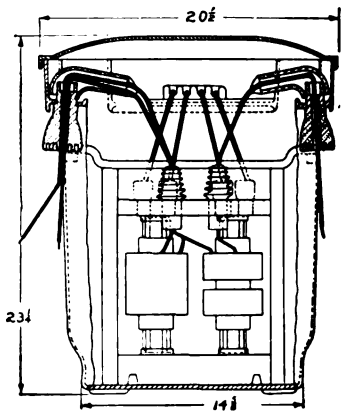


Fig. 2.—Sectional Elevation of Metering Transformer.

The terminals of the high-voltage coils are carried through the case in specially designed triple-petticoat two-piece porcelain bushings. The bell-shaped part of the bushing extends from the case and affords ample mechanical strength and sufficient leakage surface to protect the leads from ground even during the most severe weather conditions. The protector part covers the leads inside the case and removes all possibility of the leads being shoved back against the case cover. The terminal construction is shown in Fig. 4.

For single-phase metering one transformer is required and for polyphase work two transformers connected on the high-voltage side in standard open delta or V. The capacity of the potential element on stock transformers is 50 watts and 30 watts on the current element.

The secondary voltage is 110 volts and the current five amperes at full load. This permits the use of standard five-ampere 110-volt watt-hour meters with multiplying

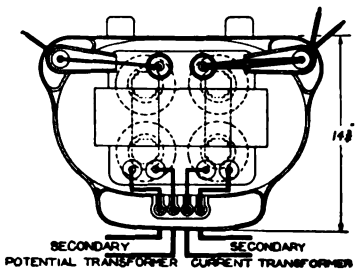


Fig. 3.—Inside Top View of Transformer.

Fig. 4.—Terminal Construction.

constant. The watt-hour meter may be mounted at an accessible and convenient point in a small weatherproof cabinet and the secondary leads of the transformer carried to it. To facilitate reading of the instruments, a 10-watt 110-volt lamp may be installed in the meter cabinet and operated from the potential wires.

Women conductors are employed on the electric street cars of many English cities.

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The Hartford Electric Brake for Automobiles.

The safety movement now sweeping over the country has been productive of many devices for minimizing danger and safeguarding lives and limbs. With respect to the automobile, however, no very striking safety methods or devices have come into use to reduce the number of fatal or serious accidents which from time to time arouse public agitation and bring about the enactment of restrictive measures.

It is therefore a pleasure to record the successful development of an automobile safety device of great possibilities, and particularly since it is electrical. This device is the electric brake invented by Edward V. Hartford as the result of several years of study and experimentation. This study was undertaken to devise an electric brake that would replace the air brake on railroads and the perfected E. V. Hartford brake is fully capable of doing so with a much lighter equipment than the air brake. However, during the development work it was realized that the automobile presented a field that was much more in need of an efficient, powerful and progressively acting brake than even the high-speed railroad. Through ingenious means this brake was therefore adapted

Fig. 1.—Simple Controller for Hartford Electric Brake.

for automobile service. The striking demonstrations made at its first public exhibition at the recent New York Automobile Show have aroused the motorcar industry and shown the extraordinary effectiveness of the brake as a safety device.

The necessary equipment consists of but few elements and weighs complete only about 35 pounds. It comprises a controller mounted on or immediately adjoining the steering-wheel stem, a small high-speed series motor, reduction gearing between the motor and a drum, a steel cable that winds up on the drum and puts tension on the brake beam or equalizing bar and thereby tightens the brake bands on their drums. The entire equipment can be applied in a few hours to any automobile provided with a storage battery and generator, and this is now true of a large percentage of cars due to the advantages of electric starting and lighting.

The principle of the E. V. Hartford electric brake is the application of an exceptionally large torque upon the drum that winds the steel cable and thereby produces extraordinary pressure upon the brake bands, which are fitted with a unique oiling arrangement to give a progressive

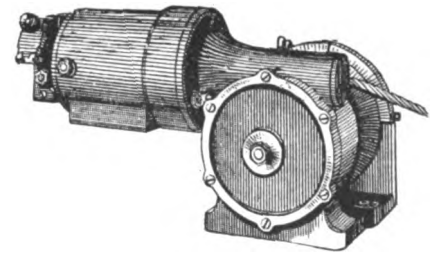

Fig. 2.—Motor, Reduction Gear and Brake-Cable Drum.

braking effect and thus prevent the locking of the wheels with its resultant dangerous skidding or even overturning of the car and the heavy tire wear due to sliding on the pavement after the wheels are locked. This braking action takes place with extreme rapidity and with such power that it is possible to stop a car traveling at 50 miles an hour within 45 to 50 feet.

Power for operating the brake is obtained from the storage battery of the car, whether this be 6, 12 or 24 volts or other voltage, the motor being wound for this voltage; current is taken from the battery for only the short interval while the brake is being applied and again while it is being released. The controller, shown in Fig. 1, governs the motor and therefore the brake; it can be moved by a finger. The first "on" position gives the normal or regular service application of the brake; pulling the controller to the second or extreme "on" point gives an emergency stop. To release the brake, it is necessary merely to push the controller back to "off" position. It is very easy to learn to operate this simple control.

The motor is a very small reversing series motor capable of running at 10,000 revolutions a minute without load. Its armature drives a worm that engages a worm wheel below it and the latter through internal gears drives the adjoining drum for winding the cable, the speed reduction being 400 to 1. The compactness of this part of the apparatus is evident from Fig. 2. Its method of installation is shown in Fig. 3.

Under load the motor can apply 1,000 pounds pull; excess pull above this is prevented by a slipping clutch and a ratchet prevents the brake from slipping off. Into the connecting rods which run from the equalizing bar to the brake bands there are introduced heavy springs; these

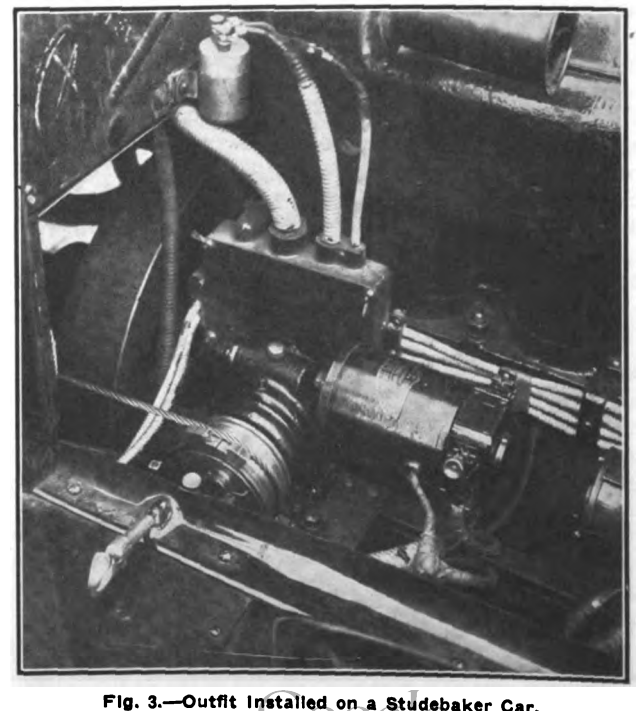

Fig. 3.—Outfit Installed on a Studebaker Car.

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serve to smooth the braking action and help to make it more progressive.

A distinctive feature of this brake is that the brake bands and drums are purposely lubricated, which is in striking contrast to all other brakes. A lubricating cup on top of the brake band is fitted with a small poppet valve, the stem of which extends far enough down so that on every application of the brake it lifts the valve and allows a little oil and graphite to be distributed on the drum, thus lubricating it in direct proportion to use. This film of oil combined with the great pressure insures the automatic progressive action of the brake, because it is impossible to suddenly lock the wheels. This cannot occur until the oil is all squeezed out and redistributed. The action is so carefully designed, however, that the friction between brake drums and bands never exceeds the friction between the wheels and road until the momentum of the car is almost entirely dissipated. The film of oil also serves to perfectly equalize the pressure between the wheels.

On account of the smooth application of the brake and the absence of locking of the wheels at each braking, the heavy wear on the rear tires, due to this, is practically eliminated and it is said that the life of these tires has been found to be doubled, a great saving in maintenance cost of the car. This, together with the positive and very rapid action of the brake when needed, makes the E. V. Hartford electric brake worthy of earnest consideration by every motorist.

Although in the above the use of this brake has been described only as applied to automobiles, it has also been applied very successfully to electric and steam railroads. It is manufactured by the Hartford Suspension Company, 143-9 Morgan Street, Jersey City, N. J.

Electrolytic Process for Preventing Corrosion.

At the December meeting of the Faraday Society, in London, there was a general discussion on the corrosion of metals.

At the conclusion of the discussion Elliott Cumberland gave a demonstration of his electrolytic process for preventing corrosion of all metals immersed in liquids. The method consists of introducing a higher counter electromotive force than that causing the corrosive action, and has achieved success in practical working conditions, and proved itself to be the only effective method of overcoming the dezincification of condenser tubes. Continuous current is supplied by a dynamo, working at 10 volts, to pieces of iron suspended in the liquid and suitably insulated from the vessel being protected. All agents to corrosion are transferred from the structure to the inserted iron, which is connected as anode, and any detrimental differences of potential are overcome. The structure is protected at the expense of these iron anodes, which are designed to last from eighteen months to two years. The cost of current is very small.

For many years this system has been used in all types of steamships, and many large power plants on shore, and has proved successful in severe cases where other methods had failed. The regular working of this electrolytic system also has a remarkable effect in removing hard scale from heating surfaces, etc., and preventing its further formation. The system may be applied to all types of steam boilers, economizers, feed-water heaters, tanks, propellers, and stern frames of ships; in fact all metals immersed in, or in contact with, water or other corrosive metals.

The amount of zinc necessary for the protection of the internal surfaces of steam boilers is stated to be as 1 square foot of zinc to 50 square feet of heating surface.

Motor-Driven Gyratory Foundry Riddle.

The cost of labor is the largest item in the making of castings, and the device described and illustrated herewith materially reduces this cost. It is a unique foundry riddle and operates on the gyratory principle. The motion of the riddle is obtained by the inertia effect of an unbalanced flywheel, which causes every part to gyrate. This motion is unusually well adapted to sifting sand, since the energy is not wasted in throwing the sand against the ends of the compartment, as is done in a reciprocating type. Each particle of sand travels around in a circle, so that the small particles reach the sieve in the shortest possible time, and the sifting takes place with great rapidity.

The outfit complete weighs only about 90 pounds, and so can be easily moved from place to place, as it is needed. The riddle is particularly useful when suspended from a trolley running on a cable stretched parallel with the line of molders in the foundry. Owing to its design there are no obstructions in the way of a shovel, and being supported

Electrically Driven Gyratory Foundry Riddle.

from above a wheelbarrow can be run under the riddle for receiving the sand.

The riddle is operated by a Westinghouse totally inclosed one-sixth-horsepower, vertical motor, made especially for the Great Western Manufacturing Company, Leavenworth, Kan., which manufacture the outfit. As the total power is obtained from the unbalanced effect of the flywheel, the horsepower to drive the riddle is very low, and a cord and plug fitting any lamp socket is furnished with the motor, so that no special wiring is necessary for the installation of this machine. The motor has a ball thrust bearing, and only three bearings are used in the drive.

The sieve is 20 inches in diameter, and with this size the riddle will do the work of ten men sifting sand by hand. In fact, the sifting is done so quickly that it will riddle faster that one man can shovel in the sand. As the sieve does not have to be connected to the motor by connecting rods, etc., it can be easily and quickly removed for dumping.

The machine mixes as well as sifts, so that one turning of the sand is eliminated and not only is the time of making the mold reduced, but a better mold is insured.

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Self-Contained Electric Washing and Drying Machine.

An entirely new departure in electrically driven washing machines for the home has just been placed on the market by the Home Specialty Manufacturing Company, 1051 Power Avenue, Cleveland, O. This machine not only washes the clothes, but also dries them in the same tub without the housewife or laundress having to handle the clothes or put her hands in the hot soapy water.

The machine consists of two tubs, both of sheet copper tinned on the inside to prevent corroding. The outside tub, which is double seamed and soldered to prevent leaking, serves as a container for the washing solution, while the inside tub holds the clothes in position so that the vacuum cups or plungers cover all of the clothes in the tub. While these cups are working up and down, the inside tub is slowly revolving, assuring that every piece of material in the tub is thoroughly saturated and cleansed by the washing solution.

A particular feature in this connection is that the inner tub, which is perforated and sets about one inch above the outside tub, permits the washing solution to be forced through the meshes of the clothes instead of against the solid bottom.

The main feature of the machine, however, is the drying, as no wringer either power or hand-operated is used. The method employed has been in successful operation in all modern laundries for some time on a larger scale, machines known as extractors being used in these places.

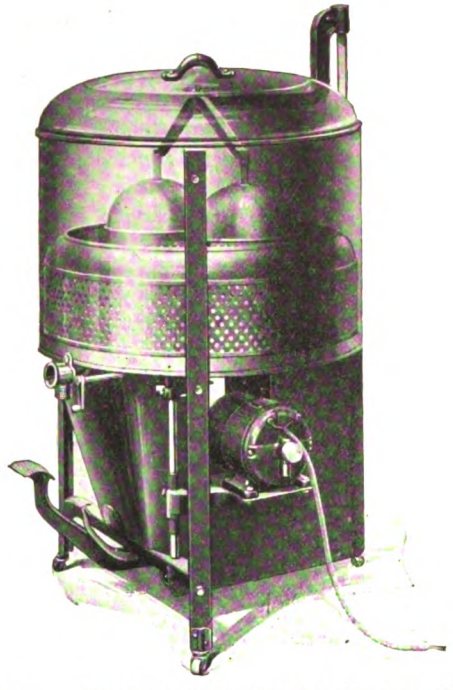
It requires from 10 to 15 minutes to thoroughly wash a tub of clothes, after which the vacuum cups are removed and the inner tub, which is perforated on the sides and bottom, is raised above the water to the drying position. It is then revolved rapidly, the perforations permitting the water to be forced out of the inside tub into the outer tub. An entire tub of clothes can be dried in this way in 30 seconds drier than they could possibly be wrung with a wringer. When the weather will not permit of clothes being hung outside the average flat work can be dried sufficiently in from 5 to 10 minutes to place on the ironing board.

The operation of this machine, both for washing and drying, is exceedingly simple. The inside tub is immersed in the water or raised out of the water by means of a foot lever, which locks in either position and when raised or lowered automatically connects or disconnects the washing or drying mechanism. The machine is friction-driven, one lever controlling the drive for either the washing or drying process. For this reason a one-eighth-horsepower motor is all that is required to operate the machine, and on account of the friction drive, all danger of overloading the motor is eliminated.

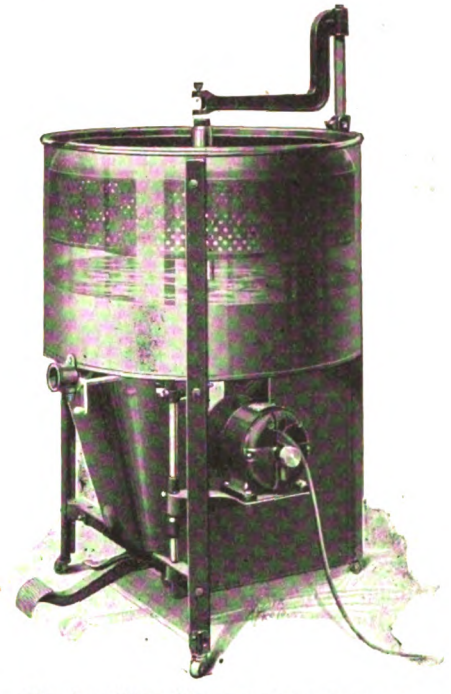
The machine is so constructed that the shaft which drives the vacuum cups while washing, or the inside tub when drying, can be stalled without doing any damage to either the motor or the machine.

All of the working parts are protected by a sheet-metal guard and the motor is completely insulated from the metal parts of the machine. The lubrication is taken care of by wicks, which require only ordinary lubricating oil and when saturated do not require re-oiling for a considerable period.

General View of Electrically Driven Combined Washing and Drying Machine.



Phantom View Showing Vacuum Cups and Inside Tub in Washing Position.



Phantom View, Vacuum Cups Removed and Inside Tub in Drying Position.

New Metal-Vapor Lamp Invented by Nernst.

A paragraph in a recent issue of *Elektricität*, of Berlin, Germany, states that Professor Nernst, of Nernst-lamp fame, has patented a new vapor lamp, in which the vapor from metals is employed. Zinc chloride and zinc bromide have been used and give the best results at atmospheric pressure. As in the mercury-vapor arc, the inclusion of air or other foreign gases in the tube is prejudicial. On the other hand, an arc in an atmosphere of aluminium chloride or titanium chloride is more stable, and an admixture of nitrogen is harmless. Oxygen, however, must be excluded. It is stated that the color of the light is white, and that the efficiency is in the neighborhood of that of the mercury-vapor lamp.

Wireless for River Barges.—Wireless apparatus will be installed on each of the 36 power barges which the Inland Navigation Company has begun to construct in Jeffersonville at the Howard Shipyards, the first to be delivered on February 1. Each of the barges, which will ply the Mississippi and Ohio Rivers, will be equipped and there will be wireless stations equipped at points along the rivers, to enable the boats to keep in touch with headquarters. Marconi wireless equipment will be used.

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Simple Device for Hanging Electric Fixtures.

In case of straight electric fixtures, it has been the custom to require that they be supported from wooden blocks secured to the lath or joists or by other suitable approved fittings. The use of the wooden block arrangement involves considerable time and labor for its installation. To overcome these disadvantages of the old methods there has recently been placed on the market an approved form of fixture support known as the "Elandee fixture attachment." This consists of two superposed iron bars, of which the upper one is slightly arched and to its arched

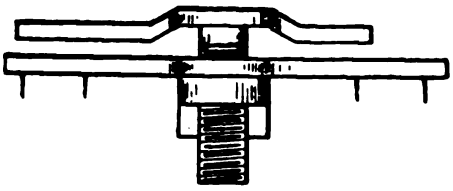

Fig. 1.—Elandee Fixture Attachment.

portion is attached the fixture stud. The lower bar is somewhat longer and has a hole in the middle through which the fixture stud passes. A wing nut is provided for securing the two bars together at any desired angle. The general arrangement of the device is shown in Fig. 1.

In Figs. 2 to 4 is shown the method of installation, which is very simple and very quickly accomplished. The wing nut is sufficiently tightened to temporarily fasten the two bars together parallel and directly over each other. The device is then inserted through the hole in the ceiling as shown in Fig. 2. As soon as the lower ends of the

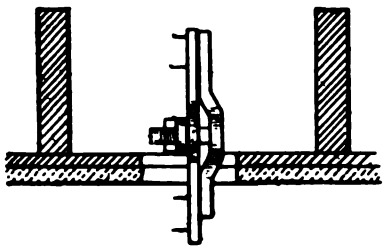

Fig. 2.—Method of Installing.

bars have cleared the lath sufficiently, the attachment is tipped into a flat position upon the inner surface of the ceiling. The stud, which now projects down through the hole, is grasped and both the bars while still parallel to each other are swung about in a circle to determine the proximity of the nearest joist. Should the hole be near the middle of the space between two joists, then the bars will swing clear and strike neither joist. By loosening the wing nut, the bars are loosened and swung so as to be approximately at right angles to each other and so as to lie over the lath at an angle of about 45 degrees

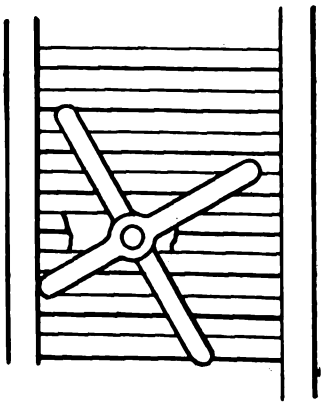

Fig. 3.—Top View of Device Installed.

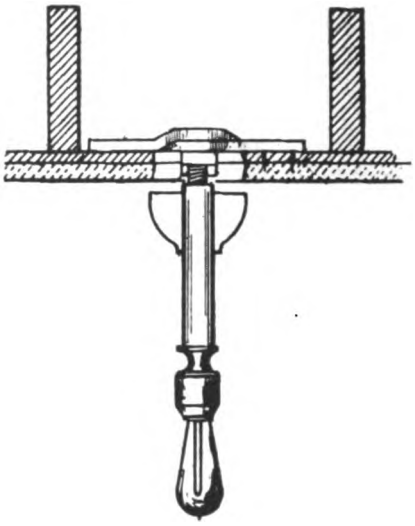

Fig. 4.—Sectional Elevation of Ceiling With Device in Place.

therewith. The lower bar is provided with a number of prongs, which on tightening the wing nut sink into the lath or plaster and serve to anchor this bar so it cannot turn. The manner in which the bars overlap the plaster is shown in the top view, Fig. 3. From this it will be seen that the bars serve to spread the weight of the fixture over a large area of the ceiling and cause some half-dozen or more lath to bear this weight. Fig. 4 shows the section of the ceiling after the bars have been tightened in place and the fixture and canopy secured to the fixture stud.

The device is very strongly made and as indicated in the foregoing is the means of saving much time and labor in the mountnig of fixtures. Although in the foregoing the attachment has been described as used for supporting fixtures from the ceiling, it also can be used as advantageously for mounting electric fixtures on sidewalls, in all cases where the construction provides hollow ceilings or walls.

This device is patented and has been approved by Underwriters' Laboratories. It has also met the hearty approval of a large number of contractors who have appreciated its advantages. It is manufactured by the Elandee Construction Company, 4305 North Lawndale Avenue, Chicago, Ill.

Combined Door and Exchange Telephone for Apartment Houses.

The use of telephones in place of speaking tubes is becoming more general in large apartment houses as a means of communicating between the entrance vestibule and any apartment. Heretofore it has been necessary to provide a special telephone instrument for the purpose which was entirely distinct from the telephone used for connection with the city telephone exchange.

At a recent hearing on telephone matters before the Massachusetts Public Service Commission reference was made to service under a "dual system," under which a Western Electric vestibule set is installed in an apartment house, in each suite of which a common-battery substation telephone is installed. Calls from the front entrance ring on an ordinary vibrating bell, and the tenants answer by throwing a cam switch key into a certain position. If a call comes from the city exchange or long distance, it rings on the regular telephone bell and the key is thrown into the other position. By the use of a cam key on each suite telephone, connection may therefore be made for inside or outside service and only one telephone is required in each suite.

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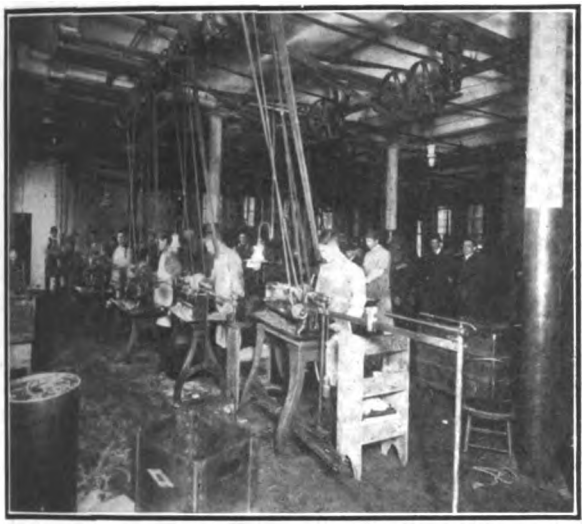
Chicago Fiber Factory Has Unusual Manufacturing Facilities.

A few months ago the major consideration of the buyer related in the main to price, with delivery and quality as general considerations. Since retrenchment policies have been waning the question of delivery has become more important and in some lines of trade the buyer now has difficulty in securing prompt and efficient service. Organized to meet this demand is the Diamond State Fibre Company, 629 West Washington



View in Chicago Factory of Diamond State Fibre Company.

Street, Chicago, Ill., dealer in fiber sheets, rods and tubes and insulating papers.

This company, which has its main factory in Bridgeport, Pa., is the only manufacturer of vulcanized-fiber specialties with a factory in the Chicago district. In conjunction with the factory the company maintains a stock room which contains one of the largest and most complete assortments of

View in Chicago Stock Room, Diamond State Fibre Company.

sheets, rods and special shapes in the West. The facilities of the factory make it possible for the company to make shipments from stock promptly and to manufacture any variety of special shapes for quick delivery.

In the factory there are seven semi-automatic lathes ranging in size from the small speed lathe to a 13-inch by 72-inch engine lathe and because of several large contracts the company is planning the installation of several more lathes if they can be secured immediately. These lathes are engaged in the manufacture of special shapes, two of them being used solely for making the threads on fiber tubes for refillable fuses, the output being 3,600 a day. Included in the shipment are two multiplex drilling machines, two punches, milling machine, shaper and several saws and grinders. These machines are all electrically driven from main shafting.

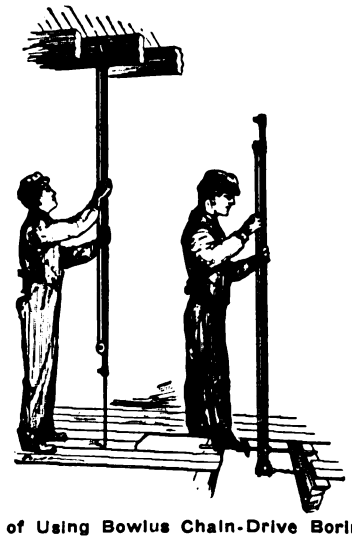
A rod-making machine, said to be the only one in Chicago, enables the company to manufacture large amounts of any particular size of rod up to two inches in diameter. Though manufactured to size accurately, fiber rods increase in volume within a short time depending upon atmospheric conditions. Inaccuracy or delay is thereby caused in making special shapes, such as bushings, and for this reason the rod-making machine is indispensable for accurate and special work.

Theodore Herkert, assisted by W. G. Peacock, is in charge of the Chicago office of the Diamond State Fibre Company. The company is pleased with present business conditions and is very optimistic concerning the future.

Bowlus Chain-Drive Boring Machine.

Electricians have found that where wires are to be run concealed in walls, floors or ceilings, particularly on the knob-and-tube system, the boring of the large number of holes required in the joists or studding takes considerable time and effort. Various types of boring outfits have been devised and among them some that are chain-driven. Almost invariably, however, the latter have been heavy and clumsy to handle.

In a new type of chain-driven boring outfit made by the Bowlus Manufacturing Company, Springfield, O., this



Two Methods of Using Bowlus Chain-Drive Boring Machine.

disadvantage has been overcome. This machine is strongly yet compactly built and weighs but 16 pounds. It is therefore easily carried and also easily manipulated in use.

Two methods of using the machine are shown in the accompanying cut. For boring holes in joists in the ceiling above or in studs in the upper part of the room, a steel extension rod which telescopes into the wrought-iron tubing that forms the backbone of the set is adjusted and clamped to bring the boring head to the point desired. This permits adjustment of height from 7 to 11 feet. The upper sprocket wheel has an outer bearing that serves to keep the axis of the bit at right angles to the chain and tubing.

Where it is possible to get at the joists from the floor above, as in new buildings before the floor is laid or in wiring old buildings where a few floor boards are taken up, the workman can use the machine even more advantageously than when he drills above his head. A cross bar with foot pedal is attached to the tube to support the outfit on the joists. The foot can now be used to start the bit.

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INDUSTRY ACTIVITIES

The Roller-Smith Company, manufacturer of electrical appliances, is building a $30,000 addition to its plant at Bethlehem, Pa., according to reports.

The Metropolitan Electric Company recently opened for business in the Security Building, Seattle, Wash., and is manufacturing switches, switchboards, panels, cabinets, etc.

Roth Brothers & Company, Chicago, Ill., manufacturers of Rothmotors, have recently issued Bulletin No. 204 which illustrates and describes a line of motors designed for use in clothing factories.

Hamilton & Hansell, 17 Battery Place, New York, N. Y., exclusive agents in the United States for the Rennerfelt electric furnace, have secured C. H. Von Baur to take charge of their sales department.

The Roessler & Hasslacher Chemical Company, 100 William Street, New York City, general chemical manufacturers, have recently issued a price list, indications of recent price changes being given.

The Westinghouse Lamp Company is planning for the erection of a four-story addition to its plant in the Watsessing district, Bloomfield, N. J. Westinghouse, Church, Kerr & Company, New York, are the engineers.

The Sundh Electric Company, New York City, is distributing as additions to its catalog a number of sheets describing and pricing magnet-operated switches and motor self-starters manufactured by the company.

Harvey Hubbell, Incorporated, Bridgeport, Conn., is distributing some new loose-leaf bulletin inserts for its catalog No. 15. One of these deals with composition current taps with side-plug and side-wire outlets. Another deals with Hubbell direct-threading shade-holders of the three-screw and locking-spring types.

J. P. Mentzer & Company, Chicago, manufacturer of the Dry Storage Battery, has prepared a neat folder which simulates in size and shape the battery itself. The folder sets forth a description of the construction of the battery, claims for its output, directions for use, and a list of the many applications of the dry storage battery.

Thomas & Betts Company, 105 Hudson Street New York City, in its catalog No. 26 lists and illustrates its large assortment of conduit fittings and electrical specialties. Among these are steel and cast-iron conduit boxes, covers and special conduit fittings, couplings, elbows, tees, bushings, clamps, fixture studs, straps, etc. The catalog is in convenient loose-leaf form.

The Anglo-American Export Company, Ltd., of London, has established a branch office in New York City. The company acts as export representative for a number of large French and German manufacturers and has connections in many foreign countries including Central and South America, South Africa, Australia and New Zealand. Agencies for American manufacturers are being secured.

The Globe Stove & Range Company, Kokomo, Ind., recently has issued for general distribution a series of four folders, describing the electric ranges manufactured by the company. The subject matter of each folder is called "Talking Points on Globe Electrics" and is arranged for the use of salesmen in presenting a sales proposition to central station customers. A complete description of the product is presented in a very concise and commendable manner.

The Chelten Electric Company, Philadelphia, Pa., manufacturer of electrical snap switches and other appliances, is distributing to the trade a very unique form of desk blotter. It consists of a Chelten flush type snap switch, with switching mechanism, mounted on a half-round plate to which a blotter is attached. The positive operation and details of the switching mechanism can easily be seen, as well as the appearance of the exterior of the switch. The blotter is a clever and valuable advertisement for Chelten products and will be an ornament on any desk.

The Western Electric Company points out as an indication of the return of prosperity the increased amount of equipment purchased by the railroads. As an illustration of this fact and of the tendency toward the purchase of most modern apparatus the company reports sales to the Pennsylvania Railroad of telephonic train-dispatching equipment for five of the large eastern divisions of the company. This installation will add to similar apparatus now in successful operation and is regarded as a step toward the complete equipment of all divisions.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., reports that during the month of December, 1915, its automobile equipment works produced 200 per cent more equipment than in the corresponding month of the previous year. This production was also 30 per cent in excess of that of November, 1915. Anticipating continued increase in production, the company has made provision to meet the continued increase of 25 per cent each month for the succeeding several months. Contracts for automobile equipment have recently been closed with the Gerlinger Motor Car Company, Portland, Ore.; the Martin Carriage Company, York, Pa., and the Stegeman Motor Car Company, Milwaukee, Wis.

The Lux Manufacturing Company, Hoboken, N. J., announces the appointment of R. A. Berrenberg, formerly advertising manager, as general sales manager. Mr. Berrenberg has been in the incandescent lamp business over twenty years. He learned the trade under the supervision of his father, Adolf Berrenberg, one of the pioneers of the lamp business, who at one time was foreman in the General Electric Company's lamp works and who has been attached in various positions to some of the largest European lamp concerns. R. A. Berrenberg was born in Boston, Mass., and graduated from Harvard Law School. Combining technical and commercial abilities, Mr. Berrenberg has been able to make good progress with the Lux Manufacturing Company. He has been its advertising manager for some time and developed a new sales organization which is a valuable asset to the company.

The Exide Battery Depots, Inc.—During Automobile Week in New York City a convention of "Exide" service station men was held at the Hotel Imperial. Eighty-five delegates attended, all being from the territory covered by the New York Exide Depots, Inc. The sessions were instructive and permitted a free discussion of many points of interest to the visiting distributors. Addresses were made by Chairman C. H. Mark, who is in charge of the districts represented; by W. H. Palmer, auto-starting and lighting engineer; C. H. Reed, manager of the advertising department of the Electric Storage Battery Company, and by Charles Blizard, third vice-president and manager of the sales department of the same company. The convention was terminated with a banquet attended by nearly 100 of the distributors and members of the sales forces of the New York offices of the Electric Storage Battery Company and the Exide Battery Depots, Inc.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless.—Trenton Electric and Conduit Company, Trenton, N. J.

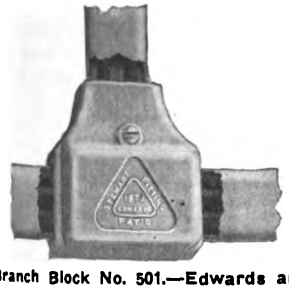
Non-separable attachment plug. Trenton, 660 watt, 250 volts, catalog No. 150.

Listed December 1, 1915.

BATTERY-CHARGING EQUIPMENT.—The Lincoln Electric Company, East Thirty-eighth Street and Kelley Avenue, Cleveland, O.

Lincoln electric charger, consisting of a motor-generator and a control cabinet containing a field regulator and a special starting switch, permitting starting of machine from battery before connecting single-phase motor to line. Alternating-current and direct-current circuits between generator and cabinet are separately inclosed in flexible steel conduit.

Standard when installed in a manner and in a location in accordance with requirements of inspection department having jurisdiction.



Branch Block No. 501.—Edwards and Company.

Listed December 24, 1915.

CONDUIT BOXES.—The Adapti Manufacturing Company, 919 West Street, Cleveland, O.

Pressed-steel and cast-iron conduit boxes.

For use with rigid conduit, catalog Nos. 2901-03 inclusive, 3001-09 inclusive, 3000-T, 3001-T, 3101-09 inclusive, 3100-T, 3101-T, 3150-54 inclusive, 3170-79 inclusive, 3301-09 inclusive, 3300-T, 3301-T, 3350-54 inclusive, 3401-09 inclusive, 3400-T, 3401-T, 3450-54 inclusive, 3501-09 inclusive, 3500-T, 3501-T, 3550-54 inclusive, 3601-09 inclusive, 3701-09 inclusive, 3801-09 inclusive, 3901-09 inclusive, 4001-09 inclusive, 4101-09 inclusive, 4201-09 inclusive, 4200-T, 4201-T, 4250-54 inclusive, 4301-09 inclusive, 4400-09 inclusive, 4500-09 inclusive, 4600-09 inclusive, 4700-09 inclusive, 4800-09 inclusive, 4900-09 inclusive, 5000-09 inclusive, 5110-98 inclusive, 5201-89 inclusive, 5301-89 inclusive, 6100, 6101, 6100-T, 6101-T, 6200, 6201, 6200-T, 6201-T, 6300, 6301, 6300-T, 6301-T, 6400, 6401, 6400-T, 6401-T, 0108-L, 0109-L, 0113, 0113-L, 32710-19 inclusive, 33710-19 inclusive, 34710-19 inclusive.

Box extension, catalog No. 498.

For use with flexible tubing, with or without clamps, catalog Nos. 0228, 0240, 0250, 0261, 0263.

Conduit-box covers, catalog Nos. 1, 2, 4-12 inclusive, 15, 20-24 inclusive, 45, 81, 84, 85.

Adapter plate, catalog No. 25.

Listed November 22, 1915.

CUTOUT BASES, Cartridge Fuse.—The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Slate-base cutouts for N. E. Code inclosed fuses, 250 and 600 volts, catalog Nos. 631-34 inclusive.

Listed December 6, 1915.

FIXTURES.—Stanley and Patterson, submittor, 23 Murray Street, New York, N. Y. Manufactured by Savage Novelty Company, Incorporated, 2 Rector Street, New York, New York.

Patterson Electric Sign Fixture consisting of a base or tray containing special receptacles for 10-watt incandescent lamps covered with individual glass and metal lanterns, and provided with armored cord for connection to ordinary lighting circuits; 125 volts.

Standard for indoor use only.

Listed December 23, 1915.

FUSES, Cartridge Inclosed.—Thomas and Betts Company, 105 Hudson Street, New York, N. Y.

Cartridge inclosed fuses.

T. & B. 0-200 amperes, 250 volts; 0-100 amperes, 600 volts.

Listed November 23, 1915.

LAMP GUARDS.—Flexible Steel Lacing Company, 522 South Clinton Street, Chicago, Ill.

Lamp guards made of tinned, expanded metal in plain and locking types. Flexco-Lok.

Listed December 7, 1915.

MOLDING FITTINGS.—Edwards and Company, Exterior and 140th Streets, New York, N. Y.

Metal molding fittings.

Branch splicing block for use with metal molding, catalog Nos. 501-02.

Listed December 1, 1915.

OUTLET BUSHINGS AND FITTINGS—Armored Cord Fittings.—Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York, N. Y.

Brass or steel fittings for use in connecting armored cord to standard box covers, rosettes, attachment plugs and sockets. Catalog Nos. 6111, 6121.

Listed December 3, 1915.

PANELBOARDS.—Electro Dental Manufacturing Company, Thirty-third and Arch Streets, Philadelphia, Pa.

A dental switchboard equipped with inclosed cartridge fuses, flush switches and variable and fixed rheostats for control of full voltage and low-voltage circuits for operation of dental appliances. Maximum rating 15 amperes, 110 volts.

Listed December 6, 1915.

PANELBOARDS.—Metropolitan Engineering Company, 1250 Atlantic Avenue, Brooklyn, N. Y.

M. E. Co. panelboard; a steel base on which are mounted a three-pole, 100-ampere, 125-250 volt fused switch and a series of porcelain-incased two-pole branch-circuit switches having hinged fronts and special clips which form switch blades and receive cartridge-inclosed fuses, together with mica-insulated busbars in an upright channel. Maximum capacity, 96 amperes, 125 volts, catalog No. 1005.

Listed December 6, 1915.

Transformer.—Thordarson Electric Manufacturing Company.

RHEOSTATS. — Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Battery-charging, bulletin No. 11415.

Listed December 9, 1915.

SWITCHES, Surface Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. (With metal covers.)

Heater switches.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2637-38.

Series-multiple, 10 amperes, 250 volts, 20 amperes, 125 volts, catalog Nos. 2619-20, 2635-38.

Listed December 6, 1915.

TRANSFORMERS.—Thordarson Electric Manufacturing Company, 501 South Jefferson Street, Chicago, Ill.

Air-cooled transformers with sheet-metal cases. Primary 110 to 220 volts, secondary 11 to 40 volts, capacities 100 watts to 1,000 watts inclusive.

Standard only when installed and wired in both primary and secondary circuits in accord with rules for Class C wiring of National Electrical Code.

Listed December 8, 1915.

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CURRENT ELECTRICAL NEWS

ATLANTIC STATES.

GARDINER, ME.—A transmission line between this city and Bath will be constructed in the spring by the Central Maine Power Company. The right of way is now being secured by W. B. Getchell, engineer.

HAVERHILL, MASS.—Plans to extend the white way meet with the approval of Mayor Bartlett.

NORWICH, CONN.—The Westerly Light & Power Company will spend $25,000 for extensions and improvements.

SYRACUSE, N. Y.—The budget of the Bureau of Gas and Electricity, A. R. Acheson, superintendent, will carry an appropriation large enough to install a curb-standard lighting system in James Street from Dewitt Street to State Street.

TERRYVILLE, N. Y.—The Council is planning ways and means to install electric lights. P. E. Terry is interested.

PAULSBORO, N. J.—The City Council is making preparations to install an electric power plant.

MOUNT GRETNA, PA.—The Mt. Gretna Light & Power Company's plant has been sold to the Weimer Electric Company of Lebanon. Improvements will be made.

PHILADELPHIA, PA.—The Philadelphia Textile Machinery Company will erect a factory and power house. Plans are in progress by Day & Zimmerman, architects, Philadelphia.

PHILADELPHIA, PA.—A bill has been introduced into the Finance Committee of City Councils providing for $24,000 for a permanent illumination scheme for the city hall and adjacent territory. J. P. Gaffney is chairman of the committee.

CUMBERLAND, MD.—The city will vote on an issue of $25,000 bonds to be used for remodeling the electric light plant.

AUGUSTA, GA. — An ornamental lighting system will probably be installed on Broad Street from Center to McKinne Streets.

WOOLAND, GA.—The city will install gasoline-driven electric light plant at an expense of about $2,000.

DALTON, GA.—The city's electric lighting plant is to be improved. P. B. Trammel is chairman of the commission.

NORTH CENTRAL STATES.

NILES, O.—The Mahoning Valley Railway Company expects to start building a duplicate transmission line from Youngstown to the Niles substation within the next few weeks. The line extends to Girard.

COLUMBUS, IND.—Plans are being prepared for a new electric plant and a special council meeting will be called soon to consider them. The estimated cost of the proposed plant runs from $15,000 to $20,000. E. N. Dean is city clerk.

CLINTON, IND. — The Sullivan County Electric Company has increased its capital to $150,000 and announced enlargements whereby it will furnish electric light, heat and power to Sullivan, Shelburn, Farmersburg, Jasonville, Hymera, Coalmont and other cities and towns.

MARENGO, IND.—The electric light plant and pumping station of the Marengo waterworks was destroyed by fire recently. The plant probably will be rebuilt.

CEDARVILLE, ILL.—The Cedarville Light & Power Company is being organized by Clinton Fink and others.

JACKSONVILLE, ILL.—The Council plans to issue $75,000 in bonds to enlarge the water and light plant and to establish a municipal heating plant.

MATTOON, ILL.—At the April election the question of issuing $25,000 in bonds to improve the water system and establish an electric light plant will be submitted to vote.

SULLIVAN, ILL.—Bids will be advertised for the construction of the proposed municipal light plant, though the injunction filed by Irving Shuman is still in force, under a restraining order. Members of the council, it is said, will open all bids some time within the next three weeks and when a bid is accepted will start spending the money, paying no attention to the injunction proceedings.

EAST TAWAS, MICH.—The Council has ordered that the proposition of selling the municipal electric lighting plant to the Consumers' Company be submitted to the voters February 1.

IRONTON, MICH.—F. H. Josslyn of Oshkosh, Wis., is planning to furnish mines in this vicinity with electric power from an hydroelectric plant which he intends to develop at Park Falls, Wis.

PETOSKEY, MICH.—An election will be held February 14 to decide the question of issuing $35,000 in bonds to purchase the power plant of the W. L. McManus Lumber Company. The plant will be used in connection with the city power and light plant.

BRANDON, MINN.—An electric light plant may be installed here. A. J. Christenson is interested.

COLOGNE, MINN.—The city is planning to install an electric light system.

HIBING, MINN.—The city probably will make extensive repairs to the present light plant or will erect a new one.

SPRINGFIELD, MINN.—The A. C. Ochs Brick & Tile Company will install motors to drive all machinery in the new plant here. The company will have its own power plant, generating 300 horsepower.

WAUSAU, WIS.—The Wisconsin Valley Electric Company has increased its capital stock to $800,000 and the sale of $200,000 stock has been authorized. Work on an extension from Merrill and southward to Mosinee will begin at once.

CLARION, IOWA.—Elston, Clifford & Company of Chicago have purchased the electric light plant at this place.

MARSHALLTOWN, IOWA.—The Iowa Railway & Light Company has been granted franchises to furnish power for street lighting and for private use in the towns of Clemons, McCallsburg and Zearing.

MASON, IOWA.—The People's Gas & Electric Company will spend $15,000 for improvements.

SIOUX CITY, IOWA.—The Sioux City Gas & Electric Company will spend about $8,000 in erection of lines in Riverside. L. L. Kellogg is president.

CRANE, MO.—G. O. McFarlane and J. H. Wilson of St. Louis are contemplating the installation of an electric light plant here.

HIGGINSVILLE, MO.—The question of issuing electric light bonds will be submitted to vote February 1.

JOPLIN, MO.—The Council plans to enlarge the present lighting plant or build a new one. Charles Patterson is commissioner.

POWERSITE, MO. — The Ozark Power and Water Company will petition the Pierce City Council for a franchise to furnish that place with power generated at the hydroelectric plant at Powersite. Pierce City is now supplied with electricity by a municipal lighting plant. C. E. White is general manager.

SPRINGFIELD, MO.—The Young Men's Christian Association is considering plans for the installation of an independent electric light plant.

HUTCHINSON, KANS. — The stockholders of the Hutchinson Interurban Railway Company, Emerson Carey, president, have voted to spend 1915 earnings for rebuilding and additions to the line.

NORTON, KANS. — The present electric light plant is too small for the present demand, and another unit will be added.

OLATHE, KANS.—A resolution has been adopted to submit the proposition of a bond issue for the establishment of a municipal electric plant. The city will attempt to purchase the plant of the Olathe Electric Light & Power Company.

OTTAWA, KANS.—The City Commissioners are considering the matter of a proposed white way for Ottawa. The city water and light department has been instructed to draw up plans, estimates and specifications.

PLAINS, KANS.—Bonds have been voted for a lighting plant.

PONCA, NEB.—The Ponca Light & Power Company has been incorporated, with headquarters at Sioux City, Iowa, E. L. Snyder, president. The company will operate an electric light plant here.

SOUTH CENTRAL STATES.

LOUISA, KY.—The Sandy Valley Light & Power Company of Pikeville, Ky., will build a power plant here.

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MIDDLESBORO, KY.—City Commissioners are considering a plan for a municipal lighting company. The Kentucky Utilities Company has a $200,000 plant here.

MT. STERLING, KY.—The City Council has appointed R. G. Kern and W. B. White to confer with the Kentucky Utilities Company relative to supplying the city with service or construction of a plant here.

PIKEVILLE, KY.—The Sandy Valley Light & Power Company is to build a power station here.

PRINCETON, KY.—The Town Council has voted to accept the proposition of the Princeton Electric Light & Power Company to furnish power.

PROVIDENCE, KY.—The Clay Ice & Light Company, Clay, Ky., is negotiating with the City Council to furnish electric power.

MEMPHIS, TENN.—Officials of the Merchants' Power Company have inspected the property with a view to fixing a price on it under the contract by which it will pass into possession of the city.

FAIRHOPE, ALA.—Bonds have been voted for a water and lighting system.

MOULTON, ALA.—The Moulton Waterworks Company will soon establish an electric plant.

PASS CHRISTIAN, MISS.—The Council is planning to expend $7,000 for erecting ornamental electric light plant.

FT. SMITH, ARK.—Commissioner T. J. Hays is preparing plans for the acquirement of a municipal lighting plant.

NEW ORLEANS, LA.—The New Orleans Railway & Light Company is planning to install a street lighting system to cost $160,000.

CHANDLER, OKLA.—Johnson & Henderson will rebuild the electric light plant here if a new franchise is secured.

GOLTRY, OKLA.—Bonds have been voted for the installation of a 24-hour service electric light plant. Address town clerk.

AUSTIN, TEX.—The Texas Power Company of Dallas plans to build a large electric power station at Austin in addition to its other plants in the state. It will also extend its power transmission system to points south of Waco and Austin.

CORPUS CHRISTI, TEX.—The People's Light Company has sold its electric light and power plant to the Corpus Christi Light Company.

PLAINVIEW, TEX.—The Texas Utilities Company will place additional ornamental lamps.

SAN ANTONIO, TEX.—The San Antonio Traction Company has revived its project of constructing an interurban electric railway from San Antonio to Austin. Vorheis P. Brown of San Antonio is president.

WESTERN STATES.

BOZEMAN, MONT.—The installation of a special lighting system covering the entire city of Bozeman, and supplementing the recently installed cluster lights on Main Street, has been recommended by the City Council. The new system, it is estimated, will cost $85,428.24, and will include ornamental steel posts on either side of the street.

DENVER, COLO.—A skyline brilliant with electric-lighted flags is planned by a number of prominent citizens. The designs are being drawn by G. E. Williamson, sign expert for the Denver Gas & Electric Light Company. The plan includes all the public buildings and schools and provides for an electric flag for each. State and city officials will be asked to support the movement.

WELLSVILLE, UTAH.—The Wellsville city officials are negotiating with the Utah Light and Power Company for the sale of the city lighting system to that company.

CALDWELL, IDAHO.—The Caldwell Traction Company proposes to lease and electrify the Oregon Short Line branch to Wilder, Idaho.

EPHRATA, WASH.—The Council has been petitioned for permission to construct an electric power plant and erect transmission lines for furnishing power throughout the city by the Grant County Power Company.

NORTHPORT, WASH.—The Northport Smelting & Refining Company has purchased a power site near its smelter and will probably make the development in the near future.

PROSSER, WASH.—A committee has been appointed to investigate the feasibility and estimated cost of constructing a municipal lighting plant.

SPOKANE, WASH.—The City Council has been petitioned by property owners on Sprague Avenue for the installation of a curb lighting system. Morton MacCartney is city engineer.

VALLEYFORD, WASH.—The Valleyford Water Company has petitioned the County Commissioners, Spokane County, for permission to construct electric transmission lines in the town and township of Valleyford.

EUGENE, ORE.—An ornamental lighting system will soon be installed on Ninth Avenue.

PORTLAND, ORE.—The City Council has been petitioned for the erection of a cluster lighting system along First Street, from Jefferson to Burnside Streets.

PRAIRIE CITY, ORE.—Permits for development of 952 horsepower from the John Day River and Warm Springs, near Prairie City, were granted by State Engineer Lewis to the Prairie Power Company. The company proposes to extend a canal near Prairie City, construct a reservoir at Strawberry Lake and develop power for lighting Prairie City, Canyon City and John Day, at a cost of $45,000.

LOS ANGELES, CAL.—The Public Service Commission has decided to begin the installation of a municipal distributing system in the Hollywood, Garvanza and Highland Park districts and parallel the lines of the private power corporations in those districts. Chief Electrical Engineer E. F. Scattergood hopes to have the plans and specifications ready for the board within a few days. He estimates that the distributing system in the Hollywood and East Hollywood district will cost about $350,000 and that the East Los Angeles, Garvanza and Highland Park district system will cost about $375,000. In order to connect up every consumer in both districts, Mr. Scattergood estimates that a complete distributing system will cost about $800,000. The Commission authorized the calling for bids for transformers for the proposed power system.

NEW INCORPORATIONS.

MIDDLETOWN, O.—Middletown Gas & Electric Company. Capital increased from $350,000 to $700,000.

WARREN, O.—The capital stock of the Winfield Electric Company has been increased from $9,750 to $150,000.

CHICAGO, ILL.—The capital stock of the Ashbrook Electric Company has been increased from $25,000 to $50,000.

FRANCIS, OKLA.—Francis Gas & Electric Company. Capital, $10,000. Incorporators: James Mascho, L. H. Owen and others.

EAST LIVERPOOL, O.—The Hellyer Electric Company. Capital $10,000. Incorporators: C. W. Hellyer, W. H. Weaver and others.

CLEVELAND, O.—The Fitch Electric Company. Capital, $30,000. General electrical business. Incorporators: J. A. Fitch, A. T. Fitch and others.

SPRING VALLEY, ILL.—The Tiskilwa Electric Light Company. Capital, $10,000. Incorporators: C. H. Brown, Constant Brown and others.

SEATTLE, WASH.—The Electric Heating & Manufacturing Company. Capital $75,000. Incorporators: P. F. Appel, R. H. Walker and J. G. Eddy.

SENECA FALLS, N. Y.—Seneca Power Corporation. Capital, $5,000. Power plants, machinery, etc. Incorporators: H. B. Cutler and others.

CLEVELAND, O.—The Elliott-Thompson Electric Company. Capital $20,000. Incorporators: J. N. Elliott, M. B. Elliott, J. T. Thompson and others.

NORTH ATTLEBORO, MASS.—Barber Electric Manufacturing Company. Capital, $50,000. Electrical supplies. Incorporators: H. C. Barber, C. E. Riley and others.

NEW YORK, N. Y.—The Nesco Corporation. Capital $25,000. Electrical supplies, etc. Incorporators: Rene A. Manes, Isabelle Manes and Joseph P. Nolan.

BOSTON, MASS.—The Wright Electrical Company, Inc., has been organized, with a capital stock of $10,000. The incorporators are William J. Wright, Armand C. Bang, James A. Barry. W.

BUFFALO, N. Y.—The Electric King Sales Department, Inc. Capital $5,000. Deal in electrical devices, sewing machines, etc. Incorporators: W. Grant King, Jos. Markel and C. G. Babcock.

NEW YORK, N. Y.—The Ringwald-Vogel Goldberg Company, Inc. Capital, $25,000. General electrical business, electrical specialties. Incorporators: F. E. Ringwald, M. J. Vogel and Isidor Goldberg.

WILMINGTON, DEL.—The Commonwealth Utilities Company. Capital, $1,000,000. General utility business. Incorporators: H. E. Latter, C. L. Himlinger, Wilmington, and C. M. Egner, Elkton, Md.

WILMINGTON, DEL.—The United Electrical Stores, Inc. Capital, $100,000. Manufacture electrical, gas and combination fixtures. Incorporators: W. L. Stone and N. W. Cole, Scranton, Pa., and J. W. Swail, Wilkes-Barre, Pa.

NEW YORK, N. Y.—Underground Specialties Company, Inc. Capital, $100,000. Electrical and mechanical engineering, etc. Incorporators: C. H. Staten and C. F. Koster, Weehawken, N. J., and A. V. Simonson, Port Richmond, N. Y.

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FINANCIAL NOTES.

The Electric Transmission Company of Virginia has been organized as a subsidiary of the Middle West Utilities Company and has taken over the Electric Transmission Company, the Powell Valley Light & Power Company and the Pennington Light Company. The new company has sold to Chicago bankers $500,000 out of an authorized issue of $1,250,000 first-mortgage five-year six-per-cent bonds, and these bonds bill be sold on a 6.75 per cent basis. The bonds are callable at par and interest on 60 days' notice.

Union Heat, Light & Power Company, owned by the Cincinnati, Newport & Covington Light & Traction Company, a subsidiary of Columbia Gas & Electric Company, will refund its $1,608,000 four-per-cent bonds by an issue of five-per-cent bonds. The company some time ago authorized an issue of $5,000,000 five-year-old 50-year bonds to provide for additions and betterments and for refunding. A. B. Leach & Company, bankers for Columbia Gas & Electric, have now advised holders of the four-per-cent bonds that by arrangement with Union Heat, Light & Power Company they are ready to exchange the new five-per-cent bonds for the four-per-cent issue bond and pay a cash difference of one per cent on the face value of each bond. The four-per-cent bonds mature May 1, 1918, and are quoted at 96.25. As soon as these bonds are retired the five-per-cent bonds become a first lien on all the property of Union Heat, Light & Power Company. There have been $101,000 of the five-per-cent bonds issued. The company controls the lighting and power franchises in Covington, Newport and other Kentucky suburbs of Cincinnati.

Dividends.

	Term	Rate	Payable
Am. Rys., pf.	Q	1.75%	Feb. 15
Automatic Elec.	Q	1 %	Feb. 1
Bangor Elec. Ry.	Q	0.5%	Feb. 1
Brazil Trac., Lt. & Pw., com.	Q	1 %	Mar. 1
Cleveland & East. Trac., pf	—	0.5 %	Feb. 1
East St. Louis & Sub., pf.	Q	0.75%	Feb. 1
Grand Rapids Ry., pf.	Q	1.25%	Feb. 1
Jacksonville Trac., pf.	Q	0.75%	Feb. 1
Kellogg Switchboard.	Q	3 %	Jan. 31
Lowell Elec. Lt. Corp.	Q	$2.00	Feb. 1
Monongahela Val. Trac., pf.	Q	1.25%	Feb. 1
Montreal Lt., Ht. & Power	Q	2.5 %	Feb. 15
National Carbon, pf.	Q	1.75%	Feb. 15
Pacific Pw. & Lt., pf.	Q	1.75%	Feb. 1
Phila. Co., pf. 5% stock	S	2.5 %	Mar. 1
Ry. & Light Securities, pf.	S	3 %	Feb. 1
Ry. & Light Securities, com.	S	3 %	Feb. 1
Sierra Pacific Elec., pf.	Q	$1.00	Feb. 1
Texas Pw. & Lt., pf.	Q	1.75%	Feb. 1

NEW PUBLICATIONS.

REPORT ON COMMERCE.—The annual report of the chief of Bureau of Foreign and Domestic Commerce has been issued by the Department of Commerce, Washington, D. C. The report discusses suggestively some problems of foreign trade.

CANADIAN METALS.—The Department of Mines of Canada has issued an advance chapter of the annual report on mineral production in 1914, giving statistics as to the production, imports and exports of various metals, including aluminum, copper, platinum and tungsten.

NATIONAL - FOREST REGULATIONS.—The Forest Service has issued a pamphlet entitled "Water Power Projects, Telephone, Telegraph, Power Transmission Lines on the National Forests." This gives acts of Congress and regulations of the Secretary of Agriculture on these subjects.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,671. ELECTRICAL SUPPLIES.—A firm in Siberia informs an American consular officer that it desires to be placed in communication with an electrical engineer, who would be willing to act as agent for the purchase of electrical goods. It is stated that the firm will reimburse the representative for cable and incidental outlays, and allow him a small commission on all purchases made. Correspondence may be in English.

NO. 19,690. IRRIGATION AND POWER MACHINERY.—A report from an American consular officer in South America states that a representative of several private interests is in the United States with the object of purchasing drainage and irrigation machinery for large and small canal dredging, machinery for the transportation of earth, bridge connections, etc. The representative also desires to meet electrical construction engineers and manufacturers of water-power electric machinery. Quotations on water-power and electric-transmission equipment, as well as offers for the construction of a large-capacity water-power electric plant are requested. Bank references are given.

NO. 19,706. MACHINE TOOLS, ELECTRICAL GOODS, ETC. — A commercial agent of the Bureau reports that a firm in the United States desires quotations on machine tools, light railway locomotives, motorcycles, gas and oil engines, hardware of all descriptions, electrical goods, electrical machinery, and steel and iron sections for a firm in Siam.

No. 19,720. ELECTRICAL GOODS. —A firm in Denmark informs an American consular officer that one of its representatives expects to arrive in the United States in the near future for the purpose of establishing commercial relations with manufacturers of electrical goods.

NO. 19,730. HYDROELECTRIC PLANT.—A letter to the Bureau states that a company in Paraguay expects to establish a hydroelectric plant for light and motor power. Further information relative to this opportunity may be obtained from the Bureau or its district offices.

NO. 19,748. MECHANICAL AND ELECTRICAL SUPPLIES.—A report from an American consular officer in Spain states that a business man desires to represent manufacturers of mechanical and electrical supplies, etc. Correspondence may be in Spanish, French or German.

NO. 19,762. ELECTRIC FLASHING SIGNS.—A company in the near East desires to receive price lists and terms on electric-light flashing signs.

NO. 19,768. ELECTRICAL FANS.—An American consular officer in France reports that a firm in his district desires to receive quotations, f. o. b. port of shipment, with freight and insurance estimates for transportation to destination, on electric fans for cold-storage rooms. Correspondence in French is preferred.

NO. 19,774. ELECTRIC LIGHT BULBS AND SOCKETS.—A commercial agent of the Bureau has transmitted an inquiry from a firm in France which desires to be placed in communication with American manufacturers of electric-light bulbs and sockets. A statement is desired as to the quantity that could be delivered weekly, with price lists, etc.

PERSONAL MENTION.

DR. F. G. COTTRELL has been appointed chief metallurgist of the Bureau of Mines, Washington, D. C.

MR. MAYNARD D. CHURCH has recently been appointed chief engineer of the Terry Steam Turbine Company, Hartford, Conn.

MR. A. L. MARTIN, local manager of the Oregon Power Company, Dallas, Ore., has been elected president of the Dallas Commercial Club.

DR. ERASMUS KITTLER, known for his work in electrotechnics, has been awarded an honorary doctorate of engineering by the Darmstadt Technical School.

MR. C. K. CHAPIN, chief electrical engineer of the Consolidated Gas & Electric Company, Memphis, Tenn., was elected president of the Memphis Engineers' Club, succeeding MR. J. H. WEATHERFORD, city engineer.

MR. THOMAS BIBBER has been appointed general sales manager of the Adams-Bagnall Electric Company of Cleveland, Ohio, and will make his headquarters in that city. Mr. Bibber was formerly sales manager for Edwards & Company, New York City, and for some months has been Eastern field manager for the Adams-Bagnall company, with offices at New York. Mr. Bibber is well known in electrical circles and is one of the most prominent Jovians in the country.

MR. R. M. JENNINGS, manager of

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 24.	Jan. 17.
American Tel. & Tel. (New York)	127⅜	127½
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	245	243
Electric Storage Battery, common (Philadelphia)	64⅝	64
Electric Storage Battery preferred (Philadelphia)	64⅝	64
General Electric (New York)	173⅛	175¾
Kings County Electric (New York)	128	128
Massachusetts Electric, common (Boston)	6¾	6½
Massachusetts Electric, preferred stamped (Boston)	35½	34
National Carbon, common (Chicago)	165	165
National Carbon, preferred (Chicago)	122	121
New England Telephone (Boston)	132	131½
Philadelphia Electric (Philadelphia)	28	28
Postal Telegraph and Cables, common (New York)	78	78¼
Postal Telegraph and Cables, preferred (New York)	65	66
Western Union (New York)	90	91¼
Westinghouse, common (New York)	67⅝	67¼
Westinghouse, preferred (New York)	76⅜	76½

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the Oregon Power Company, Marshfield (Ore.) division, has been reelected president of the Executive Committee of the Marshfield Chamber of Commerce.

MR. ERNEST THURNAUER, of Paris, president of the French General Electric Company, recently visited Chattanooga, Tenn., where he inspected the large hydroelectric developments in that vicinity. Mr. Thurnauer was the guest of the Chattanooga & Tennessee River Power Company.

MR. ANGUS S. HIBBARD, one of the directors of the Chicago Telephone Company, has opened offices in the Bell Telephone Building, Chicago, and will, in addition to a continuance of his present relations with the telephone company, act as consulting engineer in matters pertaining to commercial or technical business organization, arbitration and corporate efficiencies. Mr. Hibbard was in the employ of the American Telephone & Telegraph Company for 11 years, and was general manager of the Chicago Telephone Company eighteen years, following which he became vice-president and later one of the directors of the company. The experience gained during those years enables him in his new capacity as consulting engineer to suggest many available and practical plans involving considerations of business engineering.

Angus S. Hibbard.

MR. PAUL SUTCLIFFE has recently been appointed advertising manager of the Edison Storage Battery Company, Orange, N. J. Mr. Sutcliffe received his earlier advertising and selling training in California. On coming east, in 1912, he joined the Edison interests, but resigned at the end of a year to become secretary of the W. S. Hill Advertising Company, Pittsburgh, Pa. He has been in the advertising department of the Edison Storage Battery Company for the past year.

OBITUARY.

MR. JOHN WENDELL CARTER, veteran electrical engineer, died January 17 at his home in Brooklyn, N. Y.

MR. CLARENCE A. STIMPSON, assistant superintendent of installation of the Philadelphia Electric Company, died January 15 at the Presbyterian Hospital, Philadelphia, Pa., after an illness of about two weeks. He was born in Maine in 1861, and was a resident of Philadelphia for 30 years. For many years Mr. Stimpson was connected with the Postal Telegraph Company, and for the last ten years acted as an assistant superintendent of installation with the central station company. He was well known in fraternal circles, being a member of the Mystic Shrine, Scottish Rite and other Masonic bodies. He was a member of the Illuminating Engineering Society and the American Institute of Electrical Engineers.

MR. JOHN ALEXANDER HILL, president of the Hill Publishing Company, New York, died suddenly on January 24 while enroute from his home at Orange, N. J., to his office. Mr. Hill was born near Bennington, Vt., and removed with his parents to Wisconsin, where he received his education in the public schools. When 14 years old he became a "printer's devil" in a printing office, where he stayed for six years, leaving it to become a locomotive engineer. For a time he was engineer on a construction train on the Denver & Rio Grande Railroad, which was then building over the Rocky Mountains. While still an engineer, Mr. Hill became a contributor to *The American Locomotive*, calling his articles "Talks With My Engine," and these attracted the publisher, who prevailed on him to return to the East. A few years later, with Angus Sinclair, he bought the magazine, shortly after founding the Hill Publishing Company, which also publishes *Power*, *The Engineering and Mining Journal*, *Engineering News*, and *The Coal Age*.

DATES AHEAD.

American Electric Railway Association. Midyear meeting, Congress hotel, Chicago, Ill., February 4. Secretary, E. R. Burritt, 8 West Fortieth Street, New York City.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary Joseph Langan, 29 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Detroit, Mich., February 15-17. Secretary, F. Overbagh, 411 South Clinton Street, Chicago, Ill.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Building, Milwaukee, Wis.

Record of Electrical Patents

Issued by the United States Patent Office, January 18, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,168,270. Protection Device for Electric Circuits. H. D. Arnold, assignor to Western Electric Co., New York, N. Y. Combination of electric valves, direct electromotive force and transformers inserted between generator and line.

1,168,280. Method and Apparatus for Electroplating Pipes and Other Articles of Magnetic Material. N. W. Buch, assignor to Safety Armorite Conduit Co., Pittsburgh, Pa. Articles magnetically supported in bath by removable frame.

1,168,281. Electroplating Apparatus. N. W. Buch, assignor to Safety Armorite Conduit Co. Modification of above.

1,168,284. Sanitary Cover for Telephone Mouthpieces. E. E. Claussen, Hartford, Conn. One-piece paper cover.

1,168,295. Pole-Elevation Indicator. J. L. Fay and S. B. Way, Milwaukee, Wis. For determining unknown, varying length of different poles.

1,168,312. Loading Coil and Case Therefor. S. B. Kent, assignor to Western Electric Co. Structure of core and magnetic casing for toroidal coil.

1,168,314. Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Has means for preventing premature sparking.

1,168,319. Automatic Telephone Exchange System. A. E. Lundell, assignor to Western Electric Co. Arrangement of cord circuits.

1,168,322. Automobile Horn. R. H. Manson, assignor to Garford Mfg. Co., Elyria, O. Has electromagnetically operated diaphragm.

1,168,325. Register Actuating Mechanism for Meters and the Like. T. F. Mulligan, assignor to S. F. Bowser & Co., Fort Wayne, Ind. Unidirectional driving mechanism.

1,168,346. Apparatus for Electric Welding. E. Thomson, assignor to Thomson Electric Welding Co., Lynn, Mass. Condenser charged by unidirectional current produces weld by energy of its discharge.

1,168,350. Lighting Fixture. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermilion, O. Comprises insulated universal joint on conduit, permitting passage of conductors.

1,168,351. Battery Lamp. F. W. Wakefield, assignor to F. W. Wakefield Brass Co. Casing for dry battery carries lamp, etc.

1,168,355. Electric Bone Saw. F. F. Wear, assignor to Alvey Ferguson Co., Cincinnati, O. Motor driven saw suspended from pivoted crane.

1,168,371. Circuit-Controller. W. P. Anderson, assignor to Dayton Engineering Laboratories Co. Arrangement and insulation of switch contacts.

1,168,378. Transformer Bell Device. C. E. Campbell, Lynn, Mass. Unitary transformer and bell structure.

1,168,383. Method of Starting Synchronous Polyphase Motors. C. J. Fechheimer, assignor to Crocker-Wheeler Co., Ampere, N. J. Fractional voltage and leading current applied to armature, then unity power factor and finally direct to line.

1,168,385. Attachment for Electric Welding Machines. E. Fulda, New York, N. Y. For spot welding in line transverse to vertical.

1,168,406. Door-Motor Controller. J. F. McElroy, assignor to Consolidated Car Heating Co., Albany, N. Y. For car doors; automatically, electromagnetically controlled fluid motor.

1,168,411. Electric Filament Lamp. T. O'Donnell, Ironwood, Mich. Special structure of bulb and filament support.

1,168,419. Selector Switch. J. N. Reynolds, assignor to Western Electric Co. For telephones; structure and operation of contacts.

1,168,422. Lamp Shade. H. K. Ritter, Niagara Falls, Ont., Canada. Has distributer of slats preventing view of light source.

1,168,432. Telegraphone. F. Seelau, Berlin-Wilmersdorf, Germany, assignor of one-half to A. M. Newman, Berlin-Wannsee, Germany. Responding and recording devices for telephone messages.

1,168,438. Electric Relay. R. W. Tarrant, London, England. Comprises two pairs of magnets, one of which has transversely swinging cores.

1,168,439. System of Constant-Current Distribution. P. H. Thomas, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Utilizes mercury-vapor device.

1,168,446. Car-Axle Power-Transmitting

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Mechanism. R. Vuilleumier, assignor to Safety Car Heating & Lighting Co., New York, N. Y. Belt drive for generator.

1,168,506. Pneumatic Electric Fire-Alarm. C. J. Jenne, San Francisco, Cal. Pressure in tube in protected place controls circuits of local and central station alarms.

1,168,519. Electromagnetic Frequency-Meter and the Like. C. R. Liljeblad, assignor to Aktiebolaget Elevator, Jarfva, Sweden. Comprises two coils with inductance and resistance respectively in series and a vane for each.

1,168,529. Connector for Electric Conductors. H. F. Maxim, Norfolk, Va., assignor of one-half to O. Wells. Has spring grip.

1,168,538. Electricity Rectifier. T. Murphy, Rochester, N. Y. Rectifying device driven jointly by induction and synchronous motors.

1,168,541. Apparatus for Wireless Telephony. E. B. Myers, New York, N. Y. Transmitting station.

1,168,542. Insulated-Wire Saturating Machine. P. A. Nehring, Sycamore, Ill. Apparatus for dipping wire.

1,168,553. Electric Shade-Holder. N. S. Richmond and R. W. Pain, Chicago, Ill. For attachment to sockets.

1,168,571. Elk's Clock. T. W. Shepherd, Waltham, Mass. Has dummy dial and hands with insignia and electric illumination controlled by regular hands.

1,168,586. Safety Control System. J. C. A. Anderson, Chicago, Ill. Elevator operating lever electrically controlled by door.

1,168,587. Means for Indicating Faults and Breaks in Electric Conductors. E. Baillat, Pont de Beauvoisin, France. Direct current employed for test; detailed arrangement of transformers, switches, indicator, etc.

1,168,595. Lightning Arrester. A. J. Bowie, Jr., San Francisco, Cal. Horn type.

1,168,596. Cable-Bonding Device. E. L. Brockway, Glenside, Pa. End of connector interlaced in grid secured to cable.

1,168,603. Printing Telegraph. L. Cerebotani, assignor to firm of Carl Zeiss, Jena, Germany. Details of typewheel operating means.

1,168,607. Attachment for Motion-Picture Machines. D. D. Daniel, Richmond, Va., assignor of one-half to C. B. Haynes. Driving motor controlled by condition of film.

1,168,619. Electric Lamp Mounting. A. Formander, Brooklyn, N. Y., assignor of one-half to J. W. Heimsoth. Portable lamp structure comprising conductor spool and adapted to be gripped to a support.

1,168,620. Mounting for Electric Lamps. A. Formander, assignor of one-half to J. W. Heimsoth. Lamp support comprising conductor spool and socket adjustably mounted thereon.

1,168,624. Trolley Retriever. R. E. Gearhart, assignor to More-Jones Brass & Metal Co., St. Louis, Mo. Trip device at base of trolley pole.

1,168,630. Signal System. B. B. Hatch, Boston, Mass. A number of signal circuits and indicators are intercontrolled.

1,168,637. Self-Restoring Switch for Ignition Systems of Internal-Combustion Engines. F. R. Hoyt, assignor to Simms Magneto Co., East Orange, N. J. Switch in primary circuit is thermostatically opened on stoppage of engine and interrupter.

1,168,638. Periodic Interrupter for Ignition Systems of Internal-Combustion Engines. F. R. Hoyt, assignor to Simms Magneto Co. Structure and operation of contact mechanism.

1,168,639. Battery Alternator for Ignition Systems of Internal-Combustion Engines. F. R. Hoyt, assignor to Simms Magneto Co. Device for intermittently reversing direction of current through interrupter contacts.

1,168,676. Railway System. J. A. Romer, assignor to B. MacFadden, New York, N. Y. System for transferring cars between tracks at different levels.

1,168,678. Ore-Reducing Process. L. St. D. Roylance, San Francisco, Cal. Comprises disintegrating ore by electrochemical action.

1,168,696. Telegraphic Transmitting Device. J. H. Abernathy, Danville, Va. Vibrating contact device.

1,168,699. Water-Level-Actuated Mechanism. A. Arbib, New York, N. Y. Float-operated alarm.

1,168,704. Type-Operating Mechanism for Typewriting Machines. O. Bennett, Placerville, Cal. Electromagnetically operated hammer for striking type bars carried in rotary rack.

1,168,706. Tension-Indicator for Felts, Fourdrinier Wires, and Paper Sheets. J. W. Brassington, Wilmington, Del. Tension on roll acts on compression resistance between roll bearing and abutment.

1,168,715. Automatic Selective Change-Gear Mechanism. G. A. Eddy, Los Angeles, Cal., assignor of three-tenths each to A. B. Dodge and E. G. Beik. For automobiles; electromagnetically controlled by the speed of the driving gear.

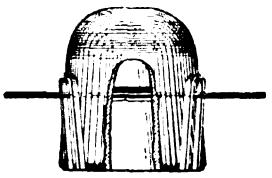
1,168,724. Electric Lantern. W. P. Hartford and C. M. Rickoff, Chicago, Ill. Battery device simulates usual oil structure.

1,168,753. Rail Bond. B. F. Silliman, assignor to Electric Railway Improvement Co., Cleveland, O. Has flexible copper body with triangular shaped iron strip integral with terminal and forming V-shaped trough with rail.

1,168,755. Electrically Operated Musical Instrument. I. B. Smith, Philadelphia, Pa. Piano key levers are magnetically operated without interfering with manual operation.

1,168,761. Electric Alarm Mechanism. E. A. Truax, Inglewood, Cal. Clock-controlled circuits have switchboard for setting time of alarm.

1,168,774. Metering Panelboard. F. B. Adam, assignor to Frank Adam Electric Co., St. Louis, Mo. Arrangement of busbars on slab.



No. 1,168,796.—Insulator.

1,168,796. Wire-Holder and Insulator. C. S. French, Salem, O. Slotted cap fits over circumferentially grooved insulator and secures wire. (See cut.)

1,168,798. Insect Trap. D. H. Glass, Rushville, Ill. Lamp attracts and fan blows insects into compartment.

1,168,836. Electric Lantern. J. G. Peterson, assignor to Manhattan Electrical Supply Co., Jersey City, N. J. Dry-battery casing carries lamp, etc.

1,168,837. Method of Producing Electrical Oscillations. E. von Lepel, Berlin-Wilmersdorf, Germany. Particular mode of regulation of sparks produced by periodic condenser discharge across quenched gap.

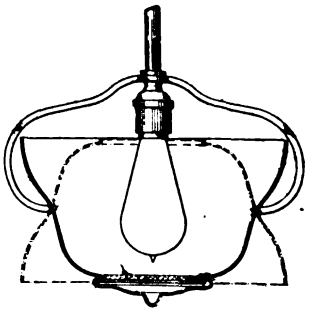
1,168,839. Lighting Fixture. E. C. White, Evanston, Ill., assignor of one-half to C. Amiguet. Combined direct or indirect fixture. (See cut.)

1,168,846. Electric-Bell Attachment for Pianos. R. A. Bessinger, Wellington, O. For controlling bell circuits by keys.

1,168,889. Construction Cleat. A. M. Knauber, assignor to M. Knauber, Oak Park, Ill. For mounting outlet and switch boxes conveniently.

1,168,892. Battery Lamp. N. Kribs, Dundee, Ill. Compact, portable structure.

1,168,894. Telephone-Exchange Trunking System. F. Lubberger, assignor to Automatic Electric Co., Chicago, Ill. Automatic interconnected with manual board.



No. 1,168,839.—Reversible Fixture.

1,168,904. Extension or Party-Line Telephone. R. Owens, assignor to First Trust & Savings Bank, Chicago, Ill. Automatic; with ground releasing circuit for each telephone.

1,168,908. Cab Control System. F. M. Raymond, Saugatuck, Conn. Car control and signals controlled by energization of ramps along trackway.

1,168,920. Priming Device for Explosive Engines. S. J. Todd, assignor of three-fourths to B. C. Hughes, Detroit, Mich. Combined with spark plug.

1,168,921. Spark Plug. S. J. Todd, assignor of three-fourths to B. C. Hughes. Modification of above.

1,168,925. Portable Dynamometer. F. C. Zanzig, Milwaukee, Wis. Has controllable generator driven with machine being tested.

1,168,949. Magnetic Educational Appliance. G. McKittrick, and P. B. Humphrey, Caney, Kan. Frame fitted with magnets removably holding lettered blocks in position.

1,168,957. Indicating Apparatus. N. J. Nessa, Sioux Falls, S. D. Float-operated circuit-closer.

1,168,971. Mail-Box Signal. A. Sinicki, Pittsburgh, Pa. Operation of push button in house rings bell, if signal on outside box is in indicative position.

1,168,977. Electric Switch. G. B. Thomas, assignor to Bryant Electric Co., Bridgeport, Conn. For lamp socket; operated by quarter turn of key.

1,168,992. Cinematograph Machine. W. H. Anderson, London, England. Safety shutter electromagnetically closed, if film breaks or runs off sprocket wheel.

1,169,005. Combined Level and Plumb. G. W. Caswell and C. E. Welt, Cliftondale, Mass. Has battery and lamps.

1,169,011. Insulator. H. A. Cook, Dixon, Nebr. Pin type; glass body formed about metal cup to which tie wires are secured.

1,169,029. Pencil Attachment. L. M. Gunnerson, Stanwood, Wash., assignor of one-half to N. P. Gunnerson. U-shaped cap on butt end of pencil carries battery lamp.

1,169,034. Train-Stopping Apparatus. C. Hippman, Kuhns Crossing, Colo. Structure of track obstacle.

1,169,038. Telephone Receiver. A. D. Jones, Philadelphia, Pa., assignor of one-fourth each to E. S. Cochran and H. Fairbanks. Mounting of diaphragm carrying permanently magnetized armature.

1,169,067. Method and Means for Automatic Accounting. W. J. Crumpton, assignor to W. R. Heath, Buffalo, N. Y. Number of registers electrically controlled by master machine.

1,169,078. Accounting System. F. O. Heuser, assignor to W. R. Heath. Electrical connections between registers cause numerical value of actuations to be the same.

1,169,079. Insulating Board and Method of Producing the Same. J. E. Lappen, assignor to Union Fibre Co., Winona, Minn. Formed of welted petroleum tailings, paraffin wax, mineral wool, alum with watery stock of degummed flax fibres and shives and partially pulped short-fibred vegetable straw.

1,169,082. Discharge Tube. R. von Lieben, E. Reisz and S. Strauss, assignors to firm of Relais-Gesellschaft M. B. H., Vienna, Austria-Hungary. Method of increasing duration of incandescent metallic-oxide-cathode discharge tubes containing gas.

1,169,089. Electric Switch. B. L. Lawton and B. A. Spitzer, assignors to Connecticut Telephone & Electric Co., Meriden, Conn. Details of plunger switch.

1,169,094. Spark-Controlling Means for Internal-Combustion Engines. C. E. Stahl, assignor to Connecticut Telephone & Electric Co. Combined throttle and spark control.

1,169,099. Snap Switch. E. C. Wilcox and B. A. Spitzer, assignors to Connecticut Telephone & Electric Co. Quick-throw plunger switch.

1,169,102. Measured-Service Telephone System. T. G. Martin, assignor to First Trust & Savings Bank, Chicago, Ill. Message registering in automatic system.

Patents Expired.

The following United States electrical patents expired on January 24, 1916:

618,054. Train Traction System. F. E. Case, Schenectady, N. Y.

618,057. Secondary Battery and Electric Lamp. W. A. Crowdus, Chicago, Ill.

618,071. Motor Speed Controller. C. A. Dresser, Chicago, Ill.

618,131. Bearing for Armature Shafts of Electric Motors. H. L. Parker and C. R. Meston, St. Louis, Mo.

618,137. Signal for Telephone Switchboards. C. E. Scribner, Chicago, Ill.

618,144. Electrical Selective Apparatus. J. S. Thompson, Chicago, Ill.

618,162. Magnetic Closer for Electric Railways. W. M. Brown, Johnstown, Pa.

618,163. Electric Motor Control. W. M. Brown, Johnstown, Pa.

618,175. Automatic Switch for Distribution of Electricity. J. Hopkinson, London, Eng.

618,179. Circuit Closer for Electric Railways. G. H. McFeaters, Johnstown, Pa.

618,231. Trolley Stand. D. Moyer, Allentown, Pa.

618,247. Secondary Battery. H. Dolter, Lyons, France.

618,328. Electrical Signal System. J. P. Buchanan, Boston, Mass.

618,380. Electric Switch. W. J. Ferguson, Baltimore, Md.

618,384. Automatic Weighing Machine. F. H. Richards, Hartford, Conn.

Reissue 11,710. Electrical Hammering Machine. T. C. Robinson, Boston, Mass.

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ELECTRICAL REVIEW

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EDITORIALS

THE CONTRACTOR AND THE CENTRAL STATION.

The national, state and local associations of electrical contractors have done much during the last decade to improve the relations of this branch of the industry to the others. Until contractors were organized, few of them realized what these relations might be. Most of them saw only their differences, their points of opposing interest and their antagonisms. It has gradually come to be realized, however, that each element of the industry has a certain function to perform and each can perform it best through the co-operation of the others.

The Electrical Contractors' Association of the State of Illinois has been one of the most active of the state associations and we note with satisfaction its appointment, at the recent convention in Chicago, of a committee which is to take up and investigate the relations of its members with the central stations, to study what has been done in other places and to report upon what can be accomplished in Illinois along this line. There is great need for such a committee and great good can be accomplished through its labors.

Much has been done in certain cities of this country in co-ordinating the work of the central station and the electrical contractor, but in other communities the situation is anything but satisfactory. Where the two interests have come together in a spirit of mutual concession and helpfulness, ways have been found by which the interest of each can be conserved and at the same time advantages secured through the co-operation of the other. It would seem that more has been accomplished, so far, in cities of medium size than in either the large cities or small towns. Frequently in the small towns, the central station has found it necessary to go into the wiring business if its customers were to be properly equipped for service. In the large cities, there has been no dearth of electrical contractors prepared to carry on the construction work, yet in spite of this they are, frequently, examples of the least advance towards a condition of mutual consideration and helpfulness. Chicago is a notable example of this condition. Here, as well as in many towns of the state, a great deal of good could be accomplished if the two interests here under consideration would come together in the right spirit, aim to understand the grievances of the other, show a willingness to appreciate the viewpoint of the other side and work for co-operation rather than antagonism.

Where satisfactory working arrangements have been made, it has become apparent to both interests that it is to their advantage to co-operate. We, therefore, welcome the appointment of a committee which may be expected to do some serious work towards practical attainments in this line. A similar committee upon the side of the central stations would no doubt facilitate such developments.

CHANGING THE CHARACTER OF SERVICE.

An interesting case which has come up before the Wisconsin Railroad Commission is reported in this issue. It involves the responsibility of a central-station company which changes the character of its service. The Janesville Electric Company originally furnished direct-current service in certain parts of its territory and more recently furnished alternating-current service as well. In 1914, notice was served that the direct-current service would be entirely abandoned by the first of this year. This is a condition which has arisen in a great many communities. Nearly all of the earlier installations were equipped for the supply of direct current. With the growth of systems and the improvement of apparatus, it has been found more economical to make use of alternating current. While direct-current systems are still maintained in the hearts of many cities, the tendency is to gradually abandon them. In most cases, the companies taking this step have managed to make satisfactory arrangements with their power customers who will be required to change from direct-current to alternating-current motors.

One consumer in Janesville brought the question before the Commission and the latter has given a decision which seems to be a reasonable disposition of the matter. Since such a change is in the interest of cheaper service for all, it is fair that all should pay at least a portion of the cost for the change. Such costs, if paid directly by the company, will be ultimately reflected in the rates for service. The Commission has decided that the present value of each motor shall be determined, taking into account depreciation and scrap value, and that the company shall either purchase the old motors at a price thus fixed or else, if a sale can be effected elsewhere only at a lower price, to reimburse the owner for the difference. All funds expended by the company for this purpose are to be amortized in a period of ten years. New alternating-current motors are then to be supplied by the user just as if he were a new customer. This ruling does not apply to concerns having isolated power plants and which are only connected for breakdown service.

This point of view of the matter is different from that taken by the court in a recent case which arose in the State of Arkansas. The conditions there were somewhat similar, except that the change was from 133 cycles to 60 cycles. In that case, the court decided not only that the change was justified, but that the company was not responsible for the expense to which indi-

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vidual consumers were put in adjusting themselves to the changed condition.

THE VALUE OF PUBLICITY.

The importance of publicity in achieving business success is not always realized or properly appraised. Its influence is, however, enormous and its proper utilization is often the determining factor as between success or failure of a given enterprise.

Publicity takes two different forms. The one is that best represented by paid advertisements. The other form comes without direct purchase by its beneficiary and yet often depends upon his efforts and his attitude toward those who are in a position to open the channels of such publicity. Publicity of this form may come through news items and write-ups in the public prints, through addresses to meetings or organized bodies and through various other channels of communication to the general public. Both of these classes of publicity are being utilized at the present time to far greater extent than ever before in the world's history. The volume of paid advertising has mounted to an enormous figure, exceeding in value $700,000,000 each year in this country alone.

The object of publicity efforts is not merely the immediate securing of customers, and indeed in many cases, this is not even a minor part of a publicity campaign. While this is, of course, an important item and in many cases the principal one, there are frequently other ends to be attained, such as the influence upon public opinion, the acquainting of the public with the problems and conditions confronting a corporation, or an exposition of its aims, methods and purposes. The latter applies especially to public service corporations. The right kind of publicity imparts information and is in a sense educational. It frequently requires repeated reiteration in order to reach a wide circle of individuals and to become impressed upon their consciousness. Many business interests have been slow in recognizing the above facts and this is probably responsible for a great deal of the suspicion and distrust with which other corporations and especially those in the public utility field have been regarded. Such an attitude sometimes arises merely from the silence which refuses to inform the public or take it into confidence, and sometimes from neglect to correct wrong impressions which are purposely disseminated by those whose object is to misrepresent.

In the case of public utility corporations, publicity is needed not only in securing customers and in enlarging the business, but as pointed out above, in explaining policies, rate schedules, methods and objects. This is to be secured not only by direct advertising, but by giving to the newspapers and other mediums of publicity information in regard to the plant, the personnel and the business which is of real public interest. Opportunities should never be lost by utility officials through public addresses and other means of direct contact to inform the public of what the company is doing and what it is trying to do.

In the case of the electrical dealer and contractor, the situation is somewhat different. The immediate securing of customers looms larger in his case, but the local advertising should not be limited to this alone. Creation of interest in new developments in the electrical field and especially those that find direct application in the home, office and factory should not be neglected. Many contractors make notable or unique installations which would furnish interesting write-ups for the local newspaper without ever giving a thought to the possibility of the advantages which might be secured through such publicity.

The electrical manufacturer stands in much the same relation to publicity work as manufacturers of other articles. He does not, perhaps, come into such direct relation to the consumer as the provider of food or clothing. Nevertheless, the manufacturer who does not recognize and make use of the power of publicity is losing an opportunity both for himself and for others who are related to his business success. Failure of this sort is often the reason for an appliance or fitting of less intrinsic worth taking the business which would otherwise go to a superior product. A short-sighted manufacturer sometimes puts the blame for such circumstances upon the lack of appreciation of his product by engineers, contractors or the public. He fails to recognize that a knowledge of the merits must precede its general recognition and the consequent demand for its use. In the case of articles purchased directly by the public, confidence is often felt in the manufacturer and in his goods if he not only has the frankness to spread information regarding the construction and design of his apparatus, but shows his own confidence in its merits by investing a large sum in advertising. Goods that are little read about are subject to suspicion.

Sales promotion should not only be aggressive, but should be planned along lines of furnishing information in a spirit of sincerity. The electrical industry furnishes many examples of campaigns of publicity carried on along broader lines than the mere securing of customers or placing of orders. One of the best examples is the Bell telephone interests, as was pointed out by Mr. N. C. Kingsbury, vice-president of the American Telephone and Telegraph Company, in a recent address before the Association of National Advertisers. This company not only does a great deal of national and local advertising, but it loses no opportunity to interest the public in its achievements and the work which makes them possible. Thus when the transcontinental telephone line was completed, the fact was not only given wide circulation, but opportunities were afforded gatherings of business men in all parts of the country to demonstrate the facilities it had provided. Moreover, thousands of visitors to the Panama-Pacific International Exposition were given the privilege of listening to a transcontinental telephone conversation. The result of this, no doubt, is that the majority of the people in this country are aware that facilities for such transcontinental service are in existence and will be ready to make use of them whenever circumstances require it.

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DEVELOPMENT OF THE ELECTRIC FAN INDUSTRY.

The electric fan was one of the first applications of the electric motor to receive extensive use and still is one of the most commonly found applications of the motor. Through its process of development, covering a little over 25 years, it has been evolved from a crude and cumbersome appliance to a highly perfect and efficient device. It was the custom of fan manufacturers formerly to make radical changes in their designs from year to year. Since the fan industry has become more standardized in recent years this tendency to make striking changes is no longer manifest. The changes made nowadays are chiefly in the line of improvement of details in construction and the addition of new types or models of fans. This is apparent from the general review of developments recently made by American fan manufacturers which will be found on other pages of this issue. Noteworthy in this connection is the very large assortment of fans now available for practically every conceivable use; this applies both to variety of sizes and types. The fan manufacturers have in most cases realized that there are many applications of electric fans which call for special types and as these special types have been developed and found satisfactory to meet the requirements they have been added to the line of standard products.

The electric-fan industry is capable of much greater development than it has as yet attained and this must be brought about chiefly in two directions. The first of these is by calling attention to many all-year-round uses of the fan which are at present not sufficiently well known. The general opinion is still held that the electric fan is purely a means for producing cooling effect on hot, sultry days, and no doubt this is its most important use. However, as an auxiliary or even primary medium of attaining ventilation in the largest sense of the term, that is, of improving the quality of air, it has an important and an increasingly useful field. It is not generally known that by merely agitating the air in a room a marked improvement in its quality is obtained. This fact has been demonstrated repeatedly and should be brought home to the public in general. This use of the fan calls principally for oscillators and these can very well be used in midwinter just as on the hottest days of summer, the requirement being that they shall run at moderate speed so as to prevent a concentrated, strong, cooling breeze in any one direction. Fans have also an important use as auxiliaries to other ventilating systems, if used with intelligence. This subject is capable of much study and careful exploitation both by manufacturers and dealers of electric fans.

Another direction in which the industry may find expansion is in the realization by dealers that in selling a fan it is desirable to know for what purpose it is to be used. The dealer should have such a good knowledge of the uses of fans and of the types best adapted for different purposes as to recommend intelligently the type which is best suited for any particular use. Thus, where it is desired to obtain a constant breeze in one direction only, it is foolish to sell an oscillating fan; it is more sensible in this case to sell a simple non-oscillating fan and induce the buyer later to purchase an oscillating fan for purposes where the oscillator is best adapted. There are many relatively low-priced fans now available which should serve as an introduction to persons not yet acquainted with the merits of the electric fan, and these fans used in their proper place will bring about a demand for more fans, so that the dealer will be enabled to sell two fans where formerly he sold one.

PRINCIPLES OF STREET LIGHTING.

The apostles of adequate street lighting are divided into two camps with respect to the best method of distributing the light which is to be used for this purpose. These may be designated as uniform and non-uniform distributions of the total light flux. In achieving the former distribution, the aim is to direct a large percentage of the light from the source in a direction a little below the horizontal. In the latter case, more of the light is distributed upon the street surface in the immediate vicinity of the source, and although the light may be well diffused, it results in a relatively high intensity around the lamps and a correspondingly low intensity at points in between. This method appears to give better results upon dirt roads and other dull surfaces, while the more uniform distribution has been found effective upon streets whose surfaces show high specular reflection, such as concrete and asphalt which have been polished from the contact of many rubber tires.

The amount of total light flux available also has considerable bearing upon a choice between these two methods, as we are directly concerned here with the question of whether dependance for seeing is to be placed upon direct illumination or upon silhouette effect, which has come to be recognized as an important factor in seeing at night. The most desirable distribution of light also depends upon lamp spacing, mounting height, width of street and nature of surroundings. Again, the character of the street surface will influence the choice of spacings. In considering the most desirable distribution, it is important to consider distribution in a horizontal zone as well as distribution in a vertical plane. It may be quite as important to have accessories which will modify the horizontal distribution as to have the light properly distributed in its vertical characteristics. The best accessories for a particular installation will depend upon the considerations noted above and it is obvious that every individual case must be considered upon its own merits. But a suitable distribution is not the only requirement for a street lighting equipment. It should be free from glare (or excessive brightness) and should present a pleasing appearance.

Many of our present installations have lamps poorly located and spacing distances are frequently too great. The increasing efficiencies of illuminants make it possible to improve conditions without unduly increasing the expense. The best location for lamps will depend upon their candlepower, spacing, nature of street surface and other considerations.

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Happenings in the Industry

New Power Plant for Joliet to Use Steam at 300 Pounds Pressure, 225 Degrees Superheat—Winter Meeting of Illinois Contractors Held in Chicago—Report of Closing Session of Western Electrical Inspectors' Convention—Program of February Meetings—Important Wire Merger

New Joliet Plant to Use Steam at 300 Pounds Pressure, 225 Degrees Superheat.

Plans for the construction of a steam turbine power plant near Joliet, Ill., to cost approximately $800,000 have been announced by the Public Service Company of Northern Illinois. It is planned to make the new plant one of the most modern steam plants in the electrical world. Although the designs for the plant have not been completed work will be started at once in preparation for the installation of the first unit, a 10,000-kilowatt horizontal turbogenerator. The building will be so arranged that provision can be made for additional units and the ultimate capacity of the plant will be at least 60,000 kilowatts. Looking toward higher efficiencies, steam will be used at a pressure of 300 pounds per square inch and 225 degrees superheat. The auxiliaries will be motor-driven, with the exception of the boiler-feed pumps, which will be turbine-driven. It will be one of the first plants of the kind to contain no reciprocating machinery, all being of the rotating-drive type.

Illinois Contractors Meet at Chicago.

The winter meeting of the Electrical Contractors' Association of the State of Illinois was held at the Congress Hotel, Chicago, on January 27, 28 and 29.

An open session was held on Thursday morning. President J. Norman Pierce occupied the chair and introduced W. R. Moss, of the Chicago Association of Commerce, who made an address of welcome which gave his hearers something to think about along the line of co-operation and service to one's fellows.

This theme was further discussed by W. W. Low, of the Electric Appliance Company, who enlarged upon the value of organization. To show how organization among electrical men had improved conditions he stated that five years ago one jobber lost three per cent of his turnover in accounts that could not be collected, whereas during the past year the loss was only one per cent, in spite of very bad business conditions. He advocated full publicity as to business methods, as more harm is done through ignorance of them than through knowledge of them by competitors. Organization means education. He made a plea for loyalty to the jobber who is on his part loyal to the contractor. The jobber could give better protection to the contractor if the latter supported the jobber and helped to eliminate the manufacturer's agent.

There ensued a general discussion of relations between jobbers and contractors, several of the latter explaining just why the attitude of the contractor could not well be different from what it is. The contractor is forced by competition to buy in the cheapest market.

J. T. Marron claimed that the jobber and contractor have many interests in common, and should be able to iron out their differences and get together on a basis which would be mutually satisfactory.

Closed sessions were held on Thursday afternoon and Friday afternoon. After much discussion a committee was appointed to collect data on the subject of co-operation between contractors and central stations in such form that it might be used to further co-operation in places where it does not now exist. This committee consists of J. T. Marron, Rock Island; Ernest Freeman, Chicago; E. F. Pendergast, Rockford; Joseph Tanner, Danville; William McGuineas, Chicago.

Another committee was appointed to investigate the subject of the concentric system of exposed wiring and arrange for an exhibit of the wire and fittings at the next meeting of the Association.

The finances of the Association were reported in good condition, all indebtedness having been paid off through the generosity of the Chicago Association.

It was decided to hold the next meeting in Rockford, and arrangements for this meeting, which will be in June, will be in the hands of E. F. Pendergast.

On Friday evening a banquet and entertainment, followed by dancing, was held at the Congress Hotel. Saturday was devoted to visiting the Automobile Show at the Coliseum.

Banquet of Illinois Electrical Contractors' Association on January 28 at Congress Hotel, Chicago.

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WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS DISCUSSES CODE.

Report of Closing Sessions of Annual Convention in Chicago.

While the discussion regarding concentric wiring was the feature of the eleventh annual convention of the Western Association of Electrical Inspectors many other questions of importance came before that body during the sessions January 25 to 28, at Hotel Sherman, Chicago, Ill. Following Wednesday morning's discussion of concentric wiring, an abstract of which was given in last week's issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, various regulations as applied to motion-picture theaters received the attention of the convention.

Major M. L. C. Funkhouser, of the Morals Inspection Department, Chicago, spoke on "The Film Censor," stating the difficulties met with in passing on films, and giving an outline of the work of the Board of Censors. S. R. Todd, of the Department of Gas and Electricity, Chicago, presented a paper on "The Regulation of Operators," giving the details necessary for an operator to secure a license and the duties the work imposes upon one. Passing to the electrical inspector, he outlined his duties in regard to actual inspection and the reporting of irregularities. He stated that the past five or six years has seen so much improvement in the electrical equipment of the motion-picture theater that a machine in the hands of an experienced operator does not now carry a great fire hazard.

J. E. Latta, of the Underwriters' Laboratories, Chicago, read a paper on "The Labeled Film." He stated that the present varied use of motion-pictures for publicity work has necessitated safeguards for the ordinary inflammable type of film or the use of a non-inflammable film. The Underwriters' Laboratories has standardized a cellulose-acetate film of the slow-burning type and attaches a three-foot leader, which states that inspection has been made. The inspected film also carries an embossing mark, which flashes on the screen, and prevents the exchange of leaders to non-inspected films. The non-inflammable film is very durable, gives as good results in quality of pictures, while the price, which is quoted at four cents per foot, is one cent per foot higher than the unlabeled film. The use of cheap machines with no shutters and inflammable films involves a maximum of fire hazard.

A number of inspectors' problems were then taken up. In discussing grounding fixtures Bernard Berssenbugge stated there was a Milwaukee ordinance prohibiting the installation of key or pull-chain socket in bath rooms, and lights must be turned on or off by a snap switch near the door and on the opposite side of the room from the bath tub. In talking on the subject of enclosure of live parts, V. H. Tousley said the trend of the Chicago Code was toward inclosing all live parts, fuses now being included and revised rules to require the inclosure of knife switches. Switch boxes are not kept closed and the operation of switches should be from outside of the box for safety and fire hazard reasons. Some interesting questions concerning the heat developed by gas-filled lamps were brought up, S. E. Doane, of Cleveland, stating there was some misapprehension about radiated heat, tests having shown that the highest temperature reached was 150 degrees Fahrenheit. It was suggested that a committee be appointed to confer with the National Electric Light Association on the subject. In discussing the electrical hazard in garages it was sugested that portable electric lamps should be provided with guards and heavy cords. Vapor-proof globes as a means of prevention of gas explosions in garages eliminates fire hazards in some instances, but was not considered practical. B. H. Glover, in the discussion on electric-organ wiring, stated that it was impossible to conform to power-wiring rules, because of wiring complications, and that a specification covering such wiring had been adopted by the Underwriters' Laboratories. Substitution of circuit-breakers for fuses on low ampere circuit was the leading point of discussion on the 1915 Code rules.

Thursday morning was devoted to committee reports, which were submitted in printed form. F. H. Moore presented the report of the Committee on Architects' Specifications, which was a summary of items to assist architects and builders in preparing clear and concise electrical specifications for bidders. The report of the Committee on Electric Traction Systems contained rules for the construction of overhead, third-rail and underground trolley systems, and light and power equipment. A recommendation for the use of temperature rise as a basis for determining the size of conductors was the subject of the same discussion. K. W. Adkins presented the report of the Committee on the Installation and Operation of Induction Motors, which carried recommendations for figuring conductor sizes. Discussion, participated in by F. E. Barron, Bernard Berssenbugge and V. H. Tousley, indicated that Tables 18-A and 18-B of the 1915 Code were inadequate for determining all conductor sizes, and the report was referred back to the committee. F. L. Lucas presented the report of the Committee of Theater Wiring and Show Equipment, which recommended changes in the Code requiring motors on stages to be inclosed and lessening fire hazards of portable equipment. After the morning session many of the inspectors attended a luncheon given by the Electric Club-Jovian League at the Hotel Sherman.

Thursday afternoon session began with an exhibition of motion pictures showing the rescue work attendant upon the turning over of the steamer *Eastland* in Chicago last July. Henry A. Morss, of the Simplex Wire & Cable Company, gave an interesting talk on "The Manufacture of Rubber-Covered Wire," fully illustrated with motion pictures.

V. H. Tousley presented the report of the Committee on Rubber-Covered Wire, which urged the discontinuance of the manufacture of so-called old Code wire. The majority of wire manufacturers have either stopped the manufacture of old Code wire or expressed their willingness to do so, and ways and means for concerted action to stop its manufacture altogether were suggested. Emil Anderson presented the report of the Committee on the Construction and Installation of Electric Signs, which recommended changes in the 1915 Code for greater protection of wiring. After discussion the report was referred back to the committee for revision. The report of the Committee on Revision of Articles of the Association, presented by V. H. Tousley, was also referred back for revision.

The slate presented by the Nominating Committee met was no opposition, and the following officers were elected for the ensuing year:

President, F. H. Moore, Indianapolis, Ind.

First vice-president, Emil Anderson, Minneapolis, Minn.

Second vice-president, F. L. Lucas, Toledo, Ohio.

Secretary, W. S. Boyd, Chicago, Ill.

Executive Committee: C. K. Cregier, Chicago, Ill., chairman; R. E. Knox, Louisville, Ky.; F. P. McGough, Omaha, Neb.; W. S. Boyd, Chicago, Ill.; A. J. Pruvot, Sioux City, Iowa; H. B. Wileford, Denver, Colo., and H. F. Strickland, Toronto, Canada.

Invitations were received from Toledo, St. Louis and Grand Rapids as meeting places for the next convention. Mr. Kelsey, publicity manager of the Toledo Railways & Light Company, extended the hospitality of his city, and indications point to Toledo as the next meeting place.

Secretary W. S. Boyd read a brief report from W. J. Canada, representative of the Association to the Pan-American Scientific Congress. In making a few closing remarks Mr. Boyd asked the members of the Association to consider, individually, problems involved by concentric wiring from the primary standpoint of its safety.

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Program of Midwinter Convention of Electrical Engineers.

The fourth midwinter convention of the American Institute of Electrical Engineers will be held at the Engineering Societies Building, New York City, on Tuesday and Wednesday, February 8 and 9. A dinner-dance will be given at the Hotel Astor on Tuesday evening.

Four sessions will be held for the reading of technical papers, the program being as follows:

Tuesday, 10:00 a. m.: Address by President J. J. Carty; "The A. I. E. E. and the Technical Committees," by D. B. Rushmore; "Municipally Operated Electric Utilities of Western Canada," by A. G. Christie.

Tuesday, 2:30 p. m.: Symposium on High-Voltage Measurements. "Crest Voltmeters," by Clayton H. Sharp and E. W. Doyle; "The Crest Voltmeter," by L. W. Chubb; "The Voltmeter Coil in Testing Transformers," by A. B. Hendricks, Jr.; "Notes on the Measurements of High Voltage," by William R. Work.

Wednesday, 10:00 a. m.: Symposium on Electric Railway Operation. "Operation on the Norfolk & Western Railway," by F. E. Wynne; "Chattering Wheel Slip in Electric Motive Power," by G. M. Eaton; "The Liquid Rheostat in Locomotive Service," by A. J. Hall.

Wednesday, 2:30 p. m.: "Method of Determining the Correctness of Polyphase Wattmeter Connections," by W. B. Kouwenhoven; "The True Nature of Speech," by John B. Flowers.

Program of Midwinter Convention of Illuminating Engineers.

The midwinter convention of the Illuminating Engineering Society will be held at the Engineering Societies Building, New York City, on February 10 and 11. At the first session, which will be held on Thursday morning, addresses will be made by Mayor Mitchel, A. E. Kennelly, Charles P. Steinmetz, L. B. Marks, Hugo Munsterberg, J. Lawrence Mauran, F. Parke Lewis and George B. Cortelyou.

Sessions for the reading of papers will be held on Thursday afternoon, Friday morning and Friday afternoon. At the last session there will be an illustrated address by W. D. Ryan on the lighting of the Panama-Pacific International Exposition. On Thursday evening there will be a dinner at the Hotel Biltmore, at which honorary membership will be conferred upon Thomas A. Edison. The presentation will be made by John W. Lieb and addresses will be made by President Charles P. Steinmetz and A. E. Kennelly. A vaudeville entertainment will follow.

The following papers are to be presented: "Relation of Lighting to Architectural Interiors," by Morgan Brooks; "Candlepower Measurements of Series Gas-Filled Incandescent Lamps," by Ralph C. Robinson; "Theater Lighting," by Bassett Jones; "Illuminating-Engineering Photographs," by B. H. Norris; "Lighting of the General Offices of the Consolidated Gas and The New York Edison Companies, Consolidated Gas Building, New York City," by Thomas Scofield and Clarence L. Law; "Gas Lighting of a Large Cathedral in Philadelphia," by J. D. Lee; "An Interlaboratory Photometric Comparison of Glass Screens and of Tungsten Lamps—Involving Color Differences," by G. W. Middlekauff and J. F. Skogland; "An 'Average Eye' for Heterochromatic Photometry, and a Comparison of a Flicker and an Equality-of-Brightness Photometer," by E. C. Crittenden and F. K. Richtmyer; "An Integrating Sphere," by E. B. Rosa and A. H. Taylor; "The Box Photometer," by L. O. Grondahl.

The General Convention Committee consists of Arthur Williams, L. B. Marks, Preston S. Millar, D. McFarlan Moore, George H. Stickney, Norman Macbeth, H. B. McLean, W. H. Robinson, A. S. McAllister and Clarence L. Law.

The Committee on Awarding Honorary Membership to Mr. Edison is made up of the following: John Purroy Mitchel (honorary chairman), Arthur Williams (chairman), Walter R. Addicks, U. N. Bethel, William H. Bradley, Nicholas F. Brady, A. W. Burchard, Nicholas Murray Butler, Newcomb Carlton, Robert A. Carter, J. J. Carty, Charles H. B. Chapin, Thomas W. Churchill, Charles A. Coffin, George B. Cortelyou, Dudley Farrand, F. M. Feiker, Wilbur C. Fisk, Lewis B. Gawtry, Cass Gilbert, E. R. Graham, George H. Guy, Thomas Hastings, Frank Hedley, W. Greeley Hoyt, A. C. Humphreys, F. L. Hutchinson, M. R. Hutchison, T. I. Jones, Clarence L. Law, J. W. Lieb, T. C. Martin, William H. Meadowcroft, T. M. McCarter, James H. McGraw, H. B. McLean, Joseph B. Murray, Thomas E. Murray, Walter Neumuller, L. A. Osborne, George F. Parker, J. E. Phillips, Charles W. Price, C. G. Ramsdell, C. W. Rice, E. W. Rice, Theodore P. Shonts, Frank W. Smith, B. W. Stilwell, George A. Taber, C. G. M. Thomas, G. E. Tripp, Theodore N. Vail, J. M. Wakeman, W. F. Wells, Frederick Whitridge, Timothy S. Williams, William Williams.

Electrochemists to Discuss War Supplies.

On the evening of February 11 a meeting will be held by the New York Section of the American Electrochemical Society jointly with the Society of Chemical Industry and the New York Section of the American Chemical Society. This meeting is to be held at the Chemists' Club, 52 East Forty-first Street, New York City. A symposium on electrochemical war supplies is to take up the main part of the evening and will include, among others, addresses on "Electrochemical War Supplies," by Lawrence Addicks; "Air Saltpeter," by W. S. Landis; "Hydrogen for Military Purposes," by E. D. Ardery (United States Navy); "New War Products," by Albert H. Hooker; "Magnesium," by William M. Grosvenor; "Liquid Chlorine," by G. Ornstein; "Electric Steel," by George W. Sargent.

Wire Concerns in $1,000,000 Merger.

The filing of incorporation papers in Yonkers, N. Y., recently has disclosed the merger of the Habirshaw Wire & Cable Company, of Yonkers, with the Electric Cable Company, of Bridgeport, Conn. The new corporation, which has a capital of more than $1,000,000, will be known as the Habirshaw Electric Cable Company. The Yonkers plant will be enlarged to employ 1,000 hands instead of 225. The merger will not affect the Bridgeport plant, which will henceforth be devoted to the manufacture of light grades of wire. It employs 800 men.

Illinois State Electrical Central-Station Men to Meet.

A convention of the Illinois State Electric Association will be held at Champaign, Ill., on February 23 and 24. This Association did not hold a regular annual convention last year and the meeting proposed is therefore the first general meeting since the fall of 1914. The arrangements are in charge of a convention committee of which J. J. Frey, president of the Southern Illinois Light & Power Company, Hillsboro, Ill., is chairman. The secretary of the Association is H. E. Chubbuck, Peoria, Ill.

Generators for Supplying New Haven Railroad.

In an editorial entitled "Tendencies in Large Generating Units" in the issue of January 22, reference was made to the two 20,000-kilowatt generators installed in the 201st Street power station of the United Electric Light & Power Company, New York City, for supplying energy to the New York, New Haven & Hartford Railroad. It was inadvertently stated that these machines were installed by the New York Edison Company, instead of the United Electric Light & Power Company.

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Electric Power in Gold-Ore Reduction

Details of a Noteworthy Motor Installation at the Mill of Golden Cycle Mining & Reduction Company Where a Ton of Ore is Treated at an Average Consumption of 22.6 Kilowatt-Hours

Industrial Power Series—Article No. 153

The milling end of the mining industry, while a very important part, is not given much thought outside of mining circles. It is considered simply as a clearing house or conveyance to the market for the gold bullion, and not worthy of much discussion.

The mill of the Golden Cycle Mining & Reduction Company, Colorado Springs, Colo., however, has won a position which commands attention, due largely to its size, methods and efficient operation. It is a modern cyanide mill for the treatment of refractory ore, and is capable of treating completely 1,300 tons of ore per day, bullion bars being the final product having a fineness of 0.940 on the basis of 1.000 being pure gold.

This bullion is sold to the United States Mint at Denver, Colo.

The ore here treated is mined in the Cripple Creek district, 48 miles distant, and is conveyed to the mill in standard railroad cars. Owing to this ore having characteristics not found in other Colorado ores, the mill is adapted for its treatment exclusively.

The company owns its own coal mines, located upon 15,000 acres of coal land near the city, which are also electrically operated, and draws therefrom 200 tons per day for mill use.

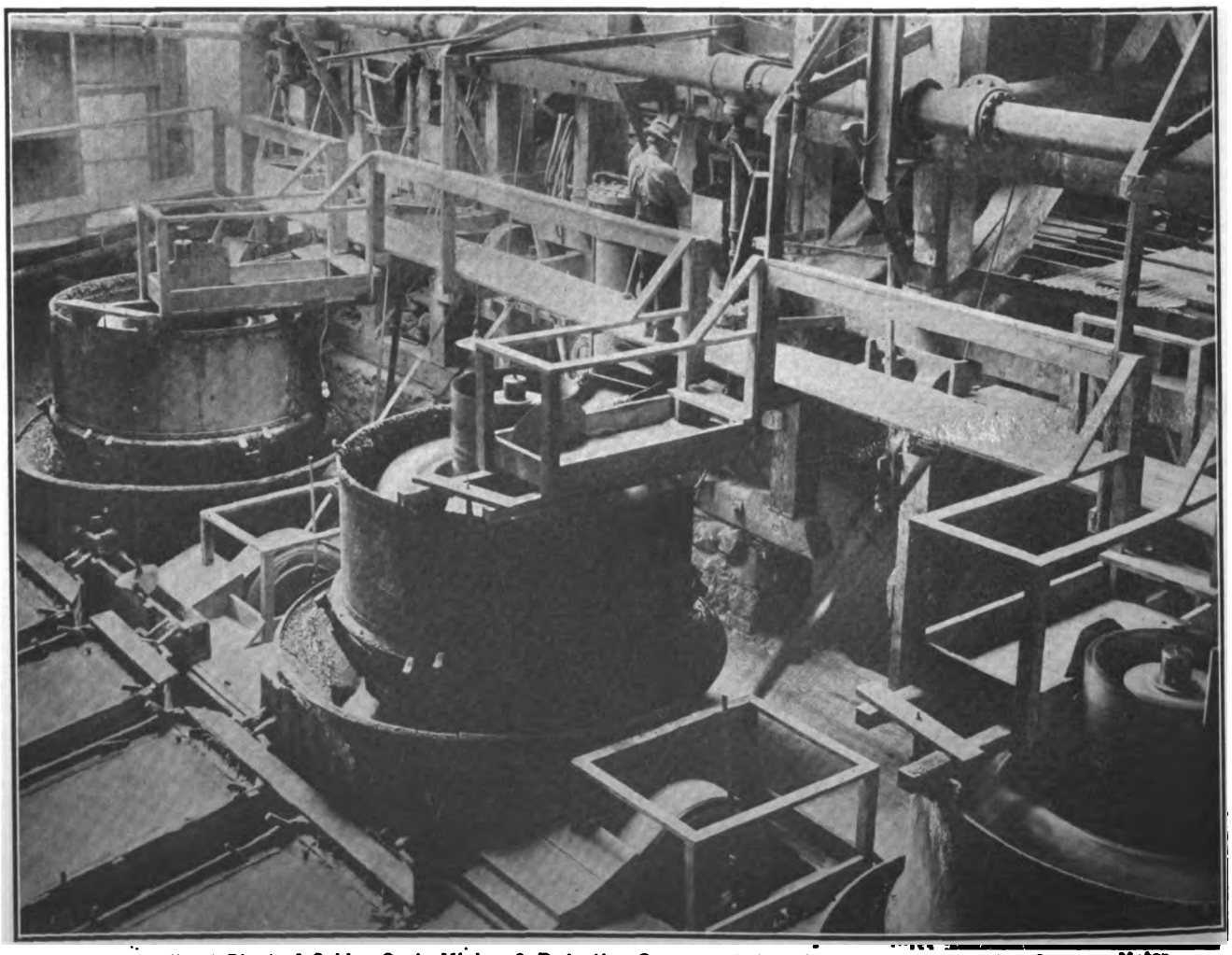
Electric power is used throughout the mill, and is purchased from the Colorado Springs Light, Heat & Power Company, in the form of three-phase, 60-cycle, 6,600-volt energy on a basis of maximum demand plus current consumed.

The maximum demand is taken over intervals of fifteen minutes by printometers, which stamp the readings on paper tapes. At the end of 30-day periods the maximum demand is ascertained by taking five of the highest 15-minute readings during five days of the period, 80 per cent of the sum of these readings being considered the maximum demand in kilowatts.

The current consumed is ascertained by recording meters in the usual way.

The mill is supplied with power by two separate circuits from the substation of the electric company, one and one-half miles from the mill. Here are also installed the automatic oil switches and measuring meters referred to. The mill substation contains eight transformers, totaling 1,500 kilovolt-amperes, the necessary primary and secondary busbars, a distributing switchboard with its oil switches and measuring instruments.

The current is here transformed to 440 volts for power and 220/110 volts for lighting.



Chilian Mills at Plant of Golden Cycle Mining & Reduction Company Driven by 250-Horsepower Synchronous Motor.

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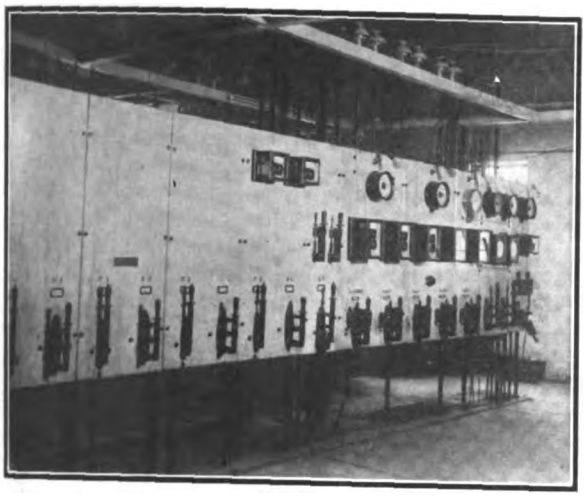
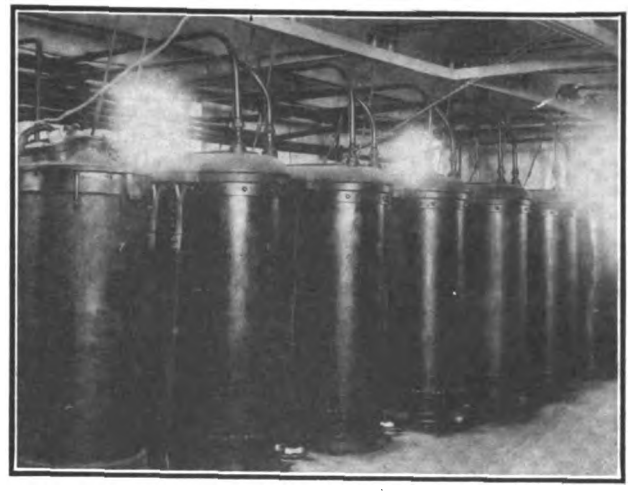


Main Switchboard in Mill Substation.



Bank of Step-Down Transformers.

All outgoing circuits to the different parts of the mill are separately metered and charged for the current consumed.

Motor Installation.

There are engaged in this service 82 induction motors of various sizes, from 0.5 horsepower to 300 horsepower, with a total rating of 3,550 horsepower.

The operation of the mill is continuous from the time the ore is unloaded from the cars until it finally rests as barren sand upon the dump ground, consequently any break in the line of travel must be repaired at once. To provide for this several spare motors of various sizes are kept ready for any emergency.

A generous supply of spare coils and other parts are carried on hand for repairs.

Most of these motors are of the squirrel-cage type, though a few have wound rotors and internal resistance.

All motors above 10 horsepower are protected by air and oil circuit-breakers.

These motors are all subject to severe operating conditions, due to the large quantities of dust prevalent, which requires all belts to be kept at a good tension to insure proper speed, necessitating careful watching and frequent changes of bearings.

For this purpose we find the air-gap gauge indispensable for watching the motor clearance.

The ore is very hard, and requires three grinding processes to prepare it for the cyanide treatment. The first operation is accomplished as it is unloaded from the cars by two large rock crushers, which are driven by the two 100-horsepower motors, the next by comminuters, six in number, which are cylinders 7 feet in diameter by 7 feet long, in which are placed steel balls 5.5 inches in diameter. Four of these are driven by a 300-horsepower motor and two by a 150-horsepower motor. The ore is then given a heat treatment in coal fired roasters to oxidize it and to drive out the sulphur contained therein. These roasters are fired by gas producing fire boxes using steam and air. Three water-tube boilers totaling 450 horsepower are used for furnishing steam for these fire boxes, a steam fire pump and heating purposes.

There are nine of these roasters divided into two groups, each group driven by a 100-horsepower motor through line shafts and belting. It is next ground wet in a weak cyanide solution in seven Chilian mills, divided into two groups, each group driven by a 250-horsepower motor, one of which is a synchronous motor used for power-factor correction. The ore from here is divided 60 per cent sand and 40 per cent slimes, and is accomplished by nine classifiers driven by a 20-horsepower motor. The sand is conveyed by belt conveyors to leaching tanks 50 feet in diameter by 7 feet deep, each holding 600 tons each.

The slimes go to filter tanks holding 60 tons each, and are treated by dry vacuum to extract the gold solution. This slime must be handled rapidly to prevent settling, and is accomplished by two eight-inch centrifugal pumps, driven by a 100-horsepower motor, which moves one of these 60-ton tanks in three and one-half minutes.

The cyanide solution, after extracting all value possible from the sand and slime, is passed over zinc shavings, which leaves a precipitate of gold, which is dried and reduced in graphite crucibles in tilting furnaces operated by 0.75-horsepower motors. It is then in bullion form, and is ready for the mint.

The barren sand is mixed with equal parts of water, introduced by pressure hose from a three-stage turbine driven by a 90-horsepower motor, delivering 750 gallons per minute, at a pressure of 110 pounds. This sand and water is sent to the waste dump by a six-inch centrifugal pump driven by a 50-horsepower motor.

The ore is shoveled by hand from the cars, and is thereafter handled by belt conveyors and pumps, which require 16 motors varying in size from 5 horsepower to 35 horsepower and travels a little over 6,000 feet before it finally reaches the waste dump.

A tramway system using a two-ton locomotive operated by a 110-volt direct current distributes coal to the roasters referred to.

About 3,500 60-watt lamps are used to light the buildings and about 20 500-watt lamps light the ground about the buildings. These buildings cover ten acres of floor space and a large acreage is owned for dumping ground for the waste.

Electric current is also used in the laboratory and assay office for heating purposes, which consist of five hot plates 18 inches by 24 inches, consuming 3,000 watts each, and a water still consuming 2,500 watts.

Interesting Operating Features.

Owing to the severe power demands of the grinding processes referred to, load-factors of 65 per cent to 70 per cent were obtained over twelve-month periods. As this is a continuous operation the load-factor did not result in very good economy.

With the idea of improving this condition during 1915 a system of load dispatching was put into effect, which did not penalize any of the mill operations, and resulted in raising the load-factor to about 84 per cent.

This arrangement consists of a solenoid operated by a part of the main current through a mercury contact, which in turn operated a current relay. This relay then operates a steam whistle when the power peaks exceed the value for which it is set, and enough load is dropped to compensate for the peak created.

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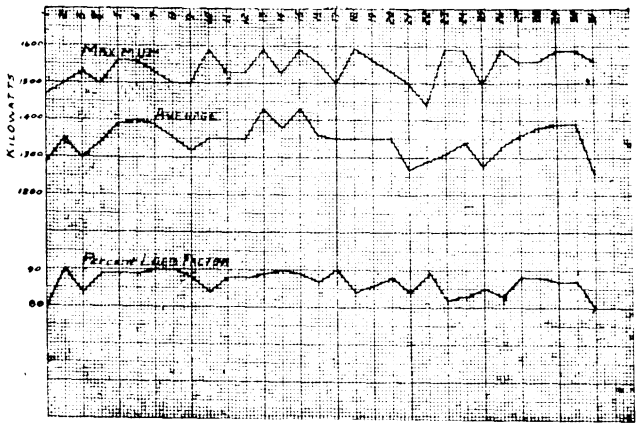


Typical Monthly Load Curve Showing Maximum and Average Demand and Load-Factor.

A typical curve is shown for the month of October, 1915, which shows the maximum demand and average kilowatts, also the resulting load-factor. Power-factor is not shown, but will average 86 per cent. During the month 1,002,210 kilowatt-hours were consumed, with a maximum demand of 1,590 kilowatts as settled for, treating 40,700 tons of ore, at the rate of 22.6 kilowatt-hours per ton. This load factor exceeded expectations, and seemed phenomenal, but twelve months' history confirms the possibility of its uninterrupted continuation.

The ore has an average value of $20.00 per ton, and the extraction is 98 per cent. This together with the load-factor obtained results in a very good economy.

All buildings have the automatic sprinkler system for fire protection, and in addition to the steam-driven fire pump, with a capacity of 750 gallons per minute, there is a three-stage turbine pump direct-connected to a 90-horsepower motor with a capacity of 750 gallons per minute, either or both of which are ready for immediate use in the event of fire.

A well-equipped motor-driven machine shop is maintained for any repairs necessary, also an electric repair shop for repairing the electrical equipment.

Five men are regularly employed in the electrical department.

Cyanide of sodium is the chemical used in this process, and as this is a product made in this country the mill does not suffer any inconvenience in obtaining a continuous supply.

The mill gives regular employment to 200 men the year round.

The photographs reproduced herewith show some of the motor applications and other equipment.

North Carolina College Receives Valuable Physical Laboratory Equipment.

The North Carolina College of Agriculture and Mechanic Arts has just received an exceedingly valuable donation, consisting of physical and electrical apparatus. This was the apparatus in the private physical laboratory of William Kearney Carr, a native of North Carolina, but residing at the time of his death in Washington, D. C.

Mr. Carr was an enthusiastic student of physics and for the last 20 years of his life devoted every evening to study and research. During this time he brought together much valuable apparatus for investigations in different branches of physics.

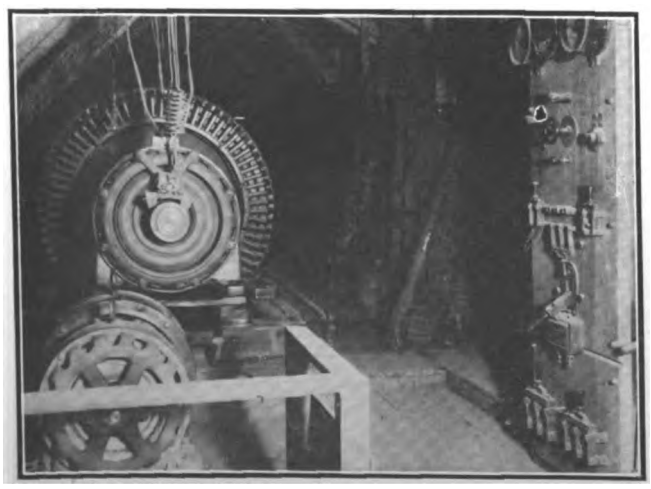
He was interested in X-rays and his laboratory contained a number of the finest X-ray tubes with all the accessories. Radioactivity also received attention and several samples of radium salts are included in the laboratory equipment with spinthariscopes, electroscopes and fluorescent ores.

At another time Mr. Carr devoted a good deal of attention to polarized light. His collection of Iceland spar and Nicol's prisms is large, as is also that of his slides showing beautiful and wonderful color effects. Most of these he himself made and they are proof of his skill as a demonstrator. The Zeeman effect was also shown to his visitors by means of apparatus which he himself constructed.

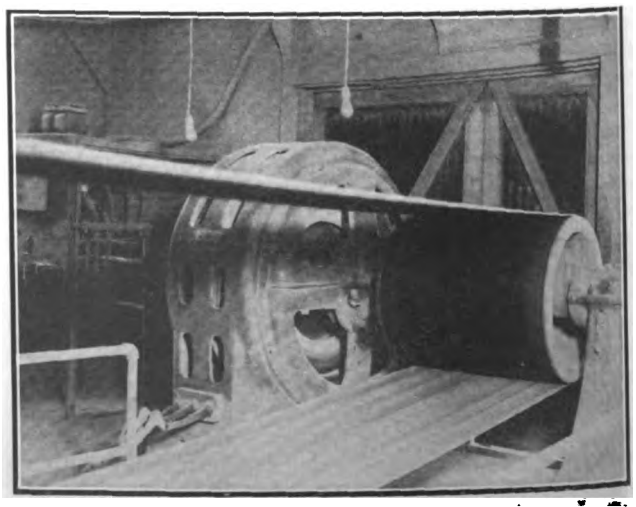
This apparatus has now been received at the college and is being installed in a separate room to be known as the Carr Physical Laboratory, which will supply a much needed addition to the physics equipment, and give opportunity for graduate study and research which had hitherto not been possible.

Engineering Board to Investigate Traction Facilities in Chicago.

A special board of three experienced traction engineers, consisting of Bion J. Arnold, of Chicago, and William Barclay Parsons and Robert Ridgeway, of New York, has been appointed to make a thorough study of the local tration facilities of Chicago and to make definite recommendations for their improvement by the construction of subways, by unification of the elevated and surface electric traction systems, by the building of additional elevated lines, and by any other means to meet the needs of the rapidly growing traffic. The investigation and report is expected to take about six months. The ordinance creating this board was passed by the City Council on January 31 and $220,000 appropriated from the city's traction fund to cover the cost of the work; each of the three engineers named will receive $30,000.



250-Horsepower Synchronous Motor Which Drives Battery of Chilian Mills.



300-Horsepower Synchronous Motor for Driving Comminuters, Golden Cycle Mill.

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The Horse Versus the Electric Vehicle

Some Original Statistics on the Advantages of Electric Vehicles as Compared With the Horse-Drawn Equipment in Commercial Service

By A. J. Marshall

Far-sighted people who have studied horse and motor-traffic conditions in this country for the past few years, have confidently pronounced the doom of the horse in the commercial field. This may seem to be a rather broad statement considering the fact that there are over 26,000,000 horses and draft animals in use in the United States at the present time, and that there are approximately only 130,000 mechanical vehicles and 60,000 tractors used. While motorized equipment is supplanting the horse in some of our largest cities where traffic conditions demand greater speed and efficiency, there are 10,000,000 horses distributed among the urban districts of the country in cities and towns of more than one hundred. It is difficult for those who live in large cities and constantly see thousands of motor vehicles doing the work that was done by horses ten or fifteen years ago to realize that only a very small percentage of horses have been displaced by motor equipment.

To quote G. Arthur Bell, of the Bureau of Animal Industry, Washington, D. C.: "It is estimated that there are approximately 100,000,000 horses in the world. Of this number the United States possesses 24,000,000 or practically one-fourth."

Care and Upkeep of Horses Costly.

A complete revolution from horse-drawn to motorized traffic will take time and the experience of the more progressive to educate and convince the general public. Every means should be brought to bear to hasten this change for the city horse is the greatest economic waste today in this country. For the 10,000,000 horses used in our cities and towns consider the enormous amount of labor devoted to their care and upkeep and the cost this entails.

The government estimates that the average food consumption of a horse is 10 pounds for every hour he works or a total of between 12,000 and 14,000 pounds per year, which is the average production of five acres of average agricultural land in the United States. It costs about 90 cents a day merely to feed a large draft horse. Shoeing a draft horse in urban service costs about $30 a year. It is said that the iron alone that is hammered by blacksmiths in the United States into horse shoes in one year is sufficient to make 40,000 farm tractors or 60,000 motor trucks.

In order to maintain sanitary conditions in our cities, thousands of stables and street cleaners must be employed, another item of expense chargeable to the maintenance of the city horse, approximating $10 per horse per year. In addition consider the tremendous amount of labor expended in hay making and corn growing, the labor of mechanics who make "horse feeding" machinery of which a conservative estimate would amount to about $50 per year per horse. A recent government report states that the horse averages but four hours of useful work per day in city service. For 300 working days (which is a very high average) his labor is valued at not more than $3 per day, the figure at which horses are hired to the public. At $3 per day for 300 working days the horse gives a total service of $900 per year.

In some lines of business a horse's useful life does not exceed three years. Compare this with the longevity of the electric truck, for example, which is from ten to fifteen years. The total expenses which this country assumes for the ten million horses in use in our cities and towns is in excess of $7,400,000,000.

Costs $2,000,000,000 Annually to Feed Horses.

The economic waste resulting from feeding the total of 26,000,000 horses and draft animals in the United States is practically impossible to calculate. Using the government's estimate that one horse requires five acres of land for his upkeep and the fact that five acres of land devoted to food product can be made to feed five people per year, the result shows an acreage sufficient to maintain a population of 125,000,000 people that is now being devoted to the raising of horse feed, or an acreage nearly equal to the combined areas of New York, New Jersey, Massachusetts, New Hampshire, Maine, Vermont, Rhode Island, Delaware, Connecticut, Pennsylvania and Ohio. To feed these 26,000,000 horses it costs $2,000,000,000 annually or a sum equal to the operating expenses of 250,000 miles of railway in the United States.

R. W. Hutchinson, Jr., in a recent article in *Collier's Weekly* states that a horse requires 750 cubic feet of space. With his adjuncts, including feed room, harness room, wagon room, an additional space of 2,500 cubic feet is required, or a total of 3,250 cubic feet per horse. In cities, which average about 10 cents per cubic foot for housing horse and vehicle units, this implies a total investment of $2,875,000,000 to shelter the 10,000,000 horses. If the acreage devoted to stabling in our cities and towns were used to house human beings, or for industrial plants, the value would increase 50 per cent. In addition to this all real estate contiguous to stables suffers a 50 per cent depreciation.

Space Economy of the Electric.

When we consider that five electric vehicle units, for example, could be garaged in the same cubic space required for one horse and wagon and adjuncts, it is apparent that there are enormous possibilities not only to manufacturers of such vehicles and to electricity supply companies, but for greatly improved traffic conditions, and better sanitary conditions, all of which make for greater efficiency and economy. Among some of our largest cities, New York, for instance, reports 128,122 horses; Chicago has 68,050 horses; Philadelphia has 50,461 horses, while St. Louis reports 27,182 horses. In Boston there are 22,997 horses and in Cleveland 16,839. Pittsburgh has 12,832 and many cities report from 8,000 to 10,000 more. There are scores of cities having 5,000 and 6,000 and but few of 25,000 inhabitants where the number of horses is less than 1,000.

Were New York City alone to be electrified to the exclusion of all other cities, it would take the present makers of electric vehicles using their present facilities approximately five years to make the change. It would take these same builders five more years to build enough vehicles to replace those that might be worn out at the end of ten years' service. Each horse now in use in our cities means a possible minimum yearly income to the central stations of between $80 and $100 if replaced by an electric vehicle. In New York City for example there is a minimum of something over $10,000,000 annually to be derived from the sale of current for electric vehicles in the place of horses.

Horses Can Be Replaced By Electrics.

Of the 10,000,000 horses in use in our cities, probably all could be successfully displaced by electric vehicles.

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This would mean an additional income to some 6,000 electricity supply companies of about one billion dollars. This is all the more significant when we consider that the combined income of all these central stations from all sources last year was approximately $450,000,000, of which but a very small percentage was derived from the sale of current for electric-vehicle charging.

Even if only a small fraction of the business in sight were obtained it would represent a tremendous increase in the total incomes to the electricity supply companies.

Aside entirely from the gain to be derived by manufacturers of electric vehicles, electricity supply companies, and users, in a change of this nature, is the sanitary aspect of the situation. It is said that over 100,000 people in this country die yearly by so-called "horse-caused" diseases. Every spring comes the campaign against the house-fly and we hear repeated the slogan of "swat the fly", but very little is said about destroying the source of the danger associated with the fly. We know that a fly would be perfectly harmless were it not for the disease germs that it carries around and as long as we have stables near city dwellings and insanitary streets the fly will continue to be a disease carrier and a pestilence.

Municipalities should recognize this fact and take the initiative in exterminating the city horse substituting motorized vehicles in all municipal departments where vehicles must be used. Many cities are recognizing the superiority of the electric over horse-drawn equipment by using them in fire department service, for collection of refuse, in street sprinkling, ambulances, mail and for city officials, etc. The Electric Vehicle Association of America has taken an active part in the efforts to electrify the fire departments of various cities and it is gratifying to note the ever increasing number of electrics being used in this particular service in many of our large cities.

In connection with the sanitary aspect of the city-horse situation, and in order to rid their cities of one of the greatest sources of economic waste, the Electric Vehicle Committee of the Incorporated Municipal Electrical Association of Ipswich, England, which works in co-operation with the Electric Vehicle Association of America, recently sent the following letter to city officials:

"The Manchester Corporation, city authorities, have recently served notices upon a large number of owners and tenants in the city to abate an alleged nuisance by discontinuing to keep horses on their premises. It is likely that this commendable action by the Sanitary Committee of the Manchester Corporation will be followed by other progressive cities and towns, since it is admitted by all who are qualified to give an opinion that the presence of stables in urban areas is harmful to the public health.

"If horses are to be displaced in this way, motor traction in some form will have to be adopted.

"From the standpoint of public health, the petrol vehicle is also most objectionable, owing to the noxious gases emitted by the exhaust and also to the nerve-racking noises caused by the engine and gears, especially at central garages.

"On the other hand, the electric battery vehicle is in every way an ideal vehicle for town use. It is odourless, silent, and by far the cheapest to run. It also causes considerably less road wear than the petrol vehicle.

"My committee therefore suggest that municipalities should make special efforts to encourage the use of the electric battery vehicle in the area under their control. The most convincing way of doing this is to set the example by house refuse removal, cartage of road and other materials, ambulance work, fire brigade work, cartage of coal and ashes, as well as for passenger vehicles by means of electric battery omnibuses. Smaller electric vehicles can also be used to advantage for the transportation of officials in performance of their duties.

"Not only will the adoption and use of electric vehicles in these directions gradually have the effect of doing away with stables, but it will, in addition, bring a handsome revenue to the Electric Supply Undertaking which nearly every municipality nowadays owns.

"My committee wish particularly to emphasize the point that there is nothing experimental about the modern electric vehicle. It has been evolved out of years of experience. Many thousands are now in use in America, and the results obtained there prove that, as regards low running cost and reliability it cannot be approached by any other system of road haulage.

"It also has the added means of depending for the source of energy upon the natural fuel of this country, i. e., coal.

"In bringing the above facts and suggestions to your notice, my committee have every confidence in asking you to give them your careful consideration and to examine for yourself the examples of electric vehicles that are daily becoming more numerous in this country."

It is a very significant fact that in spite of the war on the continent England is active in the attempt to further the plain every day commercial interests of her cities and towns. Prior to the outbreak of the war a comparatively small amount of electric vehicle promotion work had been carried out in England, and not much progress had been made. When war was declared and all available horses were sent to the front and thousands of gasoline cars were commandeered merchants were promptly acquainted with the advantages of the electric commercial vehicle as a medium of transporting merchandise and a number of large installations were promptly made. These installations have been so eminently successful that many additional concerns are substituting the electric for horse-drawn and gasoline equipment. When the war is over and business conditions are righted, it seems likely that the electric vehicle will have become recognized as the car par excellence for city and suburban work. A bright future for the electric vehicle is apparent to anyone familiar with traffic conditions in English cities, with the very high cost of gasoline and very low cost of electricity.

Electric Vehicle Men Meet at Boston.

A dinner and meeting of leaders in electric vehicle promotion, centering in Boston, was held at Hotel Thorndike, January 27. J. T. Day, manager of the Malden Electric Company, presided, and the principal speaker was Hon. John N. Cole, chairman of the Boston Industrial Development Board.

A report on Boston mail delivery service, prepared by a committee of which F. M. Kimball, of the General Electric Company, was chairman, was read by C. H. Miles.

H. Jardine, in charge of transportation for the American Express Company, in Boston, made a favorable report on electric delivery service during the severe December snowstorms. Forty-nine electric were on routes, the company securing more than 95 per cent of normal working mileage, i. e., actual freight carriage.

Edmund H. Hewins, electrical engineer, pointed out the need of preparedness to meet traffic requirements.

Mr. Cole spoke on the various disadvantages, in lack of transportation facilities, hampering industrial laws, etc., which Massachusetts, and particularly Boston, is laboring under, and called upon the electric vehicle men to cooperate in "boosting Boston." Last year the greater city produced over $600,000,000 worth of manufactured goods, which meant vast sums for haulage. The speaker believed that power vehicles are the one solution of street congestion in downtown Boston, which is at present a much agitated subject.

The Industrial Development Board is making the first complete survey and tabulation of Boston's industries. When finished, this will be a valuable review of the city's industrial conditions, needs and opportunities.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Paying Salesmen on Commission Basis Stimulates Appliance Sales.

The practice of the New Orleans Railway & Light Company in the matter of appliance sales has borne out the theory that the most satisfactory results can be obtained by paying salesmen strictly on a commission basis.

The commercial department of this company for about two and one-half years has employed special salesmen on commission for the sale of appliances. At the outset these men received a salary of $1.00 per day plus the commission. The company hired buggies and sent salesmen out in pairs, a stock of electric irons being carried in each rig. The irons were sold on the installment plan of 50 cents down and fifty cents per month. The salesmen received a commission of 50 cents for each iron sold. Notwithstanding the fact that these men were not acquainted with the business they sold about 500 irons per month.

It was on the strength of this success that the company organized its appliance department and display room and increased the number of commission salesmen to about 20. The practice of sending a supply of appliances with each salesman was discontinued and hand books containing illustrations of all appliances for sale were provided. The sales increased from 750 to 1,000 devices per month. Soon after the company made a careful canvass of the entire city, compiling a card index of all prospects and customers, each card bearing information as to whether or not gas or electricity was being used and what appliances were installed. It is the duty of the commission men to secure contracts for any class of business obtainable on the premises. The present commission force which comprises most of the salesmen of the commercial department now consists of about 25 men who are especially efficient in this work.

Electric Radiators Heat School When Boilers Fail.

An instance of the absolute reliability of central-station service and its many uses is illustrated by an emergency installation recently made at Duluth, Minn. During a recent cold snap, the boilers in the Children's Home, a neighborhood school, were put out of commission, as a result of tube trouble, and it took about 24 hours to repair same.

There were approximately 100 little tots in the institution, and in order to keep them as comfortable as possible, a large number of electric radiators were installed in various rooms. The radiators were furnished by the Northern Electrical Company, and the Duluth Edison Electric Company. The experiment proved quite successful.

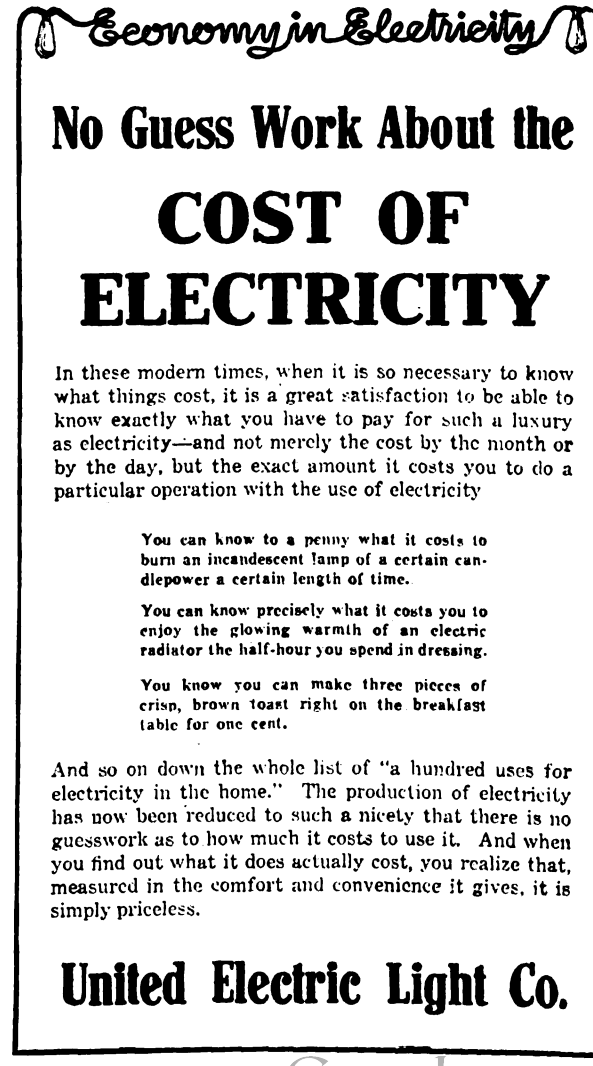
Advantages of Electric Vehicles Told in Pictures.

"Some Pictures and a Few Words," is the title of a new booklet produced by the New York Edison Company, which sets forth pictorially the advantages of the electric automobile over the horse-drawn vehicle. No end of material has been written on this subject, and volumes of statistics prepared, but practically the whole story is told simply and graphically in a score of pictures in this little book, which has not a line of copy except the captions of the pictures. Nothing could be more convincing or vivid than the photographic evidence which it contains of the superiority under all conditions of the electric over the horse and wagon in delivery service. The keynote of the whole proposition is comparative economy, economy in operating cost, in care, in room occupied when not in use, in space occupied at the loading platform or at the curb, and in dependability under adverse weather conditions.

Effective Advertising at Springfield, Mass.

The United Electric Light Company, Springfield, Mass., is notable for its well expressed advertising forms displayed in the local newspapers.

One of these appearing recently pointed out the fact that there is no guesswork about the cost of electricity, but that the cost for light, heat, cooking and other domestic uses is measured by the quantity actually used.



Advertisement of Springfield Company.

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SERVICE TO THE PUBLIC.

By Thomas R. Hay.

Service is a fundamental necessity in the upbuilding of any public utility. Most of life is made up of either giving or receiving service, and more and more the central-station management is coming to realize that it must render service first and pay dividends afterwards if it is to justify its existence. The one is reflected in the other, and in proportion as a central station renders service, both public and personal, public in so far as the whole people are concerned, and personal where the individdual user, whether he be a manufacturer or a private consumer of light or power, is concerned, in just such proportion will the dividends of the enterprise take care of themselves. This service can be rendered and made apparent, not only in the collective and impersonal attitude of the central station, but also in the individual man-to-man attitude. The treatment of the public, whether user or prospective user of this service, by employees, is largely determined by the attitude of the corporation to this public. Collective service in the way of continuity of supply, made possible by up-to-date equipment properly installed and cared for, promptness in connecting new customers, promptness in reporting and repairing "trouble," etc., and personal service in the way of giving, pleasantly and clearly, information in answer to inquiries, in adjusting complaints and in explaining the many phases of the service which are unintelligible to the layman, are expected and demanded by the public, and should be rendered in as courteous and efficient a manner as possible. The central-station employee, whoever he may be, executive, salesman, clerk or lineman, should continuously realize that he represents the corporation in a tangible and visible manner to the prospect, or user, and that the central station will be judged in accordance with the consideration and courtesy with which the question at hand, no matter what it may be, is handled.

In the past the corporate attitude of the central station was one of more or less indifference, but with the widening sphere of usage and the creation of regulating commissions this has given place to one of intelligent and sympathetic co-operation and interest and to a clearer realization that the success of the central station, not only as a public utility, but as a business enterprise, carried on for the profit of its stockholders, is in direct ratio to the service rendered. In the last ten years central-station executives have come, more and more, to understand that the organization, individually and collectively and in all its many phases, must give service, and as the public has come to realize just what this service should mean to it, it demands and insists that this service be rendered. And so the central station must give service, as failure to do so will at once impair its good will and indirectly lessen the value of its plant. Growth and progress will halt, and it is, therefore, not hard to perceive that any central station should adopt a policy of service because it is right, and also for purely selfish business reasons. The interests of the central station and of the public are identical, and the central station that serves the public well serves itself and its stockholders equally well. No detail is too trivial, no question too unimportant not to receive proper and sympathetic attention. Quantity and quality are the principal elements which determine the value of central-station service quantity, in so far as there is ample capacity to meet all requirements, and quality, as concerns the reliability of this quantity of service, together with the personal service rendered by the individual employees to the public.

Public utility officials and employees are, as a whole, striving to give the best possible service, but this fact is, at times, not as generally appreciated by the public and its authorized representatives as is desirable. The general attitude of central-station managements, as evidenced in discussions at conventions, has constantly been in harmony with the welfare of the consuming public and the great problem is always to render the best possible service under all conditions. Publicity is welcomed, as it never has been before, and in the most efficient use of this policy lies an opportunity for future advancement that is still to be realized. Rates for electric power and light service are being constantly lowered, and the quantity and quality of this service bettered and made more efficient and reliable. The policy of the open door is sure to reap its reward in this great and growing industry, but it should not be forgotten that this enlightened policy recognizes an obligation not only on the part of the central station, but it also imposes one on the public and its authorized representatives to recognize the physical and human limitations of central-station service and to cordially and sympathetically co-operate with it in the expansion of its market. Correlated with this obligation is the necessity for an understanding knowledge and appreciation of efficient corporate management, financing and operation. Always central-station management and operation should be governed by ideals of service, efficient, reliable and satisfactory service, and not by ideals of expediency.

Sign Legislation to Encourage Installations.

As an initial step in his campaign for more electric signs for Chattanooga, Mayor Jesse Littleton introduced an ordinance at a recent meeting of the city commissioners repealing the provisions of the building code which prohibit the construction of overhanging signs. The fire chief will continue to have supervision over their materials and can prevent their being placed in a position that would be detrimental to fire protection. Mayor Littleton stated that he believed the power company should furnish the city current free of charge for an electric sign, which would set a good example to prospective advertisers. There have been suggestions that an illuminated sign should be placed at the market-house.

The Associated Retailers' Association has gone on record in opposition to allowing overhead signs on the ground that each merchant, in order to have his sign conspicuous, would want it bigger and more conspicuously placed so as to have it hide his neighbors'. However, they approve the movement for more signs in general.

A $6.00 Housewiring Campaign Results in 365 Contracts.

Results are now available on an interesting housewiring campaign which was conducted by the Edison Electric Company, of Lancaster, Pa., during the month of November. During the campaign, which lasted for six weeks, 365 new house-wiring contracts were secured. The company relied entirely upon interesting the prospects through letters and literature sent through the mail, the total expense of advertising being very nominal.

The offer made by the Edison Company was to wire the parlor, dining room and kitchen for electric light for the sum of $11.00 and to give as premiums an electric coffee percolator and a six-pound electric iron to every new customer. In case the percolator was not desired, a reduction of $2.50 was made on the price of wiring and if the iron was not wanted, a reduction of $1.50 was made. In other words, if the customer did not desire the two appliances offered as premiums, the net cost of wiring for the three rooms was $6.00, inasmuch as a further reduction of $1.00 was allowed for payments made within five days after completion of the work. The campaign applied only to already-built houses.

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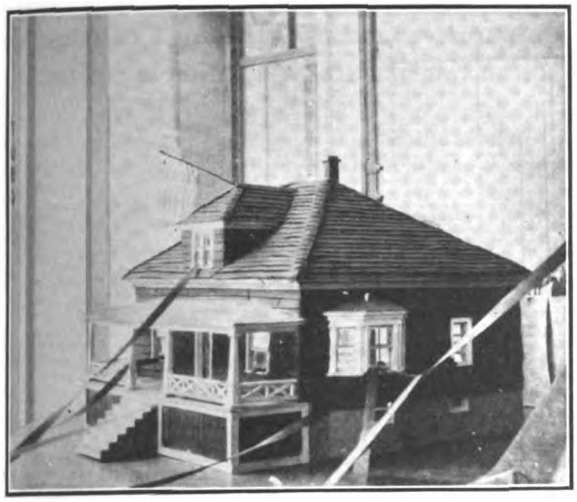


Model Houce Used In Window Display.

Lowell Window Display Conceived by Students.

A novel window display, designed to feature the type C lamp for house lighting, was recently set forth in the show window of the Lowell (Mass.) Electric Light Corporation. A model bungalow, consisting of four rooms and attic, made with attention to the last detail and having linoleum floors and papered walls, was lighted within by three 100-watt type C Mazda units, the light streaming from the windows giving an effective display, particularly at night.

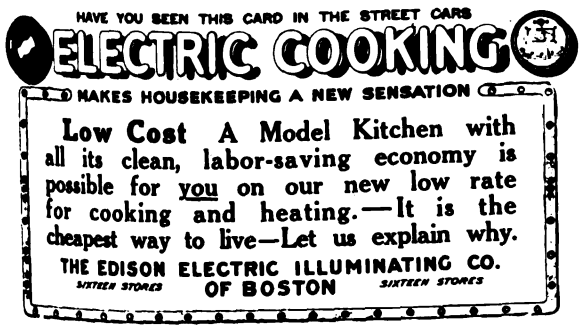
The model was the work of a class in the Lowell Manual Training School, whose members solicited the placing of it in the company's window, which was readily granted.

Boston Edison Company Sells 211 Electric Ranges in Four Months.

The first full carload of electric ranges to be delivered to any central station in that part of the country was received by the Boston Edison Company recently. Sales by this company to its customers have numbered 211 ranges since October 1, 1915. Thirty-six ranges are being installed in the New Beacon Apartments, Beacon and Mountfort Streets, Brookline, and 15 ranges in the Newhall Apartments, on Beacon Street, Brookline. The connected load in ranges in the Beacon Apartments is 182 kilowatts. The ranges installed in the Newhall Apartments are rated at 6,000 watts each, making a connected load of 90 kilowatts.

The location of the ranges in the first mentioned apartment house is remarkable. Owing to the limited size of the kitchenettes only the electric range was available in the space provided, which is a specially designed closet, into which the range is swung when not in use.

The Old Colony Real Estate Trust, Boston, has installed electric ranges in 20 single houses, and a Brookline builder has provided 18 new single houses with the modern cooking agencies, in which the Boston Edison Company's public is becoming intensely interested. As a means to this end, the advertising department is putting out some very effective publicity matter, of which the street railway placard herewith reproduced is a specimen.



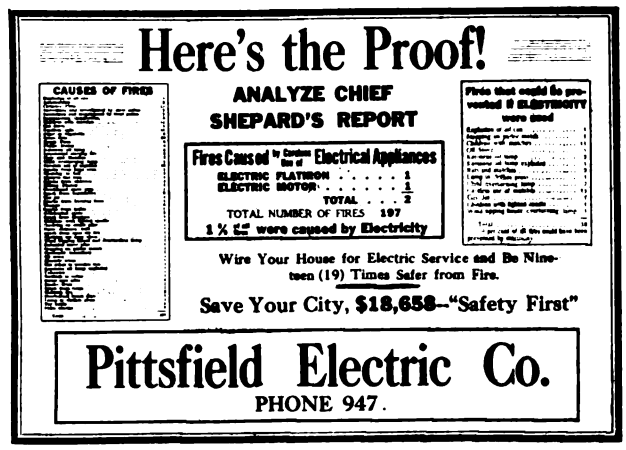
Street-Car Poster Used In Cooking Campaign.

The heating of private garages by electricity is another fruitful means of adding to the local company's connected load. More than 50 garages are now being heated by means of luminous radiators, having an aggregate capacity of about 200 kilowatts for the 79 radiators installed.

As an indication that electric cooking is increasingly popular it is pointed out that many gas and coal stove manufacturers are now producing electric ranges, the Boston Edison Company handling in all some 15 different makes, at prices from $20 up.

Capitalizing Safety of Electric Service.

The accompanying illustration shows an advertisement published in the daily papers by the Pittsfield (Mass.) Electric Company shortly after the report of the local fire department had been made public. The report showed that out of 197 fires in Pittsfield during 1915 only two were caused by electricity. The Pittsfield company was quick to appreciate the significance



Advertisement of Pittsfield Company.

of this record and the advertisement was the result.

It is shown that of all the fires 38, or 19 per cent, could have been prevented by the use of electricity in the home. The company therefore adopted the apt slogan "Wire your house for electric service and be 19 times safer from fire."

Broad Plans Under Way for 1916 House Wiring.

Never until the present year has there been a co-ordinated movement for house-wiring campaigns of maximum effectiveness, promoted by the entire electrical industry. With more money than ever before in the public's pocket, there is every prospect that 1916 can be made to witness a "grand clean-up" in the wiring of old houses, and with this thought in mind plans are being organized contemplating a concerted drive for this class of business.

The Society for Electrical Development is actively supporting the idea, and will assist in such ways as the furnishing of house-wiring window displays and other campaign material, by placing house-wiring articles in as many media as possible, also furnishing stories for supply to local newspapers, and by circulating descriptions of former campaigns that have proven most successful in practice. In this work the Society will be joined by the electrical trade papers and house organs. Special house-wiring literature is being prepared by the Commercial Section of the National Electric Light Association.

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ELECTRIC VEHICLES

Platform Wagon for Arc-Lamp Trimming Costs One Cent Per Mile.

A folding platform structure, erected on top of an electric service wagon, has been devised and constructed for use in arc-lamp trimming by employees of the Holyoke (Mass.) municipal electric light department.

On the top of a covered one-ton Detroit electric service automobile a slotted floor was constructed, with side frame of hardwood boards fitting securely on the supports of the cover. Attached to the side pieces is a collapsible

Electric Vehicle Used for Trimming Arc Lamps.

framework with telescoping side supporting rods. The uprights consist of five hardwood joists about 4 by 1.5 inches, with three horizontal slats fastened to the rear supports of the platform, providing a convenient ladder to reach the platform, which is 4 feet wide and 30 inches front and back.

The platform, when the structure is raised to operating position, is 4 feet 4 inches above the top of the car, and 12 feet 8 inches above street level. This is found to be the most convenient height for working on the luminous arc lamps, which are erected on poles which bring the arc 14 feet 6 inches above the street curb. The usefulness of the platform wagon in trimming, cleaning, etc., is obvious.

The telescoping supports consist of a 0.5-inch steel rod which slides inside a section of nine-sixteenths-inch iron conduit. Both the rods and conduits are fastened to the frame by single bolts which give them free movement. When the platform is raised for use, the center of gravity is carried forward so that the weight rests on the telescoping levers for its front support. Here it is latched automatically. When the platform is not in use, the framework is folded back onto the top of the car and secured by means of blots with wing nuts.

Comparative Cost of Operating a Passenger Gasoline Car of Same Valuation as an Electric.

The following are some comparative operating data on the cost of operating a gasoline car of the same valuation as a certain high-grade electric. The figures are for cars kept in a public garage, without chauffeur.

	Gas	Electric	Excess of Gas Over Electric Car in Per Cent
Insurance	$150.00	$135.00	11
Tires	512.16	250.32	100
Paint	150.00	125.00	20
Garage	300.00	420.00	29*
Overhaul, etc.	350.00	75.00	366
Oil	24.00	.....	.....
Gasoline	240.00	.....	.....
Batteries and battery incidentals	.....	360.00	24*
Total	$1,726.16	$1,355.32	27

*Difference in favor of gas car.

WITH RENTAL BATTERY.

Batteries	(Oil & Gas)	$ 192.00	37
Total	$1,726.16	$1,197,32	44

Batteries—Rental charge of $16.00 per month.

It will be noted that reference is made to the battery rental and the particular company responsible for these figures has also inaugurated the battery rental system as applied to the passenger type of electric vehicle. This system enables a purchaser to buy the car without batteries, renting them from an electric garage, and thereby assuring himself of batteries which are always maintained in excellent condition. The increased economy effected by this system as shown in the report is interesting.

The following data are given for cars kept in private garages and operated without a chauffeur:

	Gas	Electric	Excess of Gas Over Electric Car in Per Cent
Insurance, $2,000.00	$150.00	$135.00	11
Tires	256.08	125.16	100
Paint	150.00	125.00	20
Overhaul, etc.	175.00	37.50	366
Oil	12.00	.....	.....
Gasoline	120.00	.....	.....
Batteries	.....	175.00	.....
Current	.....	72.00	46*
Total	$863.08	$669.66	29

Figures based on mileage of 6,000 miles per year.

WITH RENTAL BATTERY.

Battery	(Oil & Gas)	$192.00	.....
Current	.....	72.00	50*
Total	$863.08	$686.66	26

In the figures tires for the gasoline car are 36 by 4.5 guaranteed for 5,000 miles while for the electric special cushion tires guaranteed for 10,000 miles are used. Garage charges for the gasoline car are $25 per month and for the electric $35. Oil is figured at 30 cents per gallon; gasoline at 14 cents; batteries on the basis of a 12-000-mile guarantee.

COST OF OPERATING ELECTRIC CAR ON COST-PER-MILE BASIS.

	6,000 Miles Per Year.	12,000 Miles Per Year.
Garage, Private.		
Battery, Bought—		
Tires	$0.02086	$0.02086
Overhaul, etc.	.00625	.00625
Batteries	.0291	.0291
Current	.012	.012
Total	$0.06821	$0.06821
Garage, Private.		
Battery, Rented—		
Tires	$0.02086	$0.02086
Overhaul, etc.	.00625	.00625
Batteries	.032	.016
Current	.012	.012
Total	$0.07111	$0.05511
Garage, Public.		
Battery, Bought—		
Tires	$0.02086	$0.02086
Overhaul, etc.	.00625	.00625
Garage	.07	.035
Batteries	0291	.0291
Total	$0.12621	$0.09121
Garage, Public.		
Tires	$0.02086	$0.02086
Overhaul, etc.	.00625	.00625
Garage	.07	.035
Battery	.032	.016
Total	$0.12911	$0.07811

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ELECTRICITY EFFECTS ECONOMY IN A SMALL BAKERY.

Details of Motor Equipment and Energy Consumption.

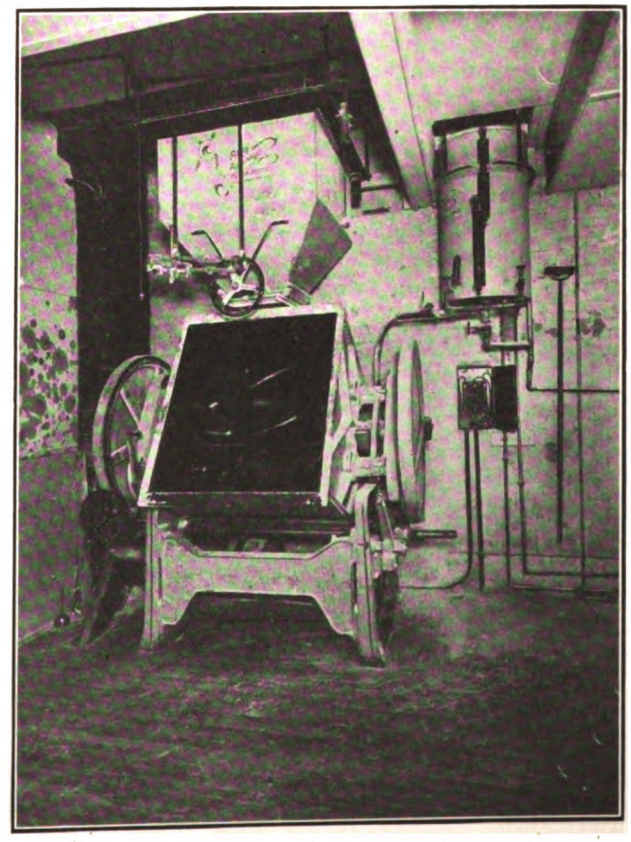
Bakeries offer especially desirable loads for central stations, the peak load of such establishments coming during the summer months, or during the off-peak season for the public utility company. There are peculiar conditions in the baking industry that are best met by motor drive, as the product is of such a nature that certain operations have to be performed with an exact time precision or the material in course of preparation is unfitted for use. With central-station power and motor drive, continuity of service is assured and the elements of uncertainty of quality and quantity of the product are removed. Cleanliness is, of course, of vital importance and individual motor drive adds greatly in maintaining this much desired condition by eliminating shafting and belting, and mechanical speed-changing devices, which are a prolific source of dirt. The operation of the various machines is timed in logical sequence of the operations, and they are seldom all operated at one time. With electric motor drive each machine can be controlled individually, and can be shut down as soon as its work is through, when the power cost of the machine ceases. Another feature is that the dough in preparation has to be maintained at a certain temperature, and this is made easily possible by the use of electrically-driven ventilating fans.

The Old Home Bakery Company, Auburn, N. Y., is a good example of an electrically equipped bakery of small size. It has a capacity of 4,000 loaves of bread daily, which includes a small production of cookies and cakes. The motor equipment includes six three-phase, 60-cycle, 220-volt motors of the squirrel-cage type, aggregating 20.25 horsepower, or at normal rated load there would be a kilowatt load of 15.1. Service is furnished by the Empire Gas & Electric Company.

On the second floor of the bakery building are located the flour storage and mixing departments; the dividing, molding and rounding are on the first floor, where the baking and the making of cakes and cookies are done. The flour is first emptied from the sacks into bins, from where it is elevated to a Reade 10-barrel blender by a screw conveyor and bucket elevator. The blender automatically stops the motor when a predetermined weight of flour has been elevated, by means of a switch actuated by the scales. The conveyor, elevator and blender are driven by a two-horsepower motor operating at 1,700 revolutions per minute through gearing and sprocket wheels and chain, forming a double reduction of speed. The gear reduction is 2 inches to 13 inches, and the sprocket reduction from 3 inches to 14 inches. The bins, motor and conveyor mechanism are located in the flour-storage department and the blender in the mixing room separated by a brick partition.

In the mixing room, located below the blender, there is a

Motor Suspended From Ceiling Driving Conveyor.



Four-Barrel Dough Mixer Driven by 15-Horsepower Motor.

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Reade four-barrel, double-acting dough mixer, driven by a 15-horsepower motor through gearing. The motor has a speed of 1,200 revolutions per minute, and also drives, by means of a belt, the dough molder on the ground floor. Water is supplied to the mixer by a Reade measuring and tempering water tank located on the side wall above the mixer. The mixer is provided with a pair of paddles or stirrers which can be reversed by means of a hand lever attached to the machine. When sufficiently mixed the dough is dumped from the mixer into steel troughs by tilting its body by means of a hand wheel and gearing. The dough is allowed to rise in the troughs for 3.5 hours, then kneaded by hand, after which it is allowed to rise twice more, receiving two more kneadings, the total process requiring about five hours. In the mixing room there is a ventilating fan driven by a direct-coupled, 0.25-horsepower motor. This outfit will reduce the room temperature 10 degrees within 10 minutes. The proper temperature for the room is 80 degrees Fahrenheit.

From the troughs the dough is transferred to a hopper and chute, where it descends to an American divider on the first floor. The divider, as the name implies, divides the dough into proper proportions for the loaves, when it is transferred by a canvas conveyor to an American rounder, where the dough receives mechanically a treatment similar to hand kneading on a bread board. From the rounder a second canvas conveyor transfers the dough to the molder, which gives it the final form for the pans. The divider, molder and canvas conveyors are driven by a one-horsepower motor operating at 1,700 revolutions per minute, through gearing and sprocket chains. The rounder is a Thompson machine, and is belt driven from the mixer motor, as stated before. This latter arrangement will, however, be changed in the near future to individual motor drive.

Baking ovens are heated by coal, the gases from the furnaces passing over the ovens in flues. Live steam from a small low-pressure boiler is introduced into the ovens during the baking process, to give the desired brown crust, and also to reduce the thickness of the crust. For cleaning and greasing the pans there is a portable, motor-driven machine with a series of revolving brushes. This is operated by a one-horsepower motor through gearing. The cake machine is used principally in the preparation of cookies. The dough is placed in a hopper above the machine, and is automatically rolled and cut into the desired shape and dropped into pans, which pass through the machine on an endless conveyor. The machine is driven by a one-horsepower motor operating at 1,700 revolutions per minute by single reduction gearing with a gear ratio of 2.5 inches to 24 inches.

The energy consumption at this plant for a period of 12 months was 2,448 kilowatt-hours, figures being as follows: October, 208 kilowatt-hours; November, 194; December, 178; January, 193; February, 182; March, 192; April, 165; May, 227; June, 237; July, 220; August, 238; September, 214.

Average kilowatt-hour consumption per month, 204. Average monthly bill, $11.42. Average kilowatt-hour consumption per day, counting 26 working days per month, 7.84. Average daily cost for current, $0.439. Average cost of current per loaf of bread, 0.000109 cent.

The following table gives the motor data:

No.	Horse-power.	Speed, R. P. M.	Application.
1	1	1700	American divider, rounder and conveyor.
1	15	1200	Reade 4-barrel, double-acting mixer and Thompson moulder.
1	1	1700	Portable pan cleaner and greaser.
1	1	1700	Cake machine.
1	2	1700	Reade 10-barrel flour blender, conveyor and elevator.
1	0.25		Ventilating fan.

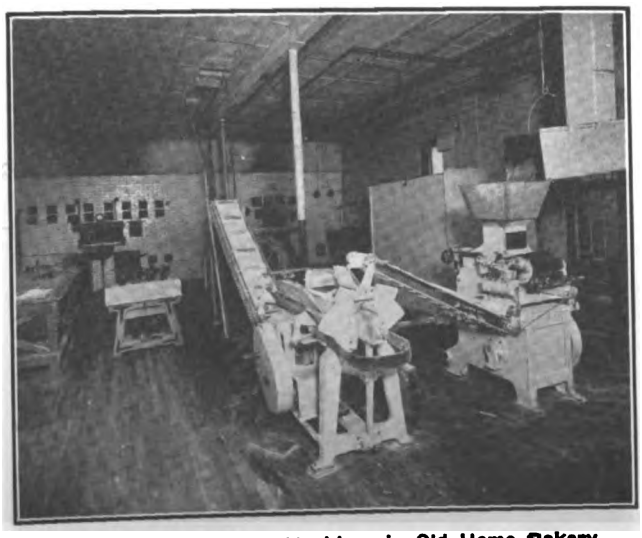
RESISTANCE-REACTANCE SINGLE-PHASE MOTORS ON THREE-PHASE SERVICE.

By George A. Schneider.

Many power men do not seem to know that it is possible to operate single-phase motors of the resistance-reactance type as three-phase machines, whereas a knowledge of this fact is sometimes very useful.

In general appearance, these motors are similar to the line of small polyphase motors built by the same manufacturer; in fact, the same line of frames is used, although the frame size required for a given single-phase rating is somewhat larger than for the corresponding three-phase machine. The stators have three-phase delta-connected windings. The rotors are of the high-resistance squirrel-cage type but of somewhat different mechanical design than is used in polyphase machines due to the necessity of having a centrifugal clutch to secure a fairly good starting torque. This is also the object of using the high-resistance rotor. The design of the rotor is such that, in starting, it revolves freely on the shaft until about 70 per cent of full speed is reached. At this value the load is then picked up by the automatic action of the clutch, which engage an outer shell keyed directly to the motor shaft. The phase displacement required in the stator windings during the starting period is produced by an external resistance-reactance starting box much similar in design and operated in much the same way as the ordinary direct-current starting box. These motors are built for either 110 or 220 volts, in sizes from 0.25 to 15 horsepower.

Motors of this design are satisfactory only when a moderate starting torque is required, and must not be used even under these circumstances if there is likely to be violent fluctuation in the load after starting. This is because of the action of the centrifugal clutch. These limita-



Group of Motor-Driven Machines in Old Home Bakery.

Motor-Driven Molding Machine in Bakery.

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tions of the clutch must be observed, even when operating as three-phase motors, unless the clutch is permanently fastened to the shaft, as will be explained. The maximum starting torque is approximately 140 per cent of full-load torque with about 250 per cent of full-load current.

To operate these machines as three-phase motors it is only necessary to remove the starting box, and then complete the installation as it would be for the regular three-phase equipment of the same size. The voltage between phases must, of course, be practically equal to that for which the motor was adapted when operating single phase. When used in this manner the output will be approximately 25 per cent greater than the single-phase rating with the same temperature rise, while the starting torque will also be greatly improved; in fact, it will probably be somewhat larger than for a standard three-phase motor built in the same frame, because of the higher rotor resistance. For the same reason, the starting current will probably be somewhat less.

On several occasions the writer has found it very convenient to change over motors of this kind, as just outlined, especially so when repairs to the starting box were necessary. In a recent case the owner of a small manufacturing plant made inquiry as to what allowance would be made for a 10 and a 15-horsepower motor of this type in exchange for regular three-phase apparatus. He explained that the power company was now supplying three-phase service to his factory, and that all of the later motors were of that type. Further, that the starting boxes of the single-phase motors were badly burned at the contacts and would need to be replaced or repaired at once. In reply it was suggested that a modern starting compensator with overload relays and low-voltage release attachment be purchased for each of the motors to replace the old boxes, and that the wiring be changed so the motors could be operated three-phase at the same voltage. This suggestion was quickly accepted. The expense of making the change was only about $80 more than the cost of two new starting boxes.

It is interesting to note that the power company's workman who had been sent to make the change was not very familiar with this type of motor and after examining the new compensators proceeded to inform the owner of the plant that someone had made a blunder, and that the new starters were all wrong for the job. Even after the proposed change was explained he remarked that "someone was crazy." Later on after the work was completed he admitted that he had gained another bit of experience and knowledge which would come in handy for the future.

In case a fluctuating load is to be handled or a large starting torque is demanded, it is well to bolt the rotor solidly to the clutch shell so the clutch will not be injured or cannot slip. It is really best to do this in any case and take full advantage of the change.

Cost of Electric Welding in Railroad Shops.

The cost of welding with the electric arc is less than by any other system, ranging from three-fourths down to one-tenth that of the gas systems, and the time required is also usually less. The reason it is cheaper than the gas system is on account of the high cost of the gases and their lower operating temperature, the latter being also the cause of the greater time required. With the electric arc it is not necessary to keep a large portion of the work heated to prevent chilling of the filling material, because the work forms the positive (and hottest) terminal of the arc and a sufficient volume of heat is generated at the point being worked upon to insure perfect fusion. This process also reduces the liability to buckle or give away after cooling, because there are no very great stresses set up in the material in or surrounding the welded space, as when welding with gases.

The following figures show the cost of several actual jobs done in steam railroad shops with electric arc welding apparatus, made by the C. & C. Electric Manufacturing Company, the labor being figured at 30 cents per hour and the current at two cents per kilowatt-hour. All of these jobs were done by men of ordinary ability.

	Time	Cost
Steel casting, shrinkage crack 1 in. deep by 6 ft. long	8 min.	$0.04
Steel casting, section 4 in. by 4 in. cut in two	4 min.	.05
Forged steel locomotive side frame, 2 breaks	20 hrs.	18.28
Long crack in back sheet of locomotive boiler	9 hrs.	5.47
Building up driving wheel instead of turning	2 hrs.	.72
Welding 67 places in old fire box	12 days	52.60
Cast steel tender frame, 3 breaks	27 hrs.	19.00
Joining broken 2 in. steel shaft, ready for turning	1 hr.	.60
Broken cast steel railway type motor case	3 hrs.	1.95
Filling enlarged hole in steel brake lever	4 min.	.05
Building up worn 2 in. shaft for motor armature	3 hrs.	1.80
Broken air brake piston rod, welded together	30 min.	.35
Leaking axle box, crack welded with box in place	15 min.	.15

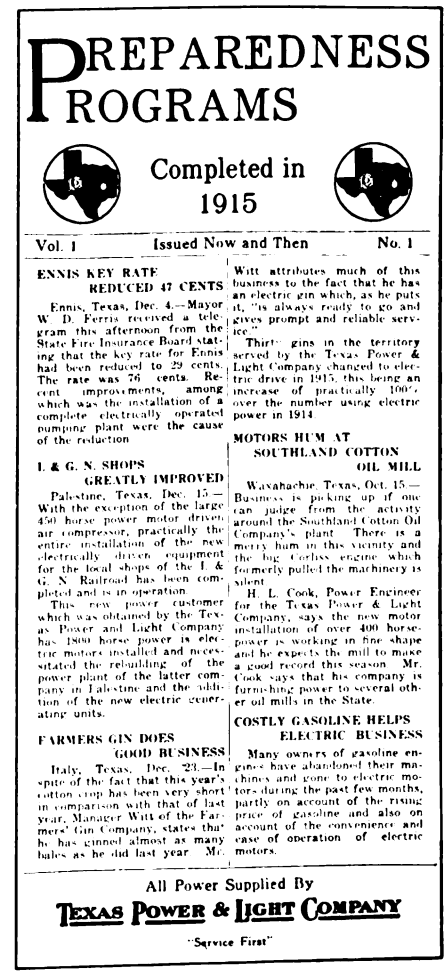
The foregoing covers but a few of the many kinds of jobs which continually arise in locomotive and car shops, but will give a fair general idea of what can be done.

The following figures have been compiled in various steam railroad shops and show the comparative savings which can be effected by using the electric arc system for making repairs. The comparisons here made are between the electric system and the old methods, whatever they may be:

	Cost	Old	Saving
Engine main frames, both broken	$11.80	$ 56.20	$ 44.40
Driving wheel built up $\frac{3}{8}$ in. on tread	2.72	8.00	5.28
General repairs on fire box side sheets	66.51	342.62	276.11
Filling in worn knuckle joint hole	.75	7.50	6.75
Repairing 7 cracks in cylinder casting	22.35	367.15	344.50
Welding broken mud ring in boiler	32.07	118.06	85.99

Taking Advantage of Current Happenings.

The blotter illustrated herewith is being used by the Texas Power & Light Company as an enclosure in letters to power prospects. It is worked out along the newspaper line and calls attention to "Preparedness Programs" which have been completed by prominent business firms in the territory.



PREPAREDNESS PROGRAMS

Completed in 1915

Vol. 1 Issued Now and Then No. 1

ENNIS KEY RATE REDUCED 47 CENTS

Ennis, Texas, Dec. 4.—Mayor W. D. Ferris received a telegram this afternoon from the State Fire Insurance Board stating that the key rate for Ennis had been reduced to 29 cents. The rate was 76 cents. Recent improvements, among which was the installation of a complete electrically operated pumping plant were the cause of the reduction.

I. & G. N. SHOPS GREATLY IMPROVED

Palestine, Texas, Dec. 15.—With the exception of the large 450 horse power motor driven air compressor, practically the entire installation of the new electrically driven equipment for the local shops of the I. & G. N. Railroad has been completed and is in operation.

This new power customer which was obtained by the Texas Power and Light Company has 1800 horse power in electric motors installed and necessitated the rebuilding of the power plant of the latter company in Palestine and the addition of the new electric generating units.

FARMERS GIN DOES GOOD BUSINESS

Italy, Texas, Dec. 23.—In spite of the fact that this year's cotton crop has been very short in comparison with that of last year, Manager Witt of the Farmers' Gin Company, states that he has ginned almost as many bales as he did last year. Mr. Witt attributes much of this business to the fact that he has an electric gin which, as he puts it, "is always ready to go and gives prompt and reliable service."

Thirty gins in the territory served by the Texas Power & Light Company changed to electric drive in 1915, this being an increase of practically 100% over the number using electric power in 1914.

MOTORS HUM AT SOUTHLAND COTTON OIL MILL

Waxahachie, Texas, Oct. 15.—Business is picking up if one can judge from the activity around the Southland Cotton Oil Company's plant. There is a merry hum in this vicinity and the big Corliss engine which formerly pulled the machinery is silent.

H. L. Cook, Power Engineer for the Texas Power & Light Company, says the new motor installation of over 400 horsepower is working in fine shape and he expects the mill to make a good record this season. Mr. Cook says that his company is furnishing power to several other oil mills in the State.

COSTLY GASOLINE HELPS ELECTRIC BUSINESS

Many owners of gasoline engines have abandoned their machines and gone to electric motors during the past few months, partly on account of the rising price of gasoline and also on account of the convenience and ease of operation of electric motors.

All Power Supplied By

TEXAS POWER & LIGHT COMPANY

"Service First"

Blotter Sent to Power Prospects Containing Current Items.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Wiring Features of Direct-Current Motor Control.

There is probably no more important feature connected with the application of electric drive to industrial purposes than that of motor control, for upon the control depends not only the handling of the work expeditiously but the safety of employees and to a large extent the rate of production. The present tendency inclines more and more to automatic control thereby eliminating the human element as far as possible. By the use of a small master controller or a push button in connection with contactors the controlling element can be placed in the most advantageous position for safety and ease of operation.

Beginning with the more simple forms of control, Fig. 1 shows the elementary connections of a direct-current series-wound motor with a regulating and reversing con-

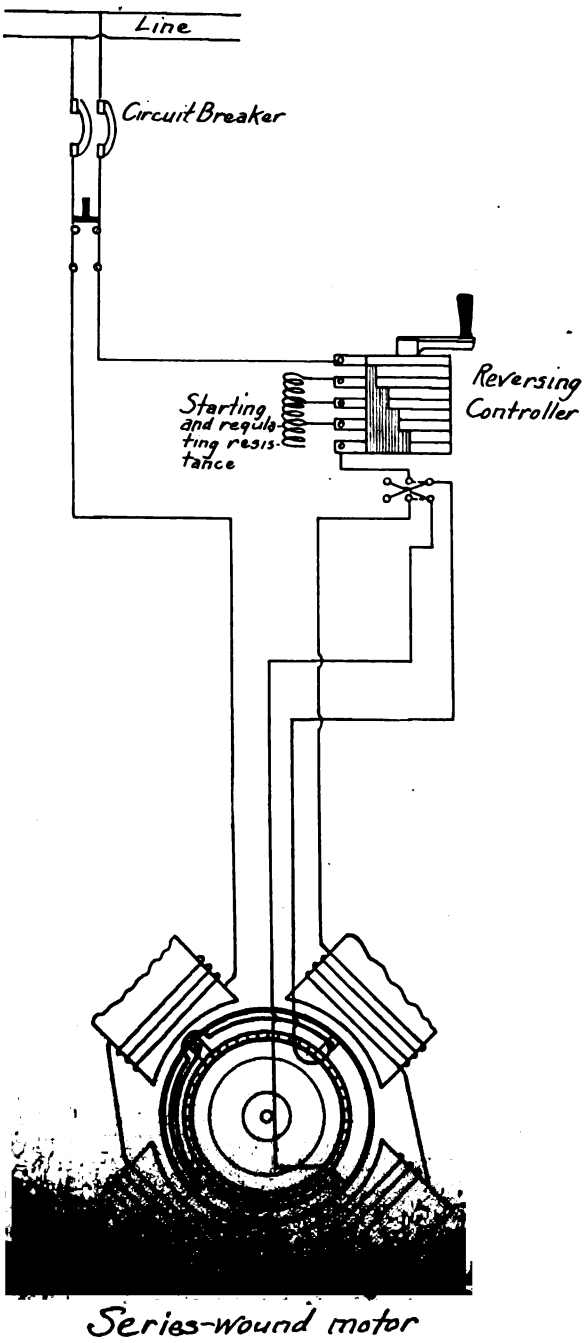

Fig. 1.—Control Wiring for Series-Wound Motor.

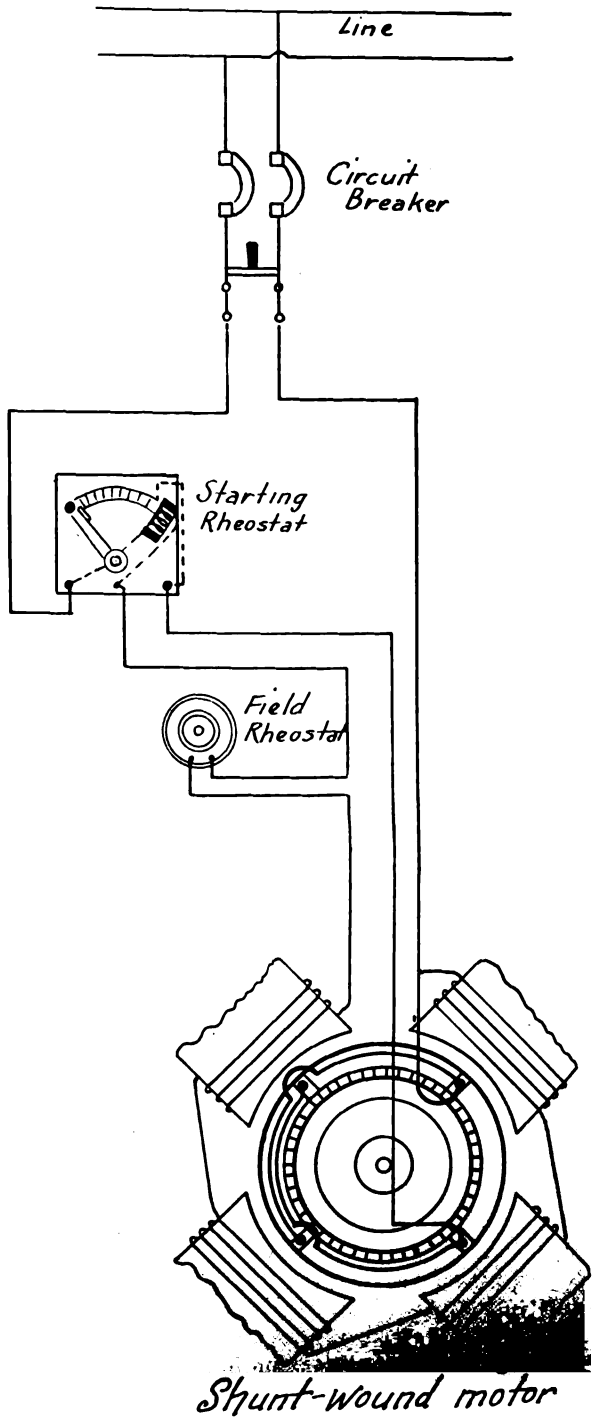

Fig. 2.—Control Wiring for Shunt-Wound Motor.

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troller. The characteristics of the series motor, that is, its tendency to gain excessive speed when underloaded, and the increased torque and decreased speed with increase of load, demands that the controlling element be under the constant observation of the operative. As this type of motor is largely used for crane and hoist work, the controller is generally of the drum or the level type and is invariably reversing.

Next comes the shunt-wound direct-current motor whose principal characteristic is maintaining uniform speed under widely varying loads. Such motors are capable of considerable speed variation by the introduction of resistance in shunt-field winding, and a shunt-wound motor with commutating poles has a much wider range of speeds. The conventional arrangement of connections and auxiliaries where the motor is not frequently started and stopped is shown in Fig. 2. This generally consists of a main switch, starting rheostat and a field rheostat.

A regulating and reversing controller can be substituted for the starting and the field rheostats and this is generally the practice where frequent starting and stopping and changing of speed is necessary. The connections of such an arrangement with a compound-wound motor are shown in Fig. 3. The external connections are the same whether

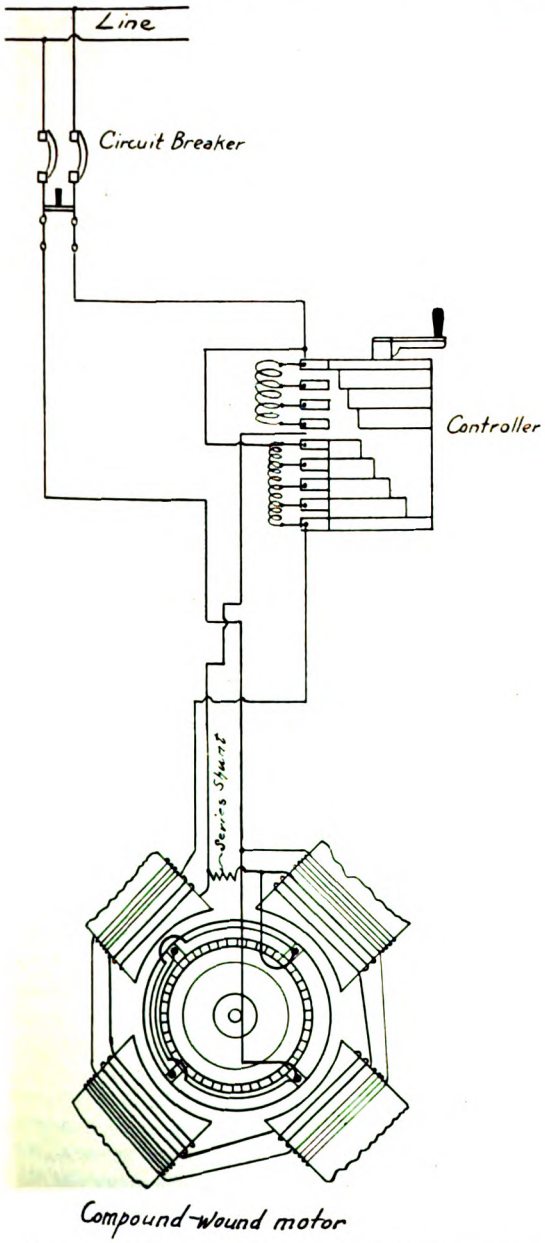

Fig. 3.—Control Wiring for Compound-Wound Motor.

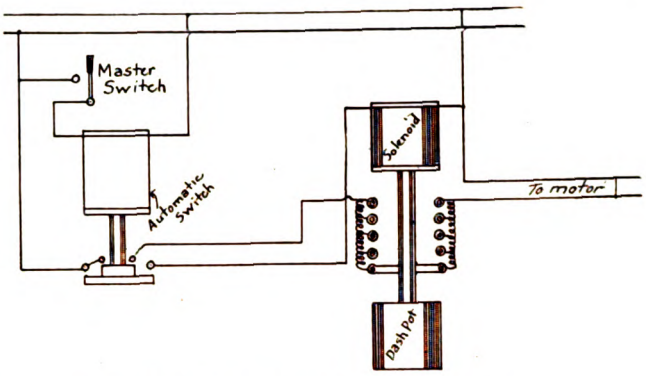

Fig. 4.—Wiring for Automatic Starter.

a shunt- or an auxiliary-pole or a compound-wound motor is used.

In connection with motor drive there are several minor auxiliary devices that are important, and one is a brake that is frequently used in connection with series-wound motors. This is considered necessary to prevent the load running away when it is being lowered by a hoist or a crane, should the current be interrupted. Dynamic braking is also frequently employed which relieves the necessity of lowering loads on reversed current.

In machine-tool work it may be desirable to operate drum controllers through gears and sprockets; if so the controller handle may be removed and a pinion readily attached. The shaft of some types of controllers is extended through the bottom to facilitate operating them either by the handle or through gearing as desired. In many installations it is desirable to have the controllers equipped with a spring return attachment which will automatically return the cylinder to the off position when released. In some cases it is also possible to use a rope wheel and guide in place of the standard handle.

To make clearer the theory of automatic starters, which will be explained later, the diagram, Fig. 4, is introduced. Some starters employ a solenoid arrangement and others a series of contactors or automatically operated switches which cut out the starting resistance. In the solenoid-operated type of starter shown in the figure, a master switch or a push button is used to close the circuit through an auxiliary switch, which in turn closes the circuit through solenoid thereby drawing up the core against the resistance of a dash pot, the sections of the starting resistance being gradually cut out.

For planer work, the increasing custom is to reverse the motor at each stroke of the planer instead of relying upon mechanical appliances with the motor operating continuously in one direction. The control equipment usually consists of a controller, a master switch, and a pendant switch. The master switch is mounted on the planer and is tripped by dogs attached to the platen. When it is tripped, the motor starts and is automatically accelerated to the desired speed. At the end of the stroke, the master switch is tripped again, and the motor is stopped almost instantly by dynamic braking and is immediately started in the reverse direction.

For the average planer, the platen speed can be adjusted between the limits or 25 and 50 feet per minute (motor speed 250 to 500 revolutions per minute) for the cutting stroke, and between 50 and 100 feet per minute (motor speed 500 to 1,000 revolutions per minute) for the return stroke.

The controller is mounted on a wrought-iron pipe frame and can be fastened conveniently to the floor or to the planer housing. The magnet switches, which automatically make contact for starting the motor, accelerating it and applying dynamic braking, are mounted on a slate panel

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which is inclosed. The armature resistance is cut out in one step and dynamic braking is applied in one step to secure rapid operation.

Two field rheostats, one for adjusting the motor speed for the cut, and one for the return, are mounted inside the cover, the handles being on the outside. No-voltage protection is obtained by means of a relay. Should the voltage fail, or a connection break, the motor is stopped instantly, so that the platen cannot run off the bed. A push button must be pressed before the motor can be started, so that the planer will not start unexpectedly on the return of the voltage. The master switch opens both sides of the line, protecting the equipment from accidents due to grounds. The pendent switch performs the same functions as the master switch and hangs over the platen at the end of a flexible cable and may be carried about by the operator.

Valuable Results in Rapid Trouble Locating on Central-Station Lines.

The full measure of success which was early claimed for it has been realized in the practical operation of the Lundin Fault Locater, an apparatus for diagnosing and locating troubles of every nature occurring on both overhead and underground systems. This apparatus was developed and patented by J. A. Vahey, general inspector of maintenance for the Edison Electric Illuminating Company of Boston, and consists of a fault analyzer and a fault interrupter.

The former is operated at the station and by means of it, it can be ascertained whether a burnout is in the cable itself or in a joint, whether submerged in liquid either conducting or non conducting, and if in water whether it is salt or fresh water. These conditions being ascertained, it is comparatively easy to predicate the probable location of the break and obtain an idea of the material, labor, etc., necessary for repair.

With the interrupter a powerful signal is obtained in the faulty circuit which is easily recognized under every condition. This instrument interrupts either alternating current or direct current, taken from the system at lamp voltage. Different tones are obtained, if desired, and one ampere of this indicating current is easily heard in the exploring coil, when flowing in a circuit along with 200 amperes of 60-cycle current. With the triangular coil, used for overhead grounds, the signal from 0.5 ampere flowing in a line 30 feet overhead can readily be picked up by the trouble man.

A feature on which the inventor lays special emphasis is that of safety to employees. The trouble hunter's job is ordinarily the most dangerous and highly paid in central-station work. With the Lundin apparatus a ground on a live 4,000-volt circuit would involve no great hazard. The fault locater makes it unnecessary to climb poles, enter manholes, disconnect customers or communicate between stations. The fault is readily located from the street, the trouble man either walking or riding 10 or 15 miles an hour.

The apparatus also makes for safety in locating faults in underground cables in that only a very trifling amount of current is necessary to obtain a very loud signal in the exploring coil, so that no large amount of energy is liberated at the fault, which of course would be dangerous to other cables by starting fire in the manhole, sometimes resulting in the blowing up of the same from gas.

On an Edison tube system in New England, the apparatus was set up in a substation, the fault analyzed by the trouble man and located with the aid of a triangle carried on an automobile, the exact spot where the tube was grounded located wtihout leaving the automobile. The defect in this feeder, which is about one mile in length, was located in about 15 minutes.

Another recent practical demonstration of the time used in locating a grounded street circuit occurred in another central-station system in New England. The portable apparatus was set up in the station and the fault analyzed, showing that the street circuit was crossed with the live side of a grounded secondary. The interrupter was started, the triangle carried on the side of the trouble hunter's automobile and about four miles of street circuit traversed. The fault was located without leaving the vehicle, and within one hour the defect was remedied. With old methods it would have taken five or six hours, at least, to locate the fault.

Recently, in tracing a ground on a live arc circuit, the trouble hunter was able to locate the ground with the naked ear without an exploring coil, while standing under the lamp, each lamp between the station and the fault giving out the interruption signal very distinctly.

One of the most noteworthy results thus far was the case of a lighting company which located seven opens in street circuits one windy night between 7 p. m. and midnight. Yet another result was in the case of a central station which had been working several days on what was thought to be a faulty street circuit. Upon the application of the Lundin locater it was shown that there was no fault nor leakage in the circuit, but that it was in almost perfect working condition.

So efficient is the apparatus that with its use impending troubles can be detected. The manager of a central station which has lately procured a set of the apparatus suspected trouble on one of his important circuits, but had been unable to learn its actual condition. A test showed that the particular circuit was in poor condition throughout, in such condition, in fact, as to warrant pulling out the cable and installing a new one, thus obviating certain trouble and expense which later would have resulted.

An example of the accuracy with which a fault can be located was in the case of an underground cable of a circuit seven miles in length. The analysis having been made, the trouble hunter went out on the line and immediately located the fault in a manhole. There was no external indication of the fault on the cable, but the trouble hunter put his finger on the fault within 0.25 inch, as was shown when the cable had been stripped.

A great merit possessed by the apparatus is in the fact that it results in large economies. The ordinarily skilled man who is employed for repair work is also able to operate the instruments, analyzing and locating the faults. In cable work the apparatus has such a range that it locates equally well a fault that does not show through the sheath as one that has blown the joint apart.

The analyzer is found to have very valuable uses for routine tests on street lines. By simply observing the pilot lamp, absolutely positive tests for opens, grounds or leakages can readily be made wtih the analyzer. It is possible to discriminate accurately between normal leakage on the line and a fault, and also to distinguish between charging current due to cables and fault or leakage current.

The Vahey set also has its field in high-tension line fault finding, and one company has purchased the apparatus for this purpose. Considerable success has been obtained by Mr. Vahey in the location of leaky insulators on high-tension construction, and valuable developments may be looked for along this line.

There are thus far about 15 sets in use, and about 10 more are being made on order. The demand exceeds the ability of the manufacturer to produce the sets. Among the companies now using the Lundin apparatus are the Central stations at Hartford, Conn., Lynn, Springfield, Boston and Lawrence, Mass., the latter now testing out its 2,300-volt three-phase underground circuits between its generating station and the city, about 1.5 miles of conduit.

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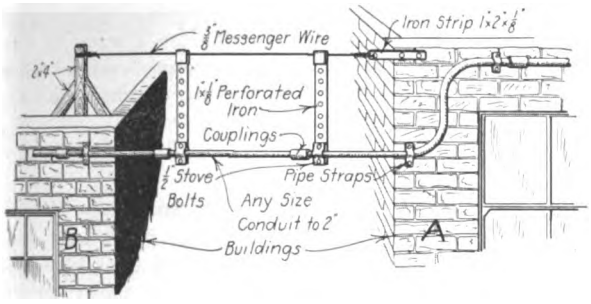
Supporting Conduit Between Buildings.

According to Chicago city requirements every length of conduit must have its own support. The following suggestions may be useful in running a line of conduit from one building to another.

The accompanying illustration shows a method of suspending a length of about 20 feet of conduit between two buildings, one of which is higher than the other. Upon building A a strip of iron one foot long and about two inches by one-eighth inch in cross-section is fastened by means of lag screws



Method of Suspending Conduit Between Buildings.

or bolts and bored holes. On building B a frame is constructed of two-by-four lumber, the height being the difference between the heights of the buildings. This is supported by means of spikes extending into the roof timbers. A three-eighth-inch messenger wire is stretched from the iron strip to this framework and made as taut as possible. Strips of perforated iron one inch by one-eighth inch in cross-section are hung from this messenger and bent so as to support the conduit as shown. The wooden framework is, of course, painted.

When the two buildings are of the same height, the wooden frame may be built up on the roof of each building, or both ends of the messenger may be supported as upon building A in the illustration.

Another method of supporting the conduit is to extend messenger or guy wires from the length of conduit between the two buildings to a framework such as shown upon the top of building B.

For short jumps, a support can often be made by bending an auxiliary piece of one-half-inch conduit and using a Bronson clamp to fasten its outer end to the piece of conduit to be supported. The inner end can also be fastened to the wall by a Bronson clamp.

E. Kemp.

Massachusetts Licensing Law to Be Strengthened.

At a hearing held on January 25 before the Legislative Committee on Mercantile Affairs, Herbert A. Dallas, clerk of the Massachusetts State Examiners of Electricians, explained a measure which is designed to clear up and strengthen some weak points in the law of 1915, which requires master and journeymen electricians to procure state licenses.

It was pointed out that the term "master electrician" should be more explicit, and that the law's intent that journeymen should not undertake contracts on their own account should be more clearly expressed.

Special certificates were advocated, for fixture hangers, motion-picture operators, steam engineers who do trifling work on lighting systems, and student apprentices. Mr. Dallas held that the law does not make it clear that it is the duty of local inspectors to follow up and prosecute unlicensed workmen.

Questioned as to why municipal inspection of work is not a sufficient safeguard against improper installations, Mr. Dallas said that such inspections are not provided for by all towns in the state. In Boston, a contractor must procure a preliminary certificate, but not elsewhere.

Alfred J. Hixon, president of the Massachusetts Electrical Contractors' Association, favored the measure, and had no choice as to whether the clerk of the Board or a special commission formulates the necessary amendments.

F. M. Ives, for the Massachusetts Electric Lighting Association, suggested that the Legislative Committee on Public Lighting offer the proper amendments to strengthen the law.

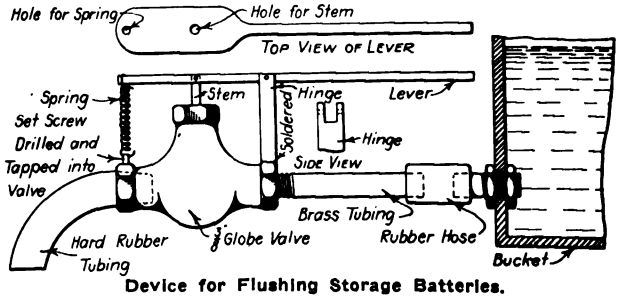
Improvements Needed in Nashville Fire-Alarm System.

Recommendations for numerous improvements in the signal system of the fire department of Nashville, Tenn., are made by the National Board of Fire Underwriters in a report to the City Commission. In addition, the National Board recommends that the electrical inspection force be increased. Among the equipment needed for the improvement of the fire-alarm system are suggested: a cable terminal board for changing connections; a protector board with lightning arrester, heat coil and fuse protection; box-circuit relay boards for manual operation and an alarm-circuit board for operation with closed circuit; battery-charging board; a manual transmitter; registers; storage batteries in duplicate. The switchboard, it is stated, should be of slate or marble; the wiring should be no smaller than No. 16, with rubber insulation and carried in ducts. A department telephone switchboard is needed also. Additional boxes are required at once, so that in the high-value district, a box shall be within 500 feet of every building; in other closely built sections, a box should be within 800 feet of every building. Reliability of service should be increased, it is recommended, by installing separate closed register circuits to connect tappers and registers and closed gong circuits. Overhead circuits should be removed from poles carrying high-tension wires and circuits should be placed underground where signaling subways are available. Other wiring changes are suggested.

The commissioners of waterworks and fire have these recommendations in charge and will act on them, at least in part. The high insurance rates in Nashville have made local business men interested in the recommendations of the National Board.

Flushing Storage Batteries.

The accompanying illustration shows a useful device for flushing storage batteries. It makes use of a three-eighth-inch Globe valve. The threads are filed off of the stem so



Device for Flushing Storage Batteries.

that it can slid up and down in the valve. A small hole is drilled near the top of the stem and used to rivet it to a lever. This rivet must be loose enough to permit a little play which will take place when the stem moves up and down. The lever is supported upon a hinge as shown, and a spring is connected to the other end so that the valve is normally closed. The spout was taken from a rubber syringe and threaded so that it could be screwed into the valve. Connection to a bucket is made by a rubber hose.

In using this arrangement the bucket is elevated somewhat so that when the end of the lever is pressed down, gravity will cause the water to flow out of the valve.

William A. J. Hahn.

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British Standard for Plugs.

The British Engineering Standards Committee has issued a standard specification for wall plugs and sockets of the two-pin type. They are limited to 5 amperes at 250 volts. They are not provided with earthing connections, but the standard plug is required to have a side entry for the flexible wire, and a hand shield must be provided to afford protection from the effects of arcing at the contacts or at the point of entry of the flexible wire. The actual design of the plug, however, has been interfered with as little as possible, and the dimensions necessary to obtain interchangeability have been agreed upon in consultation with the manufacturers.

A specification of the British standard charging plug and socket for electric vehicles has also been published. The committee, working in conjunction with the Electric Vehicle Committee of the Incorporated Municipal Electrical Association, has only standardized the essential details necessary to secure interchangeability between any charging plug and any socket of the concentric type as selected by the Electric Vehicle Committee, who will issue a detailed specification for the construction of the exact design of plug.

Schedule of Electricians' Examinations in Massachusetts for 1916.

Examinations of candidates for Class A and Class B certificates in Massachusetts will be held by the State Examiners as follows: Boston, March 1, May 3, September 6, November 8; Worcester, April 5, December 6; Springfield, March 15, September 20; Pittsfield, June 14; Fall River, July 6; Lowell, April 26, October 11; and at Newburyport, August 2.

All persons desiring to be examined, either for a master's or journeyman's certificate, must have his application on file at least 10 days before the examination. Examination shall consist of the applicant's knowledge of the National Electrical Code and practical work. Applicants must receive at least 70 per cent to qualify. Anyone failing to qualify in an examination shall not be entitled to re-examination until after three months have elapsed.

The examiners have changed their office to Room 263, West Wing, State House.

Precaution in Operating Underground Cable Systems.

A peculiar incident which might be of interest to men in charge of operating long underground cable systems occurred not long ago on the 23,000-volt system of the Toledo Railways & Light Company, Toledo, O.

At the time there were two three-phase, 23,000-volt cables approximately four miles in length supplying the Overland Automobile Company's plant and one similar cable about three miles long supplying one of the light company's principal substations (Detroit Avenue). All the cables were connected to the same high-tension bus at the generating station. At the substation ends the oil breakers are equipped with overload and reverse-current relays. At the generating station only overload relays are used.

Due to a defective cable a short-circuit occurred on the Detroit Avenue cable. This of course was soon cleared from the station bus by the overload relays and apparently the remainder of the cables were not disturbed. Such was not the case, however, for the Overland Company soon reported that it was out of power. The attendant found the switches at the generating station closed and power on the cables. When the Overland men examined their switches they found them tripped.

There seemed to be no suitable explanation for the tripping of the switches and the incident caused the superintendent of the electrical department considerable worry. However, when the report of the accident came through from the station one item in it cleared up the mystery. The voltage on the bus had dropped to zero for an instant. What had happened was that the cables and the Overland transformers (at the time about 6,000 kilowatts was being supplied) had acted as a huge condenser fully charged. When the voltage dropped to zero, the stored-up energy was returned to the station bus and the energy from the transformers in returning had caused the reverse-current relays to operate.

In case of trouble similar to this, on systems of high capacity, switches provided with reverse-current relays should be watched, particularly where continuity of service is very important.

E. E. Armstrong.

Among the Contractors.

The Jahant Electric Company, Akron, O., has been awarded the contract for the electrical work in the clubhouse to be built by the Firestone Tire & Rubber Company. The same concern also has contracts for the General Tire & Rubber Company's factory building and St. Mary's Church, Akron.

The H. F. P. Electric Company, 1342 South Meridian Street, Indianapolis, Ind., has recently incorporated under the name of the Pratt Electric Company. The company does an electrical contracting and supply business.

The United Electrical Construction Company, Philadelphia, Pa., has been awarded the contract for the electrical work in the new City Club Building, Philadelphia.

The F. H. Cheyne Company, Indianapolis, Ind., has been awarded the contract for electrical wiring, fixtures, bells, telephone and clock system for the new high school at Springfield, Ill.

Charles C. Glass, Pasadena, Cal., has been awarded the contract for the installation of ornamental lights on Prospect Boulevard, Terrace and Square, Pasadena.

The Granger-Hall Company, Ontario, Cal., has been awarded the contract for the installation of an electrolier lighting system in this city.

Alexander & Lavenson, dealers in electrical supplies, announce their removal March 1 from 633 Howard Street to 170 Second Street, San Francisco, Cal.

The Edward Joy Company, Syracuse, N. Y., is making an installation of 16-inch "Alba" daylight hemispheres in the store of Wells & Coverly in Syracuse.

The Morris & Somerset Electric Company, Morristown, N. J., has purchased a business plot on South Street, in the business section of that city, with the intention of erecting a new building for its occupancy.

Remote-Control Light Stations Successful.—Remote-control light and fog-signal stations, consisting of 500-watt incandescent lamps in lens lanterns and electric sirens, are in successful operation at Point Blunt and Point Stuart, Angel Island, Cal. The controlling station is located about one mile from Point Stuart and two miles from Point Blunt. An arrangement of magneto relays in conjunction with a telephone enables the keeper at the control station to open and close the siren circuit and to listen to the operation of the fog signal through the medium of a single wire.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

PROBLEMS OF THE ELECTRICAL DEALER.

Need for Greater Attention to Customers' Wants and Greater Educational Effort. Who Should Pay Cost of Demonstrating Appliances?

By E. M. Raetz.

The sale of every piece of electrical merchandise or conducting an electrical store is governed by the same principles as any other line. While of a more technical nature those engaged in this occupation are coming to realize that we must refrain from the use of technical and confusing terms in dealing with our customers. What the customer wants to know when he is buying a small heater for a certain size room is whether it will heat the room to a reasonable degree of satisfaction and what it will cost to run it and he asks the dealer and comes to rely on his judgment because the dealer knows or should know his business and his wares.

The success or failure of the dealer depends on whether or not he can see the opportunity for selling his goods to his customer at seasonable periods of the year just like any other line of merchandise and the volume of his sales will be in direct proportion to the amount of sales effort he puts into his business. Right here is where the electrical dealer is beginning to realize the importance of thoroughness. If he will just stop and consider the position of the customer he will find himself to blame when he fails to make a sale. After all is said and done the average customer has only a very indefinite idea of the workings of most electrical appliances, with the possible exception of very few well known appliances such as irons and vacuum cleaners and a few more, and it is therefore imperative that the dealer leave no point unexplained as to the operation of the particular device in question, especially as related to the needs of the customer.

Do not ever feel that your time is wasted when you have done your best to convey to the customer's mind what can be done with appliances, for this will stay with the customer for a long time. The writer knows personally of cases where customers have come back months afterward to get a certain article which had been thoroughly demonstrated before. To prove that we must keep everlastingly at it: we have customers come into our store almost daily to ask if Mazda lamps take more current than the old-style carbon lamps, this in spite of all national and local educational advertising on the subject. We must not get discouraged or give up the idea of educating the buying public just because we can see no immediate results from our efforts. In our town of 10,000 population we make periodic trips to the business section to demonstrate useful or new devices with the result that we never fail to get sales of some kind, and if one will stop and analyze the market it will be a surprise to know how great the field still is for electrical devices.

One can hardly think of electrical merchandise without thinking of advertised goods. At the present time, this seems to be such an unsettled proposition that one can hardly give any definite status to it, and it seems to be high time that the dealer, jobber and manufacturer got together and decided on some definite policy as to the sale of advertised goods. The manufacturer wants the benefit of the expenditure he makes to advertise his goods, to which he is entitled, but he should keep in mind that the co-operation of the dealer is his greatest asset. The manufacturer may carry out a very successful campaign of great magnitude, and for a time may make large sales, but if he expects to make a permanent proposition of his business he will do well to consider the good-will of the dealer toward his product, and he cannot expect to maintain this good-will with a gross profit of 20 per cent for the dealer as it cannot be done with an admitted overhead expense of 20 per cent which every dealer knows he must face. The only thing the dealer can do is to let the manufacturer sell his product direct and handle some goods which will net him a profit, but the experience of many dealers has been that the customer is rather reluctant about ordering goods with which he is entirely unfamiliar from a circular, especially when there is a live dealer in the town. The customer would rather step in and ask the dealer's advice before buying, so it would seem as though the manufacturer who sticks to legitimate trade channels and allows his dealer a living profit will survive, for he will have thousands of dealers "working while he sleeps."

It is well known that repeat orders are what the manufacturers want. There is no profit in that first order which you spent $10 to get, but when the mail brings in orders without solicitation these come through the implicit faith of the one sending in the order that the goods are right and the order will be taken care of.

Perhaps one of the biggest problems which the dealer must face is the introduction of new appliances in his town or territory and the question arises who should stand the loss on demonstrating devices. The dealer buys the device in good faith, he puts some sales effort on it and finds out it is a "lemon" and must sell it for less than cost besides lose the time and money he has already invested in advertising and demonstrating. It seems to the dealer that the manufacturer has not stood his share. He gets the ultimate benefit of the sales effort of the dealer and if a large percentage of the new appliances are not successful the dealer must stand the loss.

Obtaining Publicity Through Attractive Window Displays.

Aside from the value of an attractive window display to attract the attention of passers-by to specific goods shown in a window considerable publicity can be gained through displays which are maintained for the sole purpose of being original. The Freeman-Sweet Company, Chicago, is a firm believer in attractive windows as a business asset and it is seldom that a week passes without some noteworthy display in one of its show windows.

The accompanying illustration will give a vague idea of the most recent window dress of this company, which is attracting a great deal of attention. A 100-watt lamp is suspended from a glass frame with no visible connection between the leads which extend upward and the source of supply. An ordinary lamp cord is hung from an outlet in the

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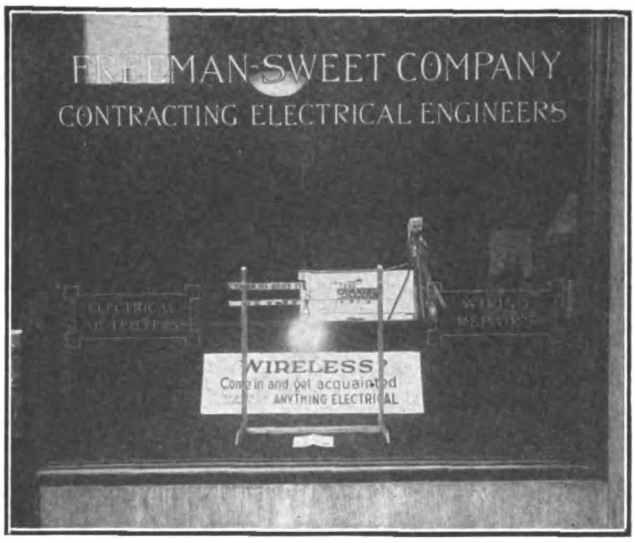

Attractive Window of Freeman-Sweet Company, Chicago.

ceiling directly above the lamp and the ends of this terminate about four inches above the loose ends of the wire leading to the lamp. The wire from both the lamp and the outlet is frayed at the open ends to give a realistic appearance.

Immediately back of the lamp, which is kept burning, is a placard, bearing the legend "Wireless" and underneath this is an invitation to the observer to "come in and get acquainted."

Electric-Iron Selling Campaign for Louisville.

Arrangements have just been completed by the Tafel Electric Company in Louisville, Ky., to conduct an electric-iron selling campaign, which is planned to cover the whole city and which will last about three months. There are several new angles connected with this campaign, which is the first in Louisville to be undertaken by a dealer independently of a lighting company.

The list of electric customers of the Louisville Gas & Electric Company has been placed at the disposal of the dealer, who has divided them into sections and routed ten canvassers who will be required to make reports on each of the subscribers. Each canvasser, all of whom are experienced men, will be given an allotted territory and furnished with cards on which to make reports. These cards which will be cut to fit in a card index will be preserved for later reference, especially in case where the first call did not result in making sales. Those marked to call later will be taken care of by wing clips and in that manner it is to be assured that all of the 10,000 prospects are solicited and reported on.

Westinghouse irons will be supplied by the company and they will sell at $3 on easy payments at 50 cents down and 50 cents a month or 10 per cent off for cash, salesmen receiving 50 cents for each sale. Collections will be taken care of altogether by the Tafel Company, which will use cards for punching to keep record of payments and thus be enabled to do away with elaborate bookkeeping. The Louisville Gas & Electric Company will lend its assistance wherever possible and the canvassers will meet daily at the offices of the company where the Tafel sales manager will discuss the work with them. Each man's record will be kept from day to day and percentages marked. The selling campaign will begin immediately.

Ductile Tungsten.—A patent taken out in Switzerland describes the preparation of tungsten by fusing in an electric furnace, and rapidly cooling with an air blast. It is then exceedingly malleable and ductile.

HOW PROGRESSIVE ELECTRIC SHOPS BID FOR TRADE.

Three Novel Window-Display Ideas.

In the window of an electric shop in a Pacific Coast city, a boy in farmer's dress, raking and tossing about a pile of one and two dollar bills, totaling several hundred dollars, served as highly effective advertising for the week of display. The window attracted great attention, crowds gathering about daily to watch the maneuvers of the boy, and resulted in a large increase in sales. A cash prize of $25 was offered for the nearest correct estimate of the amount of money in the window, the guess to be written on form blanks obtained in the store. Beyond the immediate returns, an active mailing list of possible customers was secured.

An electrical goods store in Southern California arranged an interesting display in its two show windows, consisting of a varied assortment of electrical specialties with a large amount of small currency, ranging from one cent to five dollars in silver and gold. The money was inserted in the different articles where possible and laid near them, as well as being scattered among the velvet window trimmings; all of the money was in plain view. Ten prizes, each a two-dollar article as might be selected from the stock, were offered for the nearest guess of the amount displayed, the estimate to be made on a form blank provided, with name and address, and deposited in a ballot box at the store entrance. The attraction continued for one week, during which the windows were a center of great interest with people endeavoring to count the money displayed. Considerable increased business was derived and the electric store became impressed upon the minds of hundreds of possible customers; additionally, a large list of names for circularizing was secured. The windows contained $273.72.

An enterprising electrical goods dealer in a Middle West city devised a unique window display with land turtles. His name comprised eight letters and on the back of each turtle one of the letters of the name was painted. A prize of $30 was offered to the first person who saw the turtles lined up so as to correctly spell the name. Large crowds watched the window continually as the turtles moved about, and during the week of display there was a noticeable increase in sales.

Electrical Development in Dominican Republic.

The Compania Anónima Dominicana de Agua, Luz y Fuerza Mortriz, recently inaugurated its service of water and electricity supply in the city of Santiago de los Caballeros in the Dominican Republic. Santiago is the second largest city in the Republic, having a population estimated at 15,000. The company, which is financed by American capital, has, since May, 1913, supplied electricity to Puerto Plata, and its future plans include the construction of a hydroelectric plant and the supply of electrical energy to the interior towns of Moca, La Vega, and San Francisco de Macoris. The American representatives of the company are Moore & Company, 12 Pemberton Square, Boston, Mass.

New Lamp Factories in Spain.—In Madrid two new factories for the manufacture of tungsten lamps have been started. One is associated with the names of Maximos Schultz and Paul Kissted. Twenty-eight electric-motors, of a total capacity of 99 horsepower, are comprised in the machinery equipment. The other factory is to be established by the Franciso Perez y Lijos Sociedad en Commandita.

At Valencia the manufacture of electric lamp bulbs will be undertaken by Olegario Masset, the concern, like the two above named, being started under the protection of the Ministerio de Hacienda.

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Business Hints for the Electrical Dealer

It Is Poor Policy to Introduce the Labor Element in Merchandise Sales—Opportunities for Using Business Information—Local Dealers Can Only Capitalize on National Advertising of Manufacturers by Letting the Public Know They Handle the Goods Advertised

By G. D. Crain, Jr.

The contractor who has been in the habit of selling labor has a hard time as a rule getting the purely merchandising angle on a proposition. That is, when he gets into the business of selling goods over the counter, as well as selling material plus labor in the form of a completed job, he can not resist the temptation, in a good many cases, to try to introduce the labor element, whether the customer wants it or not.

This is unnecessary. You can make just as much money, and make it easier, by selling goods, as by insisting on installing them. The plumbers, until a few years ago, made the mistake of refusing to sell goods which they did not install, and the result was to drive their customers to the hardware stores. The electrical dealers should encourage the public, which includes, remember, a great many amateur electricians who like to fool with dry batteries and bells and things, to buy whatever they want, irrespective of whether the dealer is going to install the material or not, the idea being to keep the trade in the trade.

Another feature of the proposition is that the uncertain factor in a business equation is always the element of labor. You know, in a given case, what the material costs, but it is always hard to tell just how long it is going to take a man to do the work. Hence when you hand out a piece of goods and ring the money up on the cash register, you have a sure and absolutely safe profit. When you send a man or a crew of men out on a job with a stock of material to work with, you are hopeful of making money, but if you are tied down by an estimate, you don't know positively whether you will or not.

"We always sell the goods if we can, especially if the job involved is small," said a successful dealer-contractor recently. "Lots of times the biggest item in the labor cost of a job would be the time taken for the man to get to the building and get back; and as we have to figure that, the customer gets the idea that we are trying to rob him. On the other hand, if the item is putting in a dining-room buzzer, for instance, and we have a piece of equipment that is easy to put in, we offer to sell it to the customer and let him do his own work. If he doesn't want to do that, and prefers to have us install it, we go ahead, and anticipate any possible kick on the labor charge. All around, selling merchandise without the labor is a good business policy, we think."

Using Business Information.

The other day the creditors of a certain young electrical contractor filed a petition in bankruptcy against him. He had had good credit—unfortunately—and so the supply houses stand to lose somewhere in the neighborhood of $5,000 or $6,000, as his assets are mostly small accounts.

It is always difficult to analyze a failure sufficiently accurately to be able to put a finger on the weak spot and say, "This is what caused the smash-up." Yet the writer had an opportunity to get one or two side-lights on this particular business which seemed to indicate in a rather certain manner just what the cause of the failure was. Failure to give attention to opportunities for business was one.

At one time this concern was paying a considerable amount of money for a daily construction bulletin issued by a local company, which had a large organization used for the purpose of compiling information about new buildings. In many cases these buildings were still in the formative stage, with the plans on the drawing-boards of the architects. Obviously, getting the tip on what was going on in the building field was valuable information from the standpoint of the man in the electrical construction field; only this particular member of the trade did not think so.

He took the service for several months, and finally discontinued it, with the explanation that he had not had time even to open the envelopes, and consequently was not getting the advantage of the information. He probably was busy with other things; and yet the mental attitude suggested by paying a high price for something of value, and then neglecting or refusing to make use of it, is suggestive as to the reason back of the ultimate failure.

Of course, there may have been and probably were other factors, such as bidding too low on large jobs, for he had several pieces of work which ran to considerable money; but the habit of running a business in the slovenly fashion indicated, with everything at loose ends, is not one that suggests success, even when fortune is favorable in the matter of business landed.

Good Will in Location.

Location is one of the most interesting and at the same time puzzling factors included in the business of selling at retail.

Picking a good location is a problem all by itself; and trying to explain why one concern succeeds in a given location, and another fails in almost the same spot, likewise offers opportunity for plenty of cogitation.

In this connection there is a certain electrical concern in a large city of the Middle West which has literally grown up with the city. It is now being conducted by the second generation of those who founded it, and during the 30 years or more that it has sold electrical goods, etc., it has never left the general locality where it is still doing business.

The name and the location have become "household words" in that town, and the name of the store is constantly heard when a consumer is asking about things electrical. The immense amount of good-will tied up in the name and the location have thus sufficed to insure a steady stream of business for that store.

Some of the other concerns that have entered the business at different times have used the rather unimaginative plan of trying to divert some of this trade by putting their stores as close to the original establishment as they could, decently. But invariably these concerns have not succeeded well enough to become permanent factors, and today the house which has dominated that part of its community in its particular field for so many years is practically without competition there.

On the other hand, a number of very successful stores have been built up in other localities. As a matter of fact, the street on which the first-named concern is doing business is hardly ideal from a retail standpoint, and it is only because of the peculiar conditions that the house has been able to make a distinct success. Electrical dealers who were wise enough to see that it was better for them to "make" their own locations, and by advertising and in other ways attract an entirely new class of trade, instead of trying to borrow from that of someone already in the business, have done well. Here, as elsewhere, the imitator and the man who follows without knowing why have a hard time coming out on top.

A Real Electrical Stock.

Electrical Prosperity Week was celebrated in a number of

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cities by holding expositions in which local dealers displayed lines of goods which they were featuring.

A noticeable phase of the situation was that a great many people who attended these expositions indicated by their comments that they did not know that these goods were on sale in their community.

Obviously the dealers have not been doing their share of the educational work. The manufacturers told about their goods and aroused the interest of the public, but until the dealers participated in this publicity effort and let their local people understand where the merchandise could be had, there was no chance to buy.

So it should be remembered, always, that merely having the agency for a certain line of goods, even though it is exclusive and valuable, does not insure getting the business; it merely presents a very favorable opportunity to get it. The distributor must earn the sales by advertising to his own community, and impressing on the minds of as many people as possible this thought: "The Blank Electrical Company Has the Stock!"

In this connection, it is no longer as easy and simple a matter to carry a complete stock of electrical goods as it was a few years ago. For example, a dealer in electrical goods recently ran over his inventory for the benefit of the writer, and found that he had nearly 1,500 items in stock. It takes some capital to keep a store running with as much goods as this constantly on hand, which is another way of saying that it is not as easy to break into the business as formerly. However, the man with a reasonable stock, who pushes it vigorously, and who really tries to perform a service for the public by having the electrical merchandise which is likely to be wanted —and there is a real service involved there—is practically certain to succeed.

The Partnership Proposition.

Some men are so busy attending to the little details of their work that they have no time to look after the big things.

They soon cease to be the masters, but become the servants of their own businesses.

The thing to do is to organize in such a fashion as to get more opportunity to look after the general conduct of the business, rather than the minor details connected with it.

This may work out in the formation of a partnership, in some cases, though not necessarily. There are certain kinds of partnerships which are ideal, because one man is able to do a certain kind of work—such as looking after the shop and the contracting—superlatively well, while the other can handle buying, sales, advertising, etc., effectively. A combination of this sort is hard to beat. If you can get a good partner, who can help out in this way, it might be the means of putting your business on the high road to success. But be sure you have the right kind of partner. The other sort can cause a lot of trouble.

Building Up Our Foreign Commerce.

In his first annual report as chief of the Bureau of Foreign and Domestic Commerce, Edward Ewing Pratt lays particular stress upon the fact that "this great European war has suddenly and in a moment thrust before the eyes and imagination of the American business community the subject of foreign trade." As the Bureau is more directly interested in the development of foreign trade than any other Government office, a large part of the annual report is devoted to a discussion of commercial conditions brought about by the war and to constructive suggestions for further extensions of our trade abroad.

After describing in detail the growth of our foreign trade during the first 12 months of the war, Dr. Pratt asserts that the American business community should guard against any sense of safety in our present prosperity in so far as that prosperity is based on business connected with the belligerent activities in Europe. Our business men should carefully discount the continuance of so-called war orders and avoid basing future calculations upon conditions which they bring into existence.

Two of the great problems that must be solved, if the United States is to make the most of its present opportunities receive much attention in the report—financing foreign trade, and the problem of educating men to carry on such trade.

In spite of the fact that we are making headway in financing our foreign trade the report insists that we can never hope to gain the really big prizes in foreign trade until we are prepared to loan capital to foreign nations and to foreign enterprises. "The big prizes in foreign trade are the public and private developments of large proportions, as, for example, the building of railroads, the construction of public-service plants, the improvement of harbors and docks, the digging of canals, and many others which demand capital in large amounts. New countries are generally poor. They look to older and richer countries to supply them with the capital to make their improvements and to develop their resources. The country which furnishes the capital usually sells the materials and does the work. In the last analysis it comes to this: The country that wants the business must finance the purchases, since the improvements will be made and the materials paid for out of the money loaned."

The other problem of commanding importance in the development of our international commerce is the education of men for foreign trade. "It is absolutely necessary that we train men to carry on our foreign trade, for we find ourselves today without an adequate supply. This problem may be regarded as the very fundamental of success in this field. Our banks can not establish branches because they have not the men with which to man them. Our manufacturers find it difficult to secure salesmen. Investors cannot find competent advisers on foreign offerings."

In addition to these two great problems the report takes up a number of others that are now receiving marked attention by the business world, such as the necessity of a definite foreign commercial policy for the United States, the revision of commercial treaties, the much-discussed subject of a merchant marine, co-operation in foreign selling, free ports, and commercial preparedness.

The effectiveness of the Bureau's work in promoting American trade in foreign countries is best shown in the definite practical results obtained. To prove that such results have been well worth while, the report takes up in detail a number of the largest contracts that American firms have closed as a result of the Bureau's activities. Some of these foreign contracts have involved millions of dollars. As a result of a conference with the King of Spain, a commercial attache of the Bureau opened up markets for about 3,000,000 tons of American coal annually. This conference resulted in the removal of the Spanish transport tax on American coal that had previously been a great obstacle to gaining a foothold in this market. One of the cases in the electrical line came from information published as foreign trade opportunities and resulted in a contract for a new telephone system for Bergen, Norway, amounting to $201,000.

In reviewing the activities of the Bureau of Foreign and Domestic Commerce during the fiscal year 1915, Dr. Pratt calls special attention to the new and important commercial-attache service made possible by an appropriation of $100,000 by the Sixty-third Congress, and urges that a still greater expansion of the Bureau's work abroad is imperative under present conditions and those sure to exist in the future.

New Lamp Filament.—An alloy of zirconium and iron has been proposed for lamp filaments, as it is tough, malleable and ductile. Its radiation is highly selective, providing high luminosity at low temperature.

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National Association of Electrical Inspectors.

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H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

The Eastern Massachusetts Section held its regular monthly meeting on January 21 at the office of the commissioner of wires, Boston, with a very large attendance.

The principal business was the election of officers, which resulted in the election of William P. Briggs, inspector of wires, New Bedford, president; W. Lincoln Smith, inspector of wires, Concord, secretary-treasurer. Executive Committee: W. H. Greenlaw, city electrician, Beverly, chairman; Charles H. Ashby, city electrician, Salem; B. Frank Moody, city electrician, Lynn; E. N. Davis, superintendent of lights and wires, Brookline, and H. A. Knight, supervisor of wires, Worcester.

Messrs. Davis and Knight were re-elected as representatives of the Section on the Executive Committee of the National Association.

At the next meeting of the Section, which it was voted to hold on either February 11 or 25, at Young's Hotel, Boston, it is expected that ex-President Day, of the National Association, will speak on "Concentric Wiring and Fittings."

The members of the New York Section assembled for their January meeting on Monday evening, January 10, in the Municipal Building, Manhattan. The attendance was large, there being representative delegations from both city and insurance departments. G. E. Bruen presided, and after the election of new members, introduced Lester H. Graves, illuminating engineer of the National X-Ray Reflector Company, who read a most interesting paper on "Lighting from Concealed Sources," illustrated with slides. The speaker showed what has been accomplished in efficiency and superior distribution of lighting when this important problem is handled properly, instead of trusting to more or less haphazard methods of the past. George R. Brown, inspector in charge of Motion-Picture Operators' License Bureau, handled the stereopticon and slides.

C. C. McIntyre, inspector for suburban fire insurance, presented a report on outlet boxes, as a result of much investigation of types and sizes by the Committee on Outlet Boxes.

The annual election of officers will be held February 14, on which date also final action is to be taken on proposed by-laws.

Question 316 is interesting, as illustrating the different views of men, according to the nature of the territory considered and the apparatus used. Thus N has nothing in his immediate territory higher than 2,200 volts on its high side, nor 220/110 single-phase on its low side, and all transformers are on poles or outdoor raised structures, except a very few in small vaults in the basements of three or four large dwelling houses in what are really small private parks on the outskirts of the town, as he tells me. On the other hand, M writes from a territory where his transformer experience is of a nature covering polyphase transformers of several thousand kilovolt-ampere, 125,000 volts on the high side and 3,500, say, on the low side, so that transformers stepping down from 3,500, to 550 or 250/125 would be common indeed and installed in all sorts of places. The viewpoint will obviously be different, and, of course, practice will differ markedly and with reason.

The Secretary desires to call the attention of members to the fact that the green binders for the Code marked with the owner's name were a gift to each member of our Association as a New Year's remembrance from the organization whose seal was placed on the binders.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Transformer Accessories in Vault.

Question 316. Where permission is granted under Rule 45 to place transformers in vaults located within buildings, are any of the secondary appliances permitted within the vault, or must they be kept outside?

Answer 1(T). I would say that secondary appliances should be located outside the transformer vault, as it would make these appliances more readily accessible.

Answer 2(F and G.). Rule 45 *b* states that the inclosure is to be used only for this purpose. It is our practice not to permit other devices in the same vault.

Answer 3(A).* Rule 45 *b* says for transformers only, and is to be kept securely locked. This does not look as if any secondary work were to be inclosed in the vault. What experience we have had with these vaults indicates that it would be rather dangerous for the ordinary householder (or help in a manufactory) to install any secondary work in with the primary wiring.

Answer 4(O). Under Rule 45 *b* the transformer vault is to be used only for the purpose of inclosing the transformer,

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and it is to be kept locked, therefore inaccesible to all but a few persons. Under these conditions it is hardly a suitable place for any secondary appliances to be used in the operation of the circuit.

Answer 5(E). Oil-immersed switches should be provided, these switches being fitted with an overload and no-load releasing device, taking the place of the ordinary fuses and switches required on the low-potential side.

Answer 6(S).* Rule 45 *b* requires that the transformer must be placed in an inclosure of fire-resisting material, the inclosure to be used only for the purpose. This rule does not allow of secondary apparatus within the vault.

Answer 7(U). I know no reason why the secondary appliances should be allowed in the vault.

Answer 8(N).* This is one of those questions which is very hard to answer flatly one way or the other. The word building is very indefinite; so is the word secondary. I presume what is meant is what is properly called the "low-potential side." Again our "vault" may range from a small chamber just big enough for a single transformer and head and shoulders while connecting up, to what amounts to practically a building within a building cut off from the main structure by fireproof walls, ceiling and floor with iron doors. A rule cannot cover every such contingency and there must be leeway for the exercise of judgment by a department chief. In general it would be a safe thing to say that low-potential fittings were *not* to be put in the inclosure, and then let the applicant prove that the conditions in this particular case were such that an exception should be made.

To illustrate a few of the above points: This case might be a very small vault, practically a fire-resistant case outside the iron case of the transformer, primary fuses inside the vault on the iron case, secondary not fused at all until main distribution center was reached, reliance being placed on the primary fuses.

Again these same fuses might be back on the pole where the private pair of primaries left the public pole line, in which case primary drop might allow considerable secondary heating before the primary current got heavy enough to blow the primary fuses, in which case a pair of fuses should be placed close to the transformer on the low side.

Again, this might be a considerable-size, thoroughly fireproof room in a mill building adjacent to the power plant, where low-potential power was stepped up for some purpose, in which case the secondary is the high side and might very well have certain devices necessarily in the vault. Such a power room is not a central nor substation technically.

These are merely suggestive and a very considerable number of conditions may arise.

The whole matter comes under the head of special permission, and this being so, it appears to me that the same thought which places discretion on the department chief would naturally also allow him to exercise similar good sense and discretion in determining whether any and what devices on either the high or low side should be permitted or possibly ordered in the vault as each special case arises for consideration.

Answer 9(M). I do not believe that the intent of the Code is either to approve or disapprove the practice of placing any secondary apparatus in the transformer vault. However, the Code does state that the inclosure must be used only for the purpose of inclosing the transformers. There is certain apparatus incident to the operation and control of high-potential transformers that it is considered a transformer inclosure is the proper place to put such apparatus as oil switches, compensators, current and potential transformers, etc.

Under ordinary conditions of operation there is little fire hazard from the use of high-tension transformers, the average of transformers in use to those destroyed by breakdown of insulation being small; if proper methods are used their destruction by fire from overload is a condition it is possible to avert; the thought that is commonly given to the high-tension wiring within the vault is such as to render it very unlikely that a possible injury to secondary apparatus from a high-tension conductor should occur.

The problem then resolves itself into whether any undue damage would be wrought to secondary apparatus through the burn-out of the apparatus on the primary side of the circuit, or the burning of oil. From a very extended experience with this class of apparatus I would permit the installation of secondary apparatus within the transformer inclosure, assuming of course that an electrician of known ability was in charge.

When an incompetent person, such as the ordinary "handy-man" has an installation such as this under his care, the door of the vault will usually be found unlocked, ajar or open; space used for storage of paints, oils, and miscellaneous litter, and the entire installation in poor condition, electrically speaking. Permission in such cases should certainly be withheld.

Answer 10(R)*. In this territory we require that all secondary devices or appliances be placed outside the vault.

Wiring Back of Switchboards.

Question 317. What is the best practice in the matter of compliance with Rule 3e? Is it better to use asbestos hose; or a wrapping of asbestos tape coated with water-glass; or tube of the "circular loom" class?

Answer 1(R)*. This is largely a matter of choice; personally I prefer the asbestos hose, well secured in place with binders, next the glass-covered tape.

Answer 2(M). It is the practice in this territory, where rubber-covered wire is used as referred to in Rule 3*e*, to serve the wire with asbestos tape on half wrap. Putting the wire in hose involves greater time in accomplishing the same object, while the third method is usually impracticable owing to limited space.

Answer 3(U). Asbestos tape coated with water-glass is my preference, but the others would usually be accepted.

Answer 4(S)*. Asbestos hose or braid should be considered for first choice. Flexible tubing might be used in some cases where conditions are favorable. I have had no experience with the tape and water-glass.

Answer 5(F and G). Flexible tubing cannot be considered non-combustible, therefore its use does not comply with the requirements of the rule. Asbestos tape properly secured in place is satisfactory, but the use of asbestos hose over the inflammable insulation is probably better.

Answer 6(A)*. This depends on the size of switchboard and what amount of current is to be distributed. A switchboard of any size would naturally have busbars. Other than that I should say flexible tubing would be perfectly safe.

Answer 7(O). The best practice to be followed is to obtain the regular central-station wire with flameproof

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braid put on by the maker. Where only a portion of the circuit is exposed and needs flameproofing, it is usually easier to apply a layer of asbestos tape secured in place by liquid glass than it is to disconnect the wires and pass them through the asbestos hose. Except in central stations the flameproofing need only be furnished when required, and I should judge that in the great majority of small switchboards and control panels if the grouped wires were separately inclosed in approved flexible tubing, then the flameproofing need not be required.

Answer 8(T). Asbestos tubing or hose is satisfactory, but I believe that asbestos tape saturated in water-glass and applied to conductors makes a much better and more substantial flameproofing finish for conductors. I do not consider flexible tubing as a very effective flameproofing braid.

Answer 9(N)*. I should say first place must be given to asbestos braid with the water-glass coating (or rather dipping, as it is put on), next the asbestos hose and lastly the flexible tubing. All this provided the job is not important enough for the standard flameproof wire for such work to be used.

Flexible tubing (Rule 63) must not carry flame when a Bunsen flame is applied outside, but what it will do when heated equally in the middle of a run is not so clear.

If we do get heat in the inflammable wire cover we may get considerable gas pressure and both the hose and flexible tube may not relieve this until the gas travels quite a distance and becomes heated enough to flash into flame, whereas on the other hand the tape wrappings will more readily tend to open slightly and relieve the pressure locally.

CONDUIT EVOLUTION.—II.[1]

Various Processes to Prevent Corrosion and Tests to Determine Efficiency of Protective Coatings.

By Alfred E. Braddell.

We come now to the present-day types of unlined rigid conduits. These may be divided into two classes, one known to the trade as "black enameled" and the other as "galvanized." The latter type I will subdivide into three classes on account of their respective methods of applying the galvanized finish and in the order of their introduction on the regular market, as follows:

No. 1. Electro-galvanizing process.

No. 2. Sherardizing.

No. 3. Hot-dipped galvanized.

The original unlined conduit placed on the market was the black-enameled type and is now being furnished by a number of manufacturers.

Black-Enameled Conduit.

This character of conduit is furnished with black enamel both on the interior and exterior surfaces and was in use for some years before the galvanized type of conduit made its appearance. It apparently gives satisfactory results where located in dry places, but where subjected to damp conditions, especially if the enamel has been subjected to harsh treatment during installation, or otherwise, corrosion will readily occur. The pipe is first put into a bath of potash to cut off all oil and grease, then into a sulphuric-acid pickle bath to remove the scale, then into a hot-water bath to clean off the sulphuric acid and finally into the enameling bath, which should be done directly after the pipe has been removed from the hot-water bath; otherwise oxidation is liable to set in before the coating of enamel is applied.

The same cleaning process applies to both an electro and a hot-dipped galvanized conduit, with the exception that with the latter after the pipe has been in the sulphuric pickle and hot water, it is again immersed in a muriatic-acid bath and then directly into a zinc bath, thus preventing the possibility of oxidation before the zinc coating is applied. The muriatic acid is used as a flux and also insures a thoroughly chemically clean surface.

The same remarks covering possible oxidation on pipe before enameling apply equally to the interior surface of an electro-galvanized conduit, there being a zinc coating on the exterior surface only. The placing of an enameled conduit in cinder fill is considered bad practice, as the presence of potash, which is an alkali, readily attacks the oil in the enameling, causing what is termed saponification and disintegration of the metal is therefore the result. Under such conditions, the highest grade of galvanized conduit is none too good.

Galvanized Conduit.

The electro-galvanized process is, as the name implies, the depositing of zinc on the outer surface of the conduit. Zinc is applied under this process to the exterior surface only, it being impracticable to deposit zinc on the interior surface of a standard 10-foot length of conduit without placing the electrode through its entire length, which, one can readily see, could not be done with commercial profit. For this reason electro-galvanized conduits are furnished with an enameled interior. Now it may be interesting to analyze how the zinc is deposited on conduit or any given material by the electro-deposition method.

We know that each element has what is termed its own particular "electrochemical equivalent," viz.: the amount which is liberated by one coulomb, or ampere-second of electric current.

From experiment it has been shown that one coulomb will liberate 0.000010384 gram of hydrogen, and hydrogen being the lightest element known, its weight is taken as unity or the basis of comparing the weights of atoms of other elements.

Knowing this factor, therefore, together with the atomic weight and valency of other elements, we can calculate their respective electrochemical equivalents by the simple formula: electrochemical equivalent equals 0.000010384 multiplied by the atomic weight and divided by the valency.

From this formula we obtain the electrochemical equivalents of zinc as 0.000337 per coulomb. Now from this it will be seen that the amount of zinc which can be deposited will vary directly as the amount of current used and the time consumed, or in electrical terms, the number of ampere-seconds or coulombs expended.

The minimum thickness of zinc coating which should be applied to a conduit in order to obtain satisfactory rust prevention will be discussed later under tests.

The sherardizing process obtains its name from an English engineer, Sherard O. Cowper-Coles, and is obtained by a process of applying heated zinc dust both on the interior and exterior of the conduit.

The general method is the placing of the article to be sherardized in large drums which are heated to the desired temperature, approximately 700 degrees Fahrenheit, and containing zinc dust consisting mainly of finely powdered metallic zinc with zinc oxide, which becomes vaporized and amalgamates with the metal article to be sherardized.

The hot-dipped-galvanized process is as the name implies. The pipe after being suitably cleaned of all scale, grease, rust, etc. (which applies to conduit of all manufacturers), is placed in a bath containing pure molten zinc at a temperature of approximately 900 degrees Fahrenheit, the melting point of zinc being 773 degrees Fahrenheit, for a certain period of time, and each ten-foot length is then picked up mechanically and run through a patented machine which wipes the molten zinc into the conduit on both the exterior and interior surfaces at the same time, thus obtaining a smooth and homogeneous coating of zinc throughout.

[1] Paper read at meeting of New York Section of National Association of Electrical Inspectors, December 13, 1915. Part I appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 22, pages 164 and 165.

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This wiping process has to be done quickly to obviate any cooling effect on the zinc, the period of time elapsing between the actually picking up of the conduit from the bath until the wiping process is completed being approximately only two seconds.

It may be of interest to know that the wiping process referred to is carried out by means of heated compressed air, and the product thus manufactured is another sample of Mr. Greenfield's originality.

With regard to this particular product, owing to the belief that if it had been marketed showing the zinc coating only on both the exterior and interior surfaces, unscrupulous persons might have seen fit to use ordinary commercial galvanized pipe in place of an approved electric conduit, it was decided by the underwriters (see National Electric Code, Rule 58-*f*) that some identification was necessary and for that reason only, this type of conduit is furnished with a thin black japan finish on its interior surface. This covers briefly the various methods of applying zinc galvanizing to the present types of conduit coming under that class.

The point now is to consider the value of galvanizing. Does it materially obviate the prevention of oxidation? The consensus of opinion among engineers is in the affirmative, provided you obtain a good and sufficient quality of zinc. There is a limit to the amount of zinc which can be absorbed, so to speak, in the hot-dipped process, by any particular piece of metal, this being governed to some extent by the thickness of the metal, and if by any process the zinc coating is applied too heavy, it will be found to crack and flake when the material such as conduit is formed on a bend.

If this zinc coating should be a thin film, you obtain little or no efficiency from such a coating. There must be some point therefore where we can arrive at the maximum efficiency with the least expenditure of zinc to obtain such efficiency. The life of a galvanized conduit is undoubtedly governed by the character of zinc applied, and this is now being recognized in the specifications of many leading engineers and the United States Government, which specifications do not recognize any particular brand of conduit, but call for the galvanizing to fulfill certain tests irrespective as to how the galvanizing is applied.

Tests.

To ascertain the amount of zinc which should be applied to conduit or other articles in order to obtain a sufficient coating of galvanizing for efficient rust prevention, several tests have been proposed, a few of which I will briefly describe.

Potash Test.—All galvanized conduits furnished with an enamel over the galvanized coating shall have same removed before testing. This may be done by using varnish remover. Make up a 10 per cent solution (by weight) of caustic soda (potash) and heat same to a temperature of 190 to 200 degrees Fahrenheit. Immerse length of conduit in potash for ten minutes, after which thoroughly rinse in clean water and then dry. The outside surface of conduit to be then cleaned with carbona to remove any existing foreign matter; conduit then to be tested in standard solution of copper and no copper deposit to show on third dip.

Caustic-Soda Test.—Quoting from the *Iron Age* of August 13, 1914, by Samuel Trood: "Another test for a zinc coating is the caustic-soda test as supplied by Professor Walker. This test will show the presence or absence of pores or cracks in zinc coatings. The galvanized article is suspended by a string or other non-metallic suspension in a strong solution of caustic soda in water, heated to a temperature of 210 degrees Fahrenheit. If pin holes or cracks exist in the surface, bubbles of hydrogen will be observed to come from the surface of the article at these points, while if no pores exist, no hydrogen will be evolved."

Salt-Spray Test.—This test consists in exposing the galvanized articles in a box into which there is projected by compressed air an atomized spray of 25-per-cent solution of salt in water. Care should be taken to avoid placing the articles directly in the path of the jet.

The spray is produced by a jet of compressed air lifting the water to the nozzle whence it is projected as a cloud of salt water and air. The temperature of the water can be controlled by a steam coil placed at the bottom of the box. The specific gravity of the water is kept at 1.026 and 1.03 at 60 degrees Fahrenheit.

Under this test the galvanized articles should stand a minimum of 170 hours without showing oxidation to be satisfactory.

Sulphate-of-Copper Test or Preece Test.—This test was prepared by the late Sir William Preece of London, England, and I believe adopted in this country as a standard by the American Telephone & Telegraph Company.

The sample shall be cleaned before testing first with carbona, benzine or turpentine and cotton waste, and then thoroughly rinsed in clean water and wiped dry with clean cotton waste.

The sample shall be clean and dry before each immersion in the solution.

The standard solution of copper sulphate shall consist of commercial copper-sulphate crystals, prepared as follows. The copper sulphate shall be ground up as small as possible before being used; then pour these ground crystals, a small quantity at a time, into a glass vessel containing water. Dissolve 5 parts by weight of copper-sulphate crystals in about 14 parts by weight of water. This process can be hastened materially by having the water at or near the boiling point and stirring constantly until cool.

The solution shall have a specific gravity of 1.186 at 65 degrees Fahrenheit at the beginning of each test, and a fresh supply used for each sample.

Sample shall be immersed in the solution four times, the temperature of the solution being maintained between 62 and 68 degrees Fahrenheit. Each immersion should be for one minute; then wash and wipe dry.

After each immersion sample should be washed in clean water having same temperature as the solution and wiped dry before the next immersion.

If no fixed copper deposit appears on the fourth dip after the wiping process, the test will be considered satisfactory.

For commercial testing, this method is apparently considered quite satisfactory for determining the efficiency of a zinc coating on conduits as applied by the electrolytic, sherardized or hot-dipped galvanized processes.

The requirements of such a test seem to be a rational procedure, practically all other materials being obliged to conform with some standard. Copper wire is required to be of not less than 98 per cent conductivity; a good rubber insulation must have at least 30 per cent Para in its composition. I might add that while, say, a No. 6 B & S gauge copper wire, with rubber insulation, is allowed to carry 50 amperes of current, such size would not be adhered to when distance is taken into account, as the drop of potential must be considered in order to obtain proper efficiency.

Further, in calculating carrying capacity of copper for busbars, switches, etc., heating effect has to be considered in accordance with the problem in hand. One installation may be satisfied with copper based on 1,000 amperes per square inch and another on account of operating conditions may require 700 amperes or less per square inch. The object is to obtain efficiency. Why then not apply the same reasoning to galvanized conduit?

The name of any particular make of conduit or the statement that the zinc coating is applied by any specific process does not necessarily imply that the coating is of an efficient character and a visual inspection of the product does not gain you any definite knowledge.

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PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

NEW JERSEY.

Public Service Electric Company. Taking of testimony has been begun by the Board of Public Utility Commissioners of New Jersey in the proceedings involving the reasonableness of rates charged by the Public Service Electric Company. Dugald C. Jackson, of Boston, submitted a voluminous report, prepared under his direction and showing the physical appraisal of the property of the Public Service Electric Company, consisting of stations with equipment, general buildings and aerial lines, including the property of leased companies. The appraisal included only such property as is actually used for electrical purposes, a separate inventory being made of all abandoned buildings or substations which have been supplanted. Three sets of figures were submitted by Mr. Jackson. He fixed the reproduction cost, new, of the plant, at $35,008,200, and the reproduction cost less theoretical depreciation, at $24,863,503. The present value, based upon inspection, as of July 1, 1915, was placed at $26,514,000. Mr. Jackson divided the state into six zones or divisions, broadly representing the operating divisions of the company. He placed the present value of the southern zone at $4,037,100; central zone, $4,438,300; Bergen zone, $1,543,500; Essex, $5,743,600; Hudson, $6,733,400, and Passaic, $1,731,100. In reaching present value, Mr. Jackson made an allowance of $1,514,700 for piecemeal construction and $772,300 for general contractor's profit.

VERMONT.

Public Electric Light Company. The Public Service Commission has granted a certificate of authorization to the Public Electric Light Company, a Massachusetts corporation, permitting it to engage in generating, transmitting and selling electrical energy in St. Albans, Fairfax, Georgia, Fairfield, Fletcher and Cambridge, Vt. The Commission approves the sale of the Vermont Power & Manufacturing Company's property in Franklin County, Vt., to the Public Electric Light Company, the latter to assume all first mortgage bonds of the Vermont company, amounting to $250,000, and also its second mortgage bonds to the amount of $160,000.

Central Vermont Power Company. The Central Vermont Power Corporation of Vermont, which was refused a certificate by the Public Service Commission, setting forth that "the establishment and maintenance of the proposed corporation will promote the general good of the state," reference to which was made in this department in the issue of January 22, has asked further hearing by the Commission, on a petition which sets forth in detail the objects and purposes of the corporation. The Commission's objection to the earlier petition was on the ground that it was too broad in its scope.

The latest petition specifies that it is proposed to construct dams on the Middlebury River and its tributaries, to build and operate transmission line and substations for the distribution of power in Middlebury, Ripton, Lincoln, Hancock, Granville, Warren, Roxbury, Northfield, Berlin, Barre, Montpelier and Williamstown, and to sell electrical energy for lighting in Ripton, Lincoln, Hancock, Roxbury, Berlin, Warren and East Middlebury.

MASSACHUSETTS.

Shirley Electric Company. The Gas and Electric Light Commission of Masachusetts has approved an issue by the Shirley (Mass.) Electric Company of 130 shares of common and 36 shares of preferred stock, of $50 par value, the proceeds of 136 preferred and 56 common shares to pay $9,600 in mortgage notes, and of 14 common shares to pay notes outstanding October 30, 1915, and of 60 common shares to pay obligations incurred for additions to plant represented in accounts payable on that date.

Provincetown Light & Power Company. The Gas and Electric Light Commission has approved an issue by the Provincetown Light & Power Company of 600 shares of new capital stock, $100 par value, at $100 per share, the proceeds to be applied to the purchase of the plant of the Provincetown Light & Power Company used in the production and distribution of electricity in Provincetown.

WISCONSIN.

Janesville Electric Company. The Railroad Commission has investigated a complaint made by several power customers relative to the proposal of the Janesville Electric Company to change from direct current to alternating current in several districts where large power customers are located. The Commission considers that the change to alternating current will increase the efficiency of the system and states that "under Commission regulation it may be assumed that an increase in plant efficiency benefits all consumers. The abandonment or reduction of the extent of direct-current service will make the Janesville system simpler and more efficient and will tend to reduce operating expense. However, the consumer whose direct-current equipment is replaced at this time will receive no greater benefit from the change than that enjoyed by every other patron of the company. Such consumers, therefore, should not be subjected to any pecuniary loss in connection with the change of equipment. On the other hand, if the utility were required to stand the entire cost of making the change and this change resulted in replacing second-hand or worn-out equipment with new equipment, it would thereby be paying for renewing that part of the equipment that had been worn out by the consumer."

It was, therefore, held that the consumer should pay for the depreciation for his direct-current installation and the utility for that part that is still useful but for which the consumer is unable to realize, plus the cost of making the change.

The particular method suggested for arriving at this value is as follows:

(1) Determine the original cost of the motor and control equipment and deduct its scrap value from that original cost.

(2) Determine by inspection the per cent condition of the equipment taking into account its remaining useful life and the care it has had while in service.

(3) Apply the per cent condition to the original cost less scrap value.

(4) Add the scrap value to the result thus obtained to give the present service value of the motor equipment before the direct-current service is discontinued.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Connectors for Emergency Power Circuits and for Meter Reading.

Since electric power is so generally used in shops and factories any means that permits maintaining power on an important motor is of value in keeping the shop in operation when breakdowns occur in the supply circuits or auxiliary apparatus. In taking a meter reading of the power input to a particular motor or other circuit it is also desirable to have available means for making the connection to the meter quickly and without disturbing the wiring.

These two objects were kept in mind in designing a line of power and meter connectors which has recently been placed on the market by the Roberson Electrical Appliance Company, 2821 North Avenue, Milwaukee, Wis. These connectors were invented by Lewis C. Roberson after many years of study of shop conditions and of the requirements for a connector suitable for emergency or temporary circuit connections. Several types of these devices have now been perfected, of which the one shown in Fig. 1 is used for miscellaneous circuit connections. It can be used for connecting wires ranging from No. 14 up to No. 6 and includes a fuse of the cartridge type carrying up to 30 amperes. Other connectors are made for heavier capacities, ranging up to 300 amperes.

The construction of this type of connector is made clear in Fig. 1. It consists of an insulating handle *K* with a separately controlled bushing *S* at its bottom and an insulating head *DG* provided with a jaw-like opening *H*. The insulated jumper wire or cable is placed into the lower part of the connector bushing at *U*, the wire being held in place by the two set screws *T*; it is not necessary to remove the insulation from the wire because on driving the set screws down tightly they will cut through the insulation and engage the conductor itself, at the same time firmly holding the wire in place. The current passes from these set screws through a movable stem that extends through the locknut *Q* and connects with an L-shaped contact secured to the lower fuse clip *M*. A standard cartridge-type Code fuse is placed between the fuse clips *M*. From the upper one of these clips the current passes through contact *L* and a metallic stem reaching through the upper part of the handle and through the jaw *J*, connecting with the barbs or prongs which are arranged to engage the other cable or jumper; in this case, also, the connection is made without wasting time to skin the wire, the sharp prongs piercing through the insulation and making rigid electrical and mechanical connection with the wire. The part with the prongs is moved upward so as to make this contact with the wire by turning the handle *K* to the right. The locknut *Q* is meanwhile left loose, this leaving the bushing *S* and its connection with the other cable at *U* free so as to be not affected by the turning of the main body of the handle *K*. As soon as the connection in the head of the connector has been completed and the prongs firmly driven into the cable the locknut *Q* is turned to the right; this makes the bushing *S*, together with its connection with the lower cable, rigid with the handle *K* so as to complete a perfect electrical connection between the cables.

Shown at the right in Fig. 1 is a small cover plate *A* which is placed over the fuse opening in the handle. On turning the knurled ring *N* about the groove *B* in this cover plate it is held in place and the fuse and its clips thoroughly protected. The body of the connector is made of insulating material and the head of the device is made of an insulating compound known as Thermoplax. Thus the entire connector is protected electrically and the fuse within it cannot injure the operator in case it should blow. The entire connection is very quickly made and serves as a means of restoring power to important circuits in which the wires may be broken through accident or otherwise.

Another type of connector is shown in Fig. 2; this is designed particularly to enable meter readings to be taken quickly and without disconnecting any wires or cables from the cutout. In order to make a meter connection the fuse is removed from the cutout clips and placed into the body of the connector between the standard cartridge fuse clips *F*. A cover, in this case flat, is placed over this opening to protect the fuse *G*. Secured to the end of the device are two cylindrical metallic connecting members *J* and *H*, separated by the insulation *I*. This end of the device is then put in place of the fuse which has been removed, *J* and *H* fitting into the fuse clips of the cutout. A stem connects internally the member *J* to the terminal bushing *D* at the bottom of the connector. The wire going to the meter is secured in *D* by one of the set screws *B*; the wire coming from the meter is secured to the other terminal *C* by the other set screw *B*. An

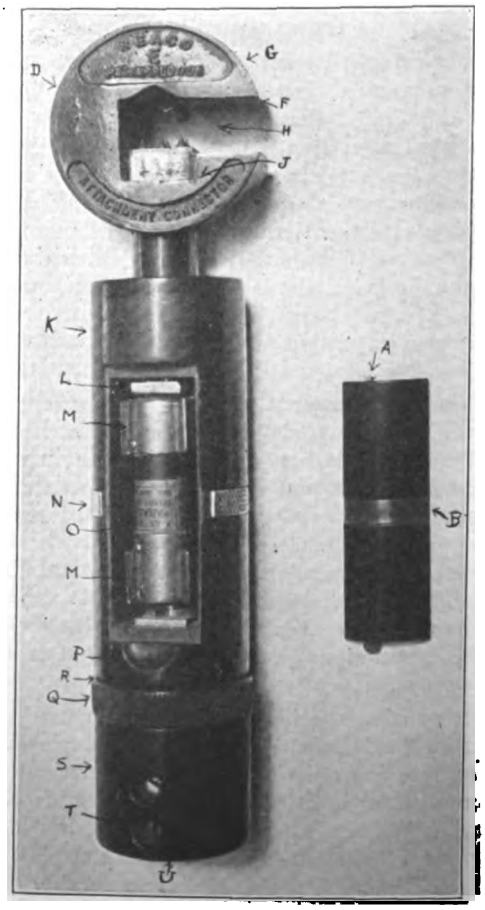

Fig. 1.—Emergency Connector for Motor Circuits and the Like.

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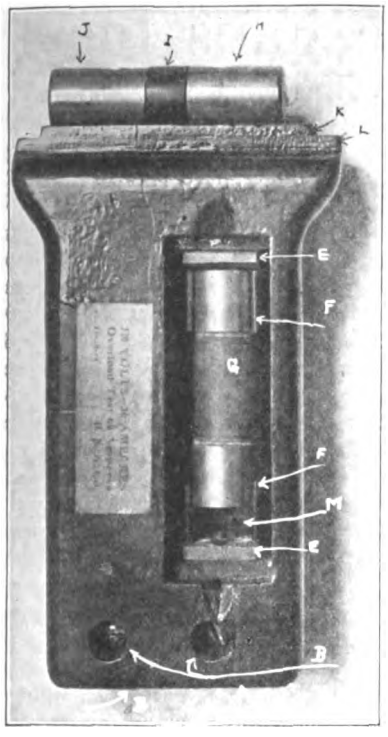


Fig. 2.—Connector for Facilitating Meter Readings.

internal stem connects *C* with the L-shaped plate *E* and its attached lower fuse clip *F*. The upper clip *F* connects with a similar plate *E* and an internal stem which leads to member *H*. Thus a standard fuse is in series between *C* and *H*.

This type of connector can be used also in connection with the emergency connector, Fig. 1, by removing the fuse in the body of the latter and placing in its stead the meter-attachment connector shown in Fig. 2, the fuse being put into the fuse compartment of meter connector. This enables a meter reading to be taken on a temporary circuit very quickly. These meter connectors can be very quickly plugged in and readily removed, interruption to the circuit being almost unnoticed.

In a great many instances the value of these connectors has been proven for making quick connections of a temporary character or for restoring power to motor circuits after accidental troubles thereon. They are useful not only for power circuits but can be employed in lighting systems and for other temporary inside or outside work.

Electric Direct-Driven Dental Engine of Light Weight.

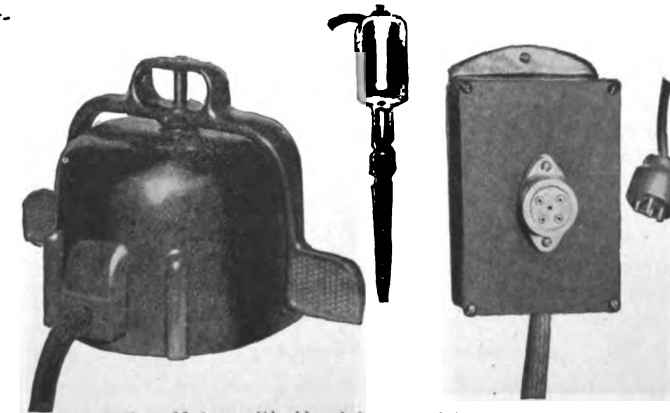
One of the things that instills fear in the average patient that is compelled to consult a dentist is the formidable and rather cumbersome dental "engine" that has usually been used for drilling, polishing and similar purposes.

An experienced dentist, H. A. Whiteside, 24 East Forty-eighth Street, New York City, some years ago saw the disadvantages of the old type of engine and proceeded to develop a direct-driven electric tool which would meet all of the requirements and be so compact that it might readily be held in the hand of the dentist and require no formidable equipment on the wall. After many years of experimentation and development a machine of this type was successfully completed by Dr. Whiteside about the year 1908; this machine, however, weighed 14 ounces and if used for any length of time caused considerable strain on the dentist.

A very much improved form of this type of dental engine has now been perfected and is being made for Dr. Whiteside by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The motor for this new type of dental engine weighs only four ounces, is said to be the lightest commercial motor made, and has an external diameter of only 1.25 inches. The motor is of the universal type, which can be operated either from direct-current or alternating-current circuit. It is made for various voltages ranging from 6 to 250 volts. In the design and construction of this motor especial care has been taken, the finest materials and workmanship being used. The motor drives the tool through direct connection without belting, gear, or other speed-reduction devices. The elimination of these devices itself means a great gain in efficiency, smoothness of operation and durability of the entire outfit. The motor is very carefully balanced so as to be absolutely free from vibration and gyroscopic effect. The armature shaft and its bearings are made of hardened tool steel. The motor windings are of enameled wire, which aids in making the outfit very compact. The motor does not heat appreciably and when used continually in the most severe work gives reliable and steady service.

Speed control is obtained by means of a foot controller giving four speeds forward and reverse, the speed range being from 600 to 2,800 revolutions per minute. The outfit is so arranged that it can be placed in a leather carrying case and taken to a patient's home if necessary. In this case a portable controller of light weight is used. The entire engine can be sterilized. The motor is perfectly insulated from the handpiece so that the patient and operator are both safeguarded from any possibility of receiving shocks. A variety of standard and special handpieces are used. The foot controller for changing the speed operates in the usual manner of devices of this kind and is placed to the rear or at the side of the patient's chair. A thoroughly protected cable leads from the floor controller to a neat metal connecting plug which is fastened to the wall or woodwork. On this wall plate there is a four-point connecting receptacle; a corresponding four-point plug is provided at the end of the seven-foot cord attached to the dental engine. By means of this the engine and its connecting cord can be readily disconnected from the wall plug and put away over night without danger of damage.

Whiteside Electric Dental Engine in Use.



Controller, Motor with Handpiece, and Wall Plate of Dental Engine.

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New and Improved Electric Fans for 1916

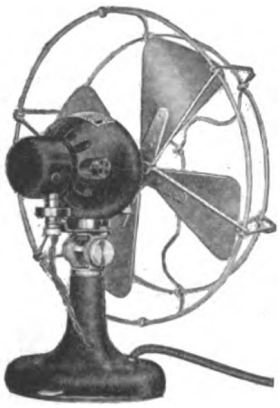
Many New Types and Improved Models Being Placed on the Market by the Leading Fan-Motor Manufacturers

Although 1915 proved to be a rather poor year for fan manufacturers, due to unfavorable weather conditions, much development work has been carried out by them and their offerings for 1916 are better and more comprehensive than ever. Some makers have added important new types of fan motors and nearly all have made improvements in designs and details of manufacture.

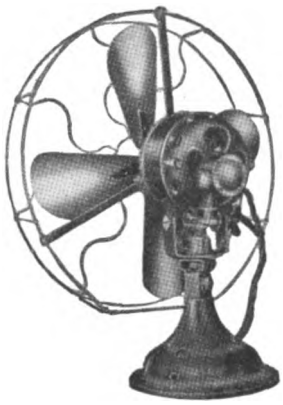
A review of these developments is given in the following. No effort has been made in these comments to cover the entire fan product of the respective manufacturers. All that has been attempted is to call attention in condensed form to the newest developments of the art that have reached the commercial and marketable stage.

The Carleton Company.

All of the fan motors marketed by the Carleton Company, 170 Summer Street, Boston, Mass., are provided with universal motors suitable for operating either on direct current or on alternating current of 60 cycles or less. Much time and effort has been spent in the development of the universal motor used and the company claims to have attained almost perfect electrical balance, so that the speed of the motor varies but slightly whether it is operated on direct or alternating current; the operation is also free from the objectionable sparking, noise and other disadvantages that characterize many types of universal motor. The motors are suitable for operating on from 100 to 120 volts. The company also makes a line of battery fans for low voltage.



Carleton Eight-Inch Oscillator.



Century Oscillating Fan.

In the oscillating fans made by the company, there have been improvements in the design and construction over the previous types made. These relate particularly to the gear drive, noiselessness of operation and the ball bearing of the oscillating mechanism. In the accompanying illustration of the eight-inch oscillating fan, the manner in which this mechanism is entirely inclosed and protected is shown. The fan is adjustable to any desired extent and can be readily changed from desk to bracket mounting. An eight-inch non-oscillating fan is also made by the company and a six-inch non-oscillating fan, which weighs 3.5 pounds, has also been added; this is particularly suitable for use for travelers.

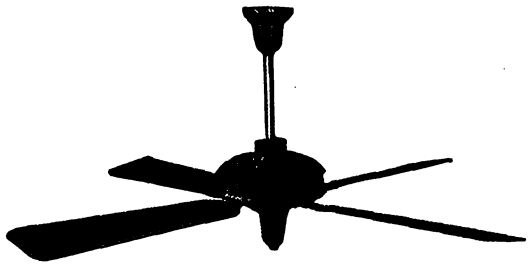
Century Electric Company.

The Century Electric Company, St. Louis, Mo., has consistently followed the policy in its fan manufacture, of not producing a large assortment of fans, but of making the fans it does build of such high-class design and construction that they will be noted for these characteristics. In line with this policy the company has continually improved and refined its fan product. These fans are all single-phase machines with motors of the split-phase induction type without moving wires. No effort is spared in the design and manufacture of these motors to produce rugged, self-starting machines of minimum operating and maintenance cost.

All the standard Century desk and bracket fans are arranged for five speeds, for which a speed coil and regulating switch is provided in the base. The fans will start and operate when this switch is left at any of these points and the circuit opened and closed somewhere else. An exceptionally secure and easily adjusted swivel and trunnion arrangement permits quickly changing any desk fan to bracket mounting or changing its horizontal or horizontal axis of air current through a wide range.

The oscillating fans are equipped with an improved, reliable and rugged oscillating mechanism with steel worm and phosphor-bronze worm wheel, crank disk and connecting rod. The gears are incased in grease. The fans oscillate about four times per minute and two ranges of arc of oscillation can be obtained by shifting the crank pin to different holes in the crank disk. All the weight of the fan is carried on two ball bearings, thus reducing friction to a minimum, even if the fan is tilted from the horizontal position.

The Century Company also makes ceiling fans of simple design, but high-grade type. The blade sweep is 58 inches. A two-speed switch permits obtaining either 240 or about 190 revolutions per minute.



Century Ceiling Fan, 58-Inch Sweep.

Diehl Manufacturing Company.

The most striking innovation introduced this year by the Diehl Manufacturing Company, Elizabethport, N. J., is a new design of its desk and bracket fans of both the oscillating and non-oscillating types. The bodies for these fans are now made one-piece die castings unbroken by angles or projections, thus producing pleasing curves which reach the rounded base; the latter is closely clasped by a soft rubber pad that gives a positive non-scratching bottom surface to the fan. At the end of the motor housing there is a detachable dustproof covering which gives ready access to the motor. Bracket mounting is readily obtained by means of the convenient joint in the stem of the fan. Each of the desk and bracket fans is provided with a speed regulator of approved design giving a choice of three running speeds. The oscillating fans have a very simple gear mechanism which oscillates the fan through an arc of 90 degrees. With the new one-piece, die-cast body and the special care used in centering the end cover, perfect alinement of the bearing sleeves and therefore even wear to the shaft is assured.

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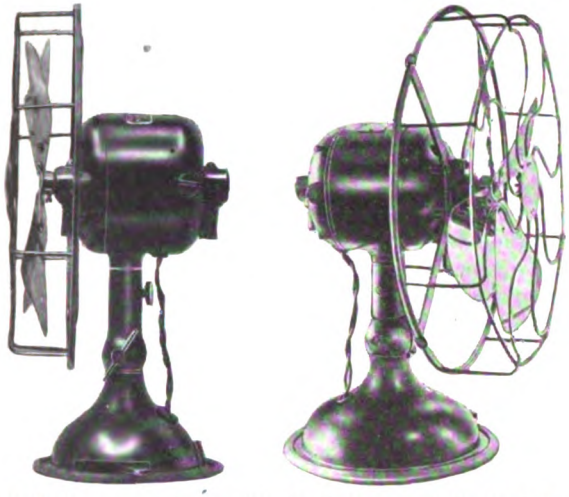


Diehl Eight and Twelve-Inch Die-Cast Desk and Bracket Fans.

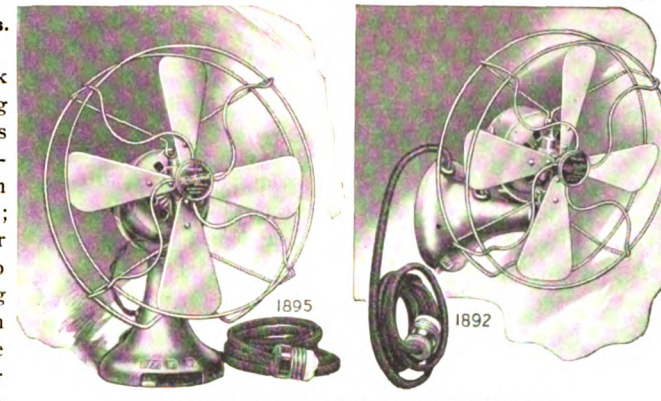
The Diehl line of fans consists of 8, 12 and 16-inch desk and bracket fans, both of oscillating and non-oscillating type, nine different varieties of plain and ornamental types of ceiling fans and also several small ventilating and exhaust fans. Of the ceiling fans four types are made with Gramme-ring motors that revolve outside of the fields; these are provided with flat commutators and copper brushes. They are two-blade fans with a 60-inch sweep and are very handsomely finished. Some of the ceiling fans are made of simple unornamented design for use in places where utility is the prime consideration. The Diehl small exhaust fans are made with either 9, 12 or 15-inch blades for free air movement; they have scoop or bucket-shaped blades and move a large volume of air in proportion to their size and power. Disk-type ventilating fans are made for installation in transoms, partitions or window casings. They are of light but durable construction and have dustproof casings.

Eck Dynamo & Motor Company.

One of the early manufacturers of fan motors was the Eck Dynamo & Motor Company, Belleville, N. J. Through its long experience in the making of fans it has developed a line of these products which has been improved from time to time and brought to such a high state of efficiency and general satisfaction that further radical improvements have not been necessary in the last few years. The company was one of the first to place on the market oscillating fans and the mechanism utilized in these contains many basic patented features. The Eck Hurricane oscillator for many years has given such a good account of itself that only minor changes in its construction have been made. This fan has a large range of adjustments, and can be readily changed from desk to wall position. Another fan illustrated is the eight-inch non-oscillating fan which is mounted on a swivel bearing, permitting adjustments to any angle. All of the Eck fans are made for direct currents and also for alternating currents of standard voltages. Exhaust fans are also made of blade diameters 12 and 16 inches.

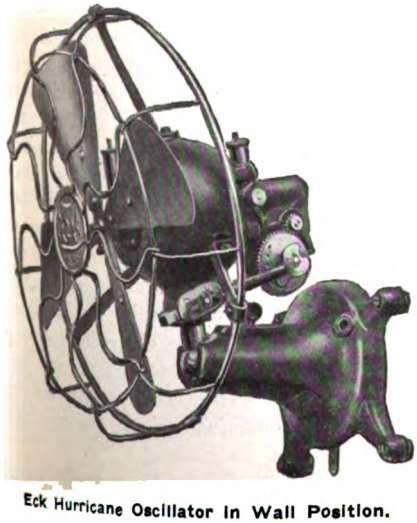
The Emerson Electric Manufacturing Company.

The long experience in electric fan manufacture of the Emerson Electric Manufacturing Company, St. Louis, Mo., has been fruitful in the development of such perfected types of fans that little further improvement is called for from year to year. New models, however, are being added as the demand seems to call for. This is especially true this year in the company's line of ceiling fans, which now in-

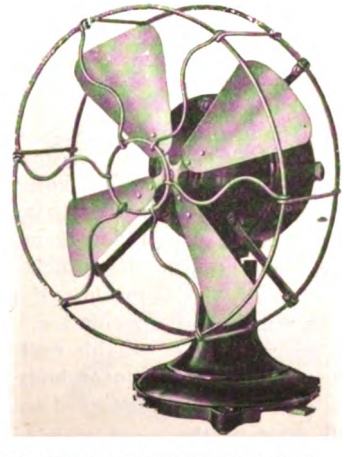


Emerson Northwind Fan in Two Positions.

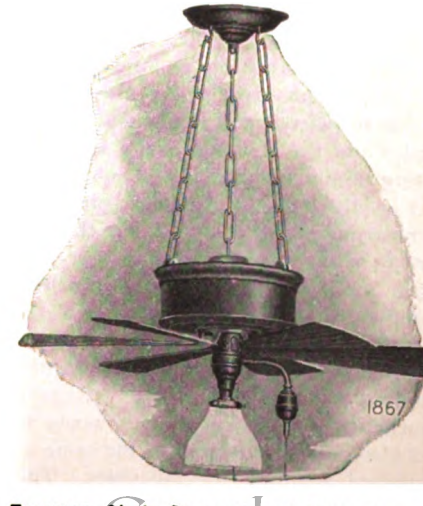
cludes about a dozen types. An innovation in this line is the three-chain suspension illustrated as applied to a six-blade ceiling fan. These fans are so well balanced that chain suspension is entirely practical and serves, in fact, to give the fan the advantage of harmony with chain-suspended lighting fixtures, which are so commonly used nowadays. Three-speed control is provided for the motor through the pull switch. The lamp is separately controlled by its pull socket. Where light is not desired the speed control is put in the center. The six-blade fan shown has a 32-inch sweep; a similar four-blade fan has a 52-inch sweep. Other new types of ceiling fans are the three-speed plain types with black or brass finish and without or with hanger rod. A ceiling model that is proving very popular is the four-blade 52-inch ornamental type, with Brascolite semi-indirect lighting unit hung directly below it. All of the



Eck Hurricane Oscillator in Wall Position.



Eck Hurricane Eight-Inch Fan.



Emerson Chain-Suspended Ceiling Fan.

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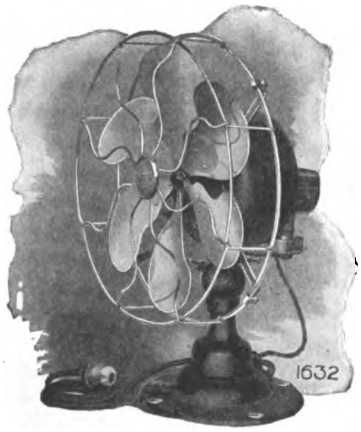
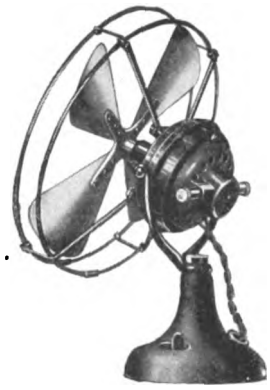
Emerson ceiling types are being used extensively in hotels, as well as restaurants.

The Emerson Company is placing on the market a new non-oscillating desk fan, known as the "Northwind," on account of its strong cooling breeze, in proportion to its small size and weight. This fan has eight-inch blades and weighs only four pounds. It has a new and highly efficient universal motor designed to operate on either direct or alternating-current circuits of 100 to 120 volts. The fan has two speeds and operates quietly. By means of swivel and trunnion adjustments the fan can be readily changed to blow in any desired direction, and mounted either as a desk or bracket fan. This fan has been developed in response to a demand for a small, light fan of low cost but good construction and will doubtless find a ready sale.

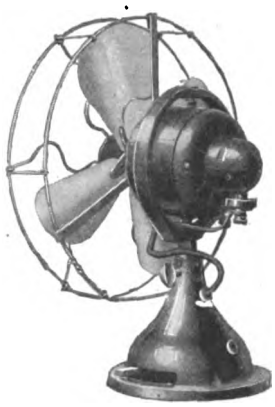
The Emerson desk and bracket fans, both of the oscillating and non-oscillating types, have not been radically altered, since they have met all requirements in service. The oscillating types have proven especially popular, and the company states that it sells more oscillators than all the other types combined. The oscillating mechanism has been so successfully developed that it is now being used for the third season without change. The arc of oscillation is adjustable in six steps from 15 to 90 degrees. The center of the oscillating zone can also be quickly adjusted. As with all of the Emerson desk and bracket fans the oscillators can be readily changed from desk to wall mounting. The six-blade desk fan has proven to meet a strong demand for a quiet-running fan in residences and other places where hum is objectionable.



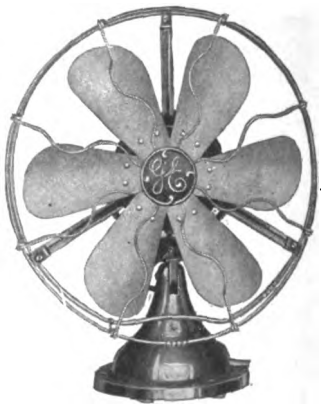
Emerson Six-Blade Fan.



New Fidelity Universal Fan.



General Electric Oscillator.



General Electric Six-Blade Fan.

The Fidelity Electric Company.

The Fidelity Electric Company, Lancaster, Pa., has this season placed on the market a new line of 8 and 12-inch fans, for which special merit is claimed. These fans are designed with a single bearing, thus doing away with the older self-alining, double type, which unless fitted more or less loosely were liable to bind the shaft. This single bearing is of ample size, rigidly fitted into the bearing bracket, and is so placed that a balance is obtained between the fan blades and the armature, thus equalizing the strain and insuring minimum wear. The bearing is of phosphor bronze, and is lubricated by one wick oiler. Another point of improvement is in the support for the motor head. This support is of the swivel and trunnion type, and instead of being rigid, as heretofore, is made resilient. This acts as a cushion, which dissipates to a large degree any vibration, and thus conduces to smooth running.

This new line of fan motors is furnished with a universal winding which at the rated voltage allows operation on alternating current of any frequency from 60 cycles down, and also on direct current of the same voltage. The fans are furnished standard for 110 volts. The retail price of the eight-inch size is low despite its excellent construction.

General Electric Company.

The General Electric Company, Schenectady, N. Y., has always prided itself on having one of the most complete lines of electric fans manufactured. This has been made still more extensive this year by the addition of a full line of nine-inch fans especially designed to meet the desire of many people who consider an eight-inch fan too small for effective service. These new nine-inch fans are but slightly heavier than the smaller fans and, therefore, retain the advantage of ready portability possessed by the latter.

Many improvements have also been made in both design and construction of the various fans made by this company. All of the 8, 9, 12 and 16-inch desk and bracket fans are now arranged for three operating speeds, with a fourth or off position. The regulating switch in the base of the fan is of improved design, whereby the lever operates in a notched guide, so as to secure a positive setting for each speed. The larger desk and bracket fans have a swivel and hinge joint, permitting adjustment horizontally and vertically through a very large angle and very easily; thus these fans can be changed from desk to bracket mounting with great facility. The small, that is the eight and nine-inch desk fans, have a hinged mounting only, since the swiveling feature is not found necessary in fans of such light weight.

The oscillating mechanism of fans arranged for oscillation has been improved decidedly, and according to the company's claim is now superior to any other type heretofore used. The reduction-gear mechanism is inclosed in a dust-proof case mounted on the rear cap. The slow-speed shaft, which projects through the lower part of the gear box, operates the crank disk, and this carries the connecting rod, which swings at one end upon a stud fastened to the stationary support, and upon its other end upon a crank pin that is adjustable with relation to the center of the crank disk. The upper adjusting nut, which throws the oscillator into or out of operation, and the lower adjusting nut, which changes the arc of oscillation, are easily adjusted, while the fan remains in operation. There is an additional adjustment in the pedestal, which permits swiveling the ring mounting of the fan body and therefore the center of oscillation can through this means be given a range of 90 degrees. Since the oscillator itself has a maximum stroke of 90 degrees and a further swivel adjustment of 90 degrees, it may be completely adjusted to any point within an arc of 180 degrees. In the reducing mechanism there is provided a simple friction device which prevents the motor from burning out or overturning, if the oscillator encounters an obstruction during oscillation. The secret of the graceful and smooth operation of this oscillator is due to the two-bearing support for the motor body, the straight connecting rod and the carefully designed train of gears.

A view of one of these oscillators is shown on this page. This gives an idea of the simplicity and sturdiness of the

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operating mechanism. All of the numerous six-blade fans, both of the oscillating and non-oscillating types, have been found particularly advantageous for use in residences, libraries, hospitals and theaters, where exceptional quiet running is necessary. The motors in these six-blade fans have a relatively slow speed, and this, together with the large number of blades, produces a powerful and steady breeze without noticeable hum.

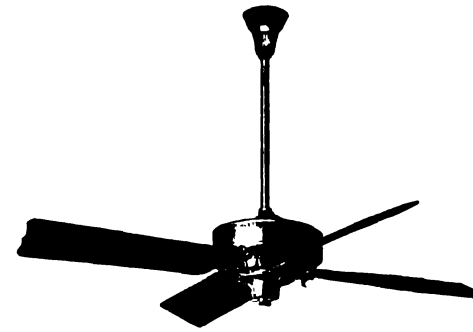
The company has also made improvements in its line of ceiling and ventilating fans. The former are now available in not only the customary ornamental type, but also in several models of very simple design, particularly suitable for shops, offices and other places where utility is of greater importance than ornamentation and where ease in cleaning is also desired.

Hamilton-Beach Manufacturing Company.

The line of fans made by the Hamilton-Beach Manufacturing Company, Racine, Wis., which has met with much favor, is being augmented by the Cyclone universal fan. This type of fan is designed to be used either as a desk or wall fan, a simple adjustment permitting a change from one to the other type of mounting. The fan is of the non-oscillating type and is provided with an extra-heavy base so that it will maintain its position on a desk or table without creeping. The fan has the well known Hamilton-Beach universal air-cooled motor which is wound to operate on either direct-current or alternating-current circuits, ranging from 105 to 120 volts. If the supply voltage is less than 105 or more than 120, or where the frequency on an alternating-current circuit is above 60 cycles, a special type of motor is furnished. The fan has a rheostatic speed controller giving six different speeds. The entire fan is finished throughout in heavy polished nickel.

Hunter Fan & Motor Company.

The Hunter Fan & Motor Company, 114 Liberty Street, New York City, is bringing out an adjustable ceiling fan that will doubtless fill a long-felt want. It is a fan that can be adjusted to blow air either down or up, with intermediate adjustment to make the air current strong or moderate. The adjustable feature is so arranged that the fan can be adjusted without the use of a screw driver or any other tool and while it is in motion. This fan can be furnished either in plain or ornamental types, with or without electrolier attachments. It can also be furnished with a wall rheostat and switch to give seven speeds. This adjustable fan has all the desirable features of the company's well known



Hunter Reversible-Blade Ceiling Fan.

Tuerk types C and CO ceiling fans. The manufacturer expects to do a very large business with this new type of fan.

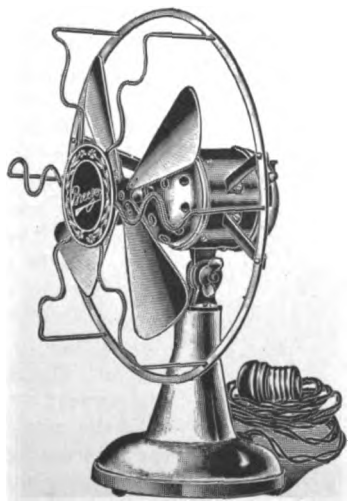
Lindstrom, Smith Company.

The Lindstrom, Smith Company, 1104 South Wabash Avenue, Chicago, is continuing its White Cross and other well known types of fans, but this year has made a specialty of the Breezer fan which is an eight-inch non-oscillating desk and bracket fan. It has a universal motor making it possible to run the fan on either direct-current or alternating-current circuits. The motor is furnished for various voltages, ranging from 8 to 220 volts, thus this type of fan can be used on battery current of 8 to 12 volts, on country-house circuits of 32 to 64 volts, on standard 110-volt circuits or on 220-volt circuits. The body of the fan is of cast iron and has either nickel, black or oxidized finish. Three speeds can be secured through a simple speed regulator. This fan, although of excellent construction, is being sold at a very low price.

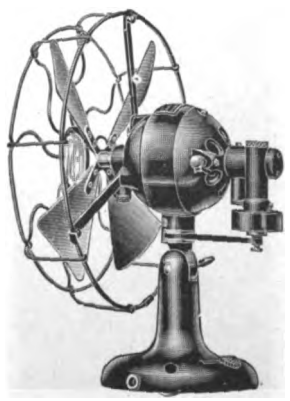
Manhattan Electrical Supply Company.

Of the fans made by the Manhattan Electrical Supply Company, 17 Park Place, New York City, the oscillating fan is of the same general construction as the adjustable desk fan but has the oscillating feature added. This oscillating mechanism is connected to the motor shaft by means of a clutch which can be disengaged if the motor is to be taken apart; thus the armature can be removed for inspection or repair without disturbing the oscillating mechanism. The only thing necessary is to remove the thumb screw holding the connecting rod; the motor can then be separated in the ordinary way, leaving all the other oscillating parts attached to the motor end cover. The oscillation is adjustable through a range from zero to nearly 110 degrees. The fan can also be tilted to any angle and mounted as a bracket fan. These fans are made for direct-current, 110 or 220-volt circuits and in either 12-inch or 16-inch size.

New Hamilton-Beach Cyclone Fan.



Lindstrom-Smith Breezer Fan.



Manhattan Oscillator.

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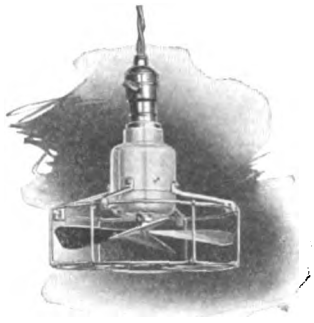
Menominee Table Fan.



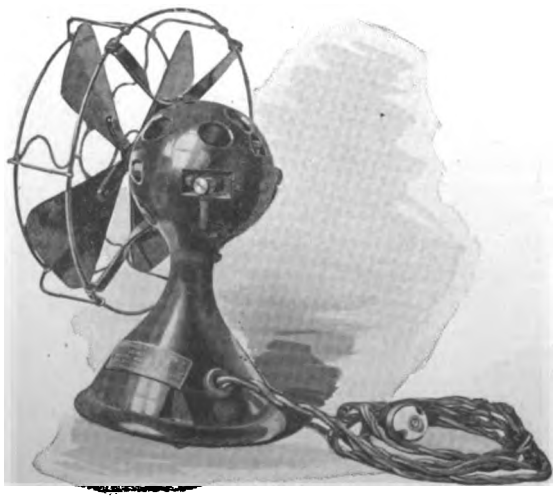
Menominee Socket Fan.

Menominee Electric Manufacturing Company.

An experience of nearly 25 years in the manufacture of electric fans has enabled the Menominee Electric Manufacturing Company, Menominee, Mich., to develop a line of fans characterized by simplicity of design, combined with stability of construction. This line has been augmented by new and improved types from time to time. Of these the table fan, previously described in these columns, continues to command deserved popularity. It is now made with a universal direct-current or alternating-current motor and with blade diameter of 8 to 12 inches. This fan is finished either in black enamel and polished brass or white enamel and polished nickel, making it very attractive as well as effective for dining tables and other flat-top tables or desks.

A new type of fan that should prove popular is the eight-inch, four-blade, single-speed fan, made for 60-cycle, alternating-current circuits. As shown in the cut, it has a very graceful and sturdy cast-iron capstan-shaped body that has practically an unbroken, smooth, curved surface. The motor has laminated field and rotor cores of high-grade sheet iron. All windings are enameled wire, which has extra coverings of cotton and silk. Bearings are of bronze and of generous size. This fan motor is thoroughly well built, despite its very low price, and should meet a demand for an inexpensive fan capable of giving a strong breeze in one direction. Its weight is only seven pounds.

Another new type is the improved eight-inch socket fan, illustrated herewith. This also is a one-speed fan, but in this case can be used on direct or alternating current, since it has a universal 110-volt motor. This fan has an aluminum body, and is designed for light weight, so that it can be screwed directly into a lamp socket, as shown. It weighs only 2.75 pounds, but has a carefully built motor. What brings about this low weight, aside from the aluminum case, is the entire absence of the ordinary base. The blades are nickel-plated and highly polished. This fan produces a downward breeze over a large area. It can easily be installed over a desk, drawing table, patient's bed, etc.



New Menominee Single-Speed Fan.

The Robbins & Myers Company.

For the 1916 season the Robbins & Myers Company, Springfield, O., has brought out a complete new line of desk and oscillating fans in the drawn-steel frame construction. In this line two new sizes have been developed, the six-inch desk fan and the nine-inch oscillator.

All sizes, except the six and nine-inch, are furnished regularly with six blades. The six-inch size has four blades and the nine-inch size has five blades. The advantage claimed for six blades over four is a lower speed for a given volume of air and consequently more quiet operation.

The steel shells of this new line are made from extra-heavy metal three-thirty-seconds inch in thickness. The bronze bearings are pressed into cast-iron hubs which are attached to the steel frames by screws. This permits the bushings to be replaced easily and quickly without dismantling the fan or destroying the alinement.

The six-inch desk fan, Fig. 1, has a universal motor and

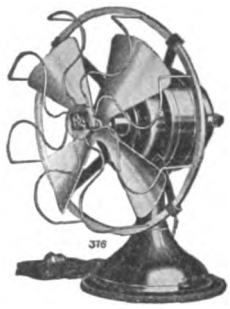


Fig. 1.

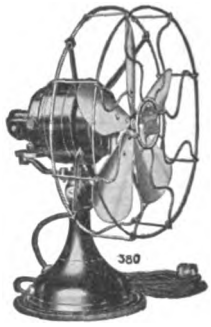


Fig. 2.

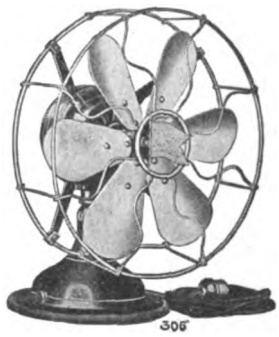


Fig. 3.

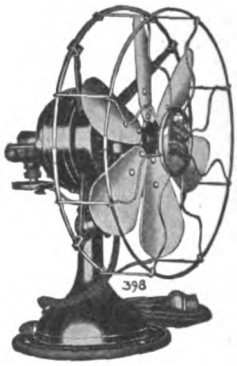


Fig. 4.

Group of New Robbins & Myers Fans.

will operate on direct current of any voltage from 100 to 120 volts and on alternating current of any frequency from 25 to 60 cycles and any similar voltage. As it is small and light it can be carried by the traveler in his hand bag, and as it will operate on the majority of commercial circuits, he can use it in almost any hotel. A switch in the base provides two speeds. The entire fan is handsomely finished. The motor is large in proportion to the blade diameter and the fan will give a good breeze.

The nine-inch oscillator, Fig. 2, has five blades and is an excellent type for all household services. It is made for alternating current in Model 26, and for direct current in Model 27. The gear-type oscillating mechanism is the same as is used in the larger fans. The motor is of the series type and the speeds for direct and alternating current are the same. A three-speed switch is provided.

Both the 12-inch and 16-inch desk fans, Fig. 3, have six blades. The motor is of the induction type in the alternating-current model. The fan has a three-speed switch.

In the case of the 12-inch and 16-inch oscillators, Fig. 4, the alternating-current fan of this type has an induction-type motor and no centrifugal or automatic starting switch is required. It is regularly furnished with six blades in both the 12 and 16-inch sizes.

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New Western Electric Ceiling Fan.

Western Electric Company.

In the effort to still further popularize its line of fans the Western Electric Company, New York City, is placing on the market a sturdy little low-cost six-inch fan that weighs but five pounds. As seen in the accompanying combined side and front view, it is evident that this brand new fan has a very pleasing and yet business-like outline and finish. The frame and base are in one piece and finished a dull black. The blades are of polished brass and are protected by a substantial guard securely fastened to the frame. A universal motor that runs equally well on direct current or alternating current drives the fan quietly and with small power consumption. The fan is not adjustable, but gives a strong, steady breeze in one direction. This new fan has been carefully designed for low first cost combined with low operating cost. It is very well built for such low cost, which has been made possible by production on a very large scale. The company has inaugurated a special publicity and sales campaign on this fan in keeping with its policy of liberal advertising and furnishing numerous sales helps to local dealers. A fan window-display contest, even more extensive than that of last year, will be carried on this summer.

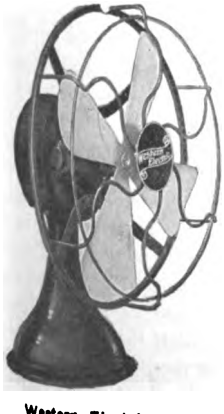
The Western Electric Company is also bringing out two new ceiling fans. There is one fan that is a distinct innovation in the art; it has adjustable blades for breeze control. A rod extending down from the base of the fan terminates in a pear-shaped handle. With this, the blades of the fan can be so adjusted that any desired volume of breeze can be secured. This is a simple and adequate method of controlling the breeze from a ceiling fan and does away with cumbersome and heavy rheostats. The other new model has a semi-indirect lighting unit attached to its under side, providing at once good ventilation and good light.

Westinghouse Electric & Manufacturing Company.

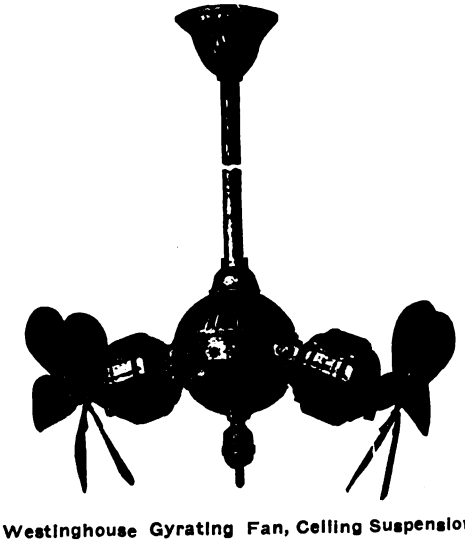
The extensive line of fans made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been added to this year by including the recently dedeveloped Westinghouse gyrating fans. These fans have already become popular in dining halls, hotel and theater lobbies, department stores, etc. They are made either as ceiling, floor-column or counter-column fans, the mechanism being the same for each method of mounting. The main elements are two 12-inch six-blade fans with drawn-steel frames. These are carefully balanced on opposite sides of the gyrating mechanism, to a stationary wheel of which one of the fan motors is geared. This provides a positive and definite speed of gyration proportional directly to the speeds of the fans and not to any variable air reaction. At full fan speed there are about seven complete revolutions of the fans about the supporting hanger or column. By means of a convenient switch the fans, and therefore also the gyrator, can be given three speeds. The motors have special bearings that absolutely prevent escape of oil. Since the fans are placed high out of reach, no guards are required. These gyrating fans provide an excellent breeze uniformly distributed throughout a sweep of 30 to 35 feet about the column or hanger of the outfit. The breeze is easily adjusted through any angle from horizontal to 35 degrees below this. This range of adjustment is obtained by a wing-nut arranged at the side of the central or gyrating body. Turning this wing nut adjusts the angle of both fans simultaneously, thus assuring perfect balance at all times. Current is supplied to the rotating fans from the central body through two carbon brushes that engage slip rings. A ball bearing supports the revolving part.

The Westinghouse line of ceiling and column fans is now exceptionally complete, providing an assortment of types suitable for practically every requirement. All these fans have four blades with a sweep of 58, 56 or 32 inches. Ornamental and relatively plain types are available, with and without electrolier or other lighting-fixture attachments; among the latter are several modern designs, such as the Brascolite semi-indirect and several shaded single-unit direct fixtures.

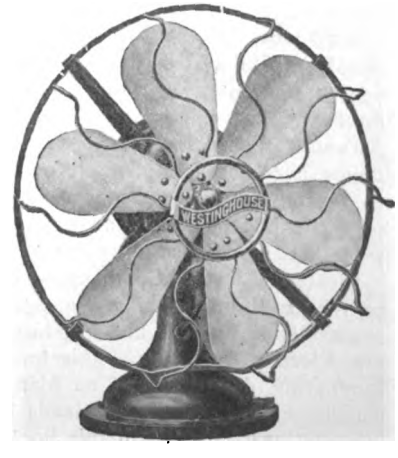
Westinghouse desk and bracket fans, both oscillating and non-oscillating, are so well known that no extended mention is necessary regarding them. One of the most popular recent developments in this line is the six-blade fan, which has been appropriately named the "Silent Six." Other features that have met with special favor are the drawn-metal base and body construction, the high efficiency of all types and their general reliability.



Western Electric Six-Inch Single-Speed Fan.



Westinghouse Gyrating Fan, Ceiling Suspension.



Westinghouse Six-Blade Desk and Bracket Fan.

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INDUSTRY ACTIVITIES

James G. Biddle, Philadelphia, Pa., has prepared a booklet entitled "A Stitch in Time," which illustrates the use of megger testing sets and gives a list of users.

The French Battery & Carbon Company, Madison, Wis., is preparing to erect a new factory building at an estimated cost of $40,000 and containing 40,000 square feet of floor space.

The Beardslee Chandelier Manufacturing Company, Chicago, Ill., is sending out its latest edition of "Beardslee Talks" a monthly publication, together with catalog additions showing new designs.

The National Metal Molding Company, Pittsburgh, Pa., manufacturer of Sherarduct, has issued a small size booklet fully describing this product. A list of some of the large buildings in this country where Sherarduct installations were made is given.

The Diehl Manufacturing Company, Elizabeth, N. J., manufacturer of electrical apparatus, announces changes in the locations of three of its branch offices as follows: New York office, 916 Singer Building; Boston office, 201 Devonshire Street; Chicago office, 1641 Edison Building.

The Condit Electrical Manufacturing Company, Boston, Mass., has issued catalog bulletins as follows: 401-A, B and C, covering type "ID" oil switches, automatic and non-automatic, 600 volts, 50-30 amperes; 410, type "PK-5" pole-line oil switches, and 411, type "M-5" manhole oil switches.

The Adsit Lockout Company has been incorporated in Michigan with a capital stock of $300,000, and the general offices of the company will be located in Escanaba. The transfer of the company's business from Minneapolis, Minn., probably will take place soon and the manufacture of the lockout device will be carried on in Escanaba.

The Bristol Company, Waterbury, Conn., manufacturers of recording instruments, has established a branch office in San Francisco, Cal. B. J. Klein, who was Chicago district manager for six years and manager of the company's exhibit at the Panama Exposition, has been appointed Pacific district manager and will have his headquarters at the San Francisco office.

The National Manufacturing Company, Minneapolis, Minn., is distributing two attractive booklets which give its plan of business and views of its product and general offices. This company controls the patents on and manufactures what is called an automatic advertiser consisting of an electric-lighted bulletin board and a clock-operated mechanism which displays a number of advertising slides.

Sindicato Italiano.—Word has been received that the Sindicato Italiano d'Importazione de Esportazione, whose address is Piazza Vittorio Emanuele 13-15, Turin, Italy, is anxious to act as agent for manufacturers of electrical apparatus for industrial and commercial use, such as motors, lamps, accessories and supplies. The firm would be pleased to receive catalogs with price lists, and, if possible, samples. This may afford an opportunity for increasing the trade between this country and Italy.

Western Electric Company.—The sixth edition of "How to Figure Illumination and a Complete Catalogue of Sunbeam Mazda Lamps" has just been published by the Western Electric Company. This booklet gives tables and illuminating data, as well as picturing and describing the various sizes of Sunbeam Mazda lamps. By means of the information contained in this booklet, lighting installations adapted to the requirements of any class of lighting may be planned.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., is distributing copies of bulletin No. 242. It describes a new and very compact form of galvanometer with self-contained lamp and scale. This instrument is very convenient for shop use and in testing where a large number of readings is to be taken. The principle of operation and the construction of the instrument is explained with the aid of several illustrations.

Wins Electrical Prosperity Week Window Display Prize.—George W. Milliken, manager of the Arkansas Valley Railway, Light & Power Company, was awarded first prize by the Hurley Washing Machine Company, of Chicago, for the best window display during Electrical Prosperity Week at La Junta, Colo. The demonstration showed the old and the electrical way of washing, and the judges decided the window display was superior in sales value, artistic merit and pulling power.

The Davis Slate & Manufacturing Company, with quarries at Bangor, Pa., and offices at Chicago, Ill., and Detroit, Mich., manufacturer of slate for panels, switches and other uses in the electrical trade, is distributing its latest price list. This company is making an earnest endeavor to standardize the sizes of slate by advocating the use of lengths which are multiples of six inches and widths which are multiples of two inches. Buyers who have been accustomed to purchasing slate in foot measurements will be interested to know that the company gives list prices per slab in different thicknesses and under the basis of the advanced standardization.

The Electric Cable Company, New York, N. Y., has experienced an increasing demand for electric wires. President E. W. Moore of the company, in discussing this demand as a test of prosperity and a commercial barometer, recently made the following statements: "The gross income in the past year of the electrical industry and service, including central stations, electric railways, telegraph and telephone service, electrical manufacturing and the like, probably totaled more than $2,500,000,000. The income from the lighting industry alone last year was $360,000,000; electric railways had receipts of $700,000,000, and telegraph and telephone service brought in $350,000,000. The interest of manufacturers of insulated wire lies in the fact that all electric current passes through an electrical conductor. Naturally, they have kept in touch with conditions throughout the country, and we have found that the demand for electricity, and, of course, for wire, has proved a most accurate measure of the country's recent commercial expansion. There can be no important developments of building operations without a large demand for insulated wire. To put it in a nutshell, the better the times the greater amount of electricity used; the more electricity, the more wiring. The manufacturers of wire in this country have doubled their output in six months—on orders coming from within the country, not from without. The export of insulated wire is trifling compared with the volume of the demand created by conditions in our own country. This has a deeper significance than the gain to the industry itself. The demand for electricity is a sign of progress. While we may look upon conditions across the sea as an unfortunate misuse of science, let us not forget that the triumphs of our electrical engineers and chemists are steps forward, by which every part of the community benefits, so that we can regard the output of the insulated wire industry as an actual contribution to the country's welfare."

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PERSONAL AND BIOGRAPHICAL

MR. LINDSAY M'MILLAN, who recently purchased the Lafontaine Electrical Works, Santa Maria, Cal., will open offices in that city.

PROF. H. H. STOEK, head of the Department of Mining Engineering of the University of Illinois, has been appointed by Governor Dunne as a member of the State Mining Investigation Commission, a body whose function is to consider and digest proposals which involve legislation affecting the mining interests of the state.

MR. F. H. MOORE, who is actively interested in the organization and work of electrical inspectors, was elected president of the Western Association of Electrical Inspectors at the annual meeting of

F. H. Moore.

that association in Chicago last week. Mr. Moore is connected with the Indiana Inspection Bureau, Indianapolis, Ind. His work is particularly related to the electrical inspection of properties for estimates of fire insurance.

MR. HORACE LOWRY, of Minneapolis, Minn., was elected president of the Twin City Rapid Transit Company at the annual meeting of the board of directors held in New York City last week. He was named to succeed the late Calvin G. Goodrich. On January 1, 1913, Mr. Lowry was appointed general manager and on January 25, 1913, was made vice-president, retaining the managerial reins.

MR. JOSEPH L. TRACY, of the Electric Storage Battery Company, delivered an address on January 12 before the Philadelphia Section of the Electric Vehicle Association of America upon the subject of "High-Horsepower Ability of Modern Electric Vehicles." Motion pictures were used to illustrate the subject.

MR. C. M. BREWER, manager of Western States Gas & Electric Company, Richmond, Cal., has been elected a member of the Board of Directors of the Mechanics Bank of Richmond.

MR. W. B. McDONALD, manager of the Northern Idaho & Montana Power Company, Kalispell, Mont., division, was recently elected a director of the Kalispell Chamber of Commerce.

MR. CHARLES S. HERVEY of Brooklyn has been appointed Public Service Commissioner in the New York District to succeed MR. G. V. S. WILLIAMS, whose resignation became effective February 1.

DR. E. F. NICHOLS, president of Dartmouth College, Hanover, N. H., has tendered his resignation to the board of trustees. After the close of the present college year he will occupy the new chair in physics at Yale University.

DR. LEO H. BAEKELAND, of Yonkers, N. Y., was presented with the Perkin medal for eminence in industrial chemical research at a meeting of the Society of Chemical Industry, held in New York City on the evening of January 21. Dr. Baekeland is well known as the inventor of Velox photographic paper and of bakelite. He is a member of the Naval Consulting Board and has served as president of the American Electrochemical Society, the Inventors' Guild, the American Institute of Chemical Engineers and other societies.

MR. RALPH B. COLEMAN, formerly with the Electric Machinery Company, Minneapolis, Minn., is now in the employ of the Moloney Electric Company, St. Louis, Mo., as traveling representative in the Chicago district and will cover the states of Iowa, Minnesota, Michigan and Wisconsin.

MR. G. C. MILES has resigned as superintendent of the plant of the Southern Wisconsin Power Company at Kilbourn, Wis., and has been succeeded by MR. M. C. PIERCE, formerly with the Fort Wayne Electric Works, Fort Wayne, Ind.

MR. GEORGE LORING has resigned as representative of the Shelby Lamp Works of the General Electric Company in Massachusetts to become general manager of the Rock Island (Ill.) Electric Company.

MR. WILLIAM K. VANDERPOEL, formerly superintendent of the Newark (N. J.) district of the Public Service Electric Company, has been made general superintendent of the entire New Jersey system. His former position has been taken by MR. R. O. BENTLEY, formerly superintendent of the Bergen district.

MR. WILLIAM G. MEROWIT, until recently with the Northern Electric Company, Ltd., Montreal, as power apparatus sales specialist in the supply sales department, has resigned to accept a position in the St. Louis house of the H. W. Johns-Manville Company as electric department manager.

MR. LOUIS H. EGAN has tendered his resignation as general manager of the Kansas City Electric Light Company, to be in the hands of the company preparatory to the reorganization that will follow the sale of the property under the "Hook" plan. It is understood that the resignation was in the nature of a courtesy in view of the reorganization. Mr. Egan's father, MR. JOHN M. EGAN, has resigned from the general managership of the Metropolitan Street Railway Company, having planned to do so when he came to Kansas City to act as president of the Kansas City Railway & Light Company in 1910. He will spend the winter with his family at Castle Hot Springs. Louis H. Egan came to Kansas City in 1910 as technical adviser to his father.

MR. VICTOR H. TOUSLEY, chief electrical inspector, city of Chicago, was presented with a handsome walrus suit case by members of the Western Association of Electrical Inspectors at the annual banquet of this organization on January 27. Mr. Tousley was chairman of the general committee in charge of the convention and in this capacity worked

Victor H. Tousley.

untiringly to provide a program of business and entertainment that would establish a new record for the Chicago convention. How well he succeeded is evidenced by the sentiment expressed by the gift.

Obituary.

MR. WILLIAM B. RUGGLES, head of the Ruggles-Cole Engineering Company, Bergen Point, N. J., died recently of pneumonia at his home in that city, aged 55 years. He was a graduate of Cornell University and until a short time ago was an engineering adviser to the Russian government.

MR. BURTON CLAY WILSON, 46 years old, one of the first electrical engineers to install electric light and power plants in Cuba, died recently at his home in Woodhaven, L. I. He was formerly superintendent of the Atlas Cement Company and recently was in charge of the bridge power substation of the Brooklyn Rapid Transit system.

MR. FRANK FISHER, who had been associated for ten years with the French Cable Company as consulting electrical engineer, died recently in his home in Brooklyn, N. Y., aged 68 years. He was an expert in the laying and repairing of cables. Mr. Fisher was born in Birmingham, England, and before coming to the United States served as consular agent of France at Sydney and Nova Scotia.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BOSTON, MASS.—In its annual report, the Metropolitan Water and Sewerage Board advocates the connection of the Wachusetts and Sudbury power systems and recommends that authority be given to spend $60,000 for a transmission line to connect the two systems and $90,000 for additional improvements.

BRIDGEPORT, CONN.—The Board of Apportionment has been asked for an appropriation to provide for extension of the white way in Main Street to Gilbert Street and in State Street and Fairfield Avenue from Main Street westerly and for a further northerly extension in Main Street.

DUNKIRK, N. Y.—Arrangements are being made to secure electrical energy from a Niagara Falls power company by the Atlas Crucible Steel Company and several other manufacturing concerns in this city.

NORTH TONAWANDA, N. Y.—The right of way for a four-track electric railway between Buffalo and Niagara Falls has been secured by the International Railway Company. A representative of the company stated that work will be started within a month and the railway completed within a year.

WATERFORD, N. Y.—The matter of giving The Cohoes Electric Light Company a franchise to operate here is being discussed by the Board of Trustees.

WATERVLIET, N. Y.—According to Mayor Foley, plans will soon be made for receiving bids for improvements to the electric lighting system. The estimated expenditure is $20,000.

CAMDEN, N. J.—The City Council is planning to increase the street lighting service with new 2,000-candlepower lamps. The Public Service Electric Company will make the installation.

JERSEY CITY, N. J.—The Board of City Commissioners is planning for the installation of a new lighting system on Central Avenue to form a white way.

JERSEY CITY, N. J.—The Commercial Power Company has been organized by L. H. Gunther and others with a capital of $250,000 to generate and distribute electrical energy.

MORRISTOWN, N. J.—The Morristown & Erie Railroad is considering the electrification of its lines between Whippany and Caldwell, making a connection with the Public Service Railway. Interested property owners are negotiating with Richard W. McEwan, president.

NEWARK, N. J.—Announcement of definite plans for the electrification of the Lackawanna Railroad between Hoboken and Morristown, giving that section an interurban rapid transit service, are expected to follow closely upon the settlement of the grade crossing differences between the railroad and the municipalities of Orange and East Orange.

PRINCETON, N. J.—Property owners on Prospect Avenue are negotiating with the City Council for the installation of additional street lights.

PRINCETON, N. J.—The Board of Public Utility Commissioners has granted permission to the Princeton Light, Heat & Power Company to issue bonds for $23,000 for extensions.

TRENTON, N. J.—The Ajax Rubber Company will build a new power plant at its factory, to be equipped with engines, generators and boilers.

ALLENTOWN, PA.—The Lehigh Navigation Electric Company has practically covered all of Lehigh County by charters and has made application for several charters in Berks County townships. A franchise in this city will probably be applied for.

LINFIELD, PA.—Steps are being taken to secure a system for electric street lighting.

MOUNT UNION, PA.—Charters have been granted to the Cromwell Light, Heat & Power Company, the Rock Hill Light, Heat & Power Company and the Shirley Light, Heat & Power Company, all with headquarters in Mount Union. The incorporators are J. E. Zimmerman, R. C. Shields and P. Marx, all of Philadelphia, and the capital is $5,000 each.

SHIPPENSBURG, PA.—It is reported that the proposed trolley line from this place to Newburg will be built in the near future.

WOMELSDORF, PA.—The South Mountain Street Railway Company intends building a trolley line from this city to Kleinfeitersville.

SMYRNA, DEL.—The Kent County Light, Heat & Power Company has been chartered to supply light and power to this and nearby cities. The capital stock is $100,000 and the incorporators are D. G. Richmond, Philadelphia, Pa.; R. R. Kenney and H. M. Jones, Dover, Del.

WOODSTOCK, VA.—J. L. Triphett of Woodstock and Edinburg, who has secured control of the Rock Spring Electric Company, is having a concrete dam 220 feet long and 21 feet high built across the Shenandoah River, so that his company will be enabled to furnish additional electrical energy for various towns and manufacturing industries in that section of the Virginia Valley.

WINNSBORO, S. C.—The city has arranged with Georgia-Carolina Power Company of Augusta, Ga., to furnish power from its plant on Broad River to operate a municipal electric light plant. T. R. Ellison is superintendent.

FOLKSTON, GA.—President B. F. Scott of the Chamber of Commerce has been instructed by that body to secure information in regard to cost of establishing electric light plant for Folkston. As soon as this information can be secured the proposition will be submitted to the voters.

GRIFFIN, GA.—The Light, Water & Sewerage Company is planning to extend the ornamental street lighting system. Fifteen series incandescent street lamps will probably be installed.

JULIETTE, GA.—The Jullette Milling Company may extend its electric lighting system for general public lighting purposes.

ST. PETERSBURG, FLA.—No bid for a franchise for the establishment and operation of an electric light and power plant in this city was submitted when the franchise was offered at public sale. The matter will be taken up again when the new city charter becomes effective.

NORTH CENTRAL STATES.

CINCINNATI, O.—E. B. Imbus and others are agitating the installation of an electric lighting system for Fifth Street.

HUNTSVILLE, O.—M. E. Gehman proposes to establish a plant in Huntsville to furnish power for electrically lighting streets, residences and business houses.

ZANESVILLE, O.—The new lighting contract which will be let by the city calls for 557 lights. Bids will be opened February 11.

MARTINSVILLE, IND.—The Martinsville Gas and Electric Company has increased its capital stock from $125,000 to $150,000. Improvements will be made.

MILROY, IND.—Citizens of this place have organized an electric light company and may erect a power plant.

TERRE HAUTE, IND.—Boulevard lighting system for Collett and Voorhees parks was discussed at the meeting of the members of the City Park Board. The board was in favor of installing lights in both parks.

WABASH, IND.—The profiles and plans for proposed light system were placed for consideration before the City Council by J. R. Cravath, expert lighting engineer, who was in this city recently to draw plans for the proposed system for the Commercial Club. The system will cost about $11,000.

WINCHESTER, IND.—Merchants of this city will offer to aid the City Council to provide an ornamental lighting system.

BELLEVILLE, ILL.—More time has been granted the special committee authorized to investigate the feasibility of constructing a municipal light plant. The committee stated that $108,000 could be expended for the purpose and that it is now inquiring how much the proposition would cost.

DANVILLE, ILL.—The City Council has passed an ordinance calling for an election to vote $250,000 bonds with which to erect a municipal electric light plant.

GOLDEN, ILL.—Right of way for a transmission line from Golden to Clayton is being sought by the Central Illinois Public Service Company, it is reported. Officials here have not yet granted the company a franchise. There is talk of building a municipal electric plant.

SILBY, ILL.—About $5,000 will be expended to install an electric light plant. An oil engine will be purchased.

STREATOR, ILL.—The Board of Local Improvements will receive bids until 2 p. m., February 8, for the installation of an ornamental lighting system on Main and Vermillion Streets.

WAYNE CITY, ILL.—The Council is planning ways and means to install an electric light system. They are now figuring whether to give a franchise to some reputable firm or individual or issue bonds and put up a municipal plant.

DETROIT, MICH.—It is reported that the Detroit Edison Company will spend $5,013,893 on improvements and extensions of its light, power and heating system in Detroit during 1916, according to estimates compiled by Alex Dow, president of the company. These contemplated expenditures include the investment of $1,134,995 on the construction of a third section at the Conners' Creek power house, $1,039,810 for substations, and $817,125 for the installation of 270 miles of 23,000-volt cable. New meters to be installed will cost $200,000; overhead lines, $408,450; an addition to the Delray power house, $360,700; a third central heating plant, $262,500; reconstruction of the coaling station, $17,000; improvements at the Farmer Street heating plant, $107,763; Park Place heating plant improvements, $33,400; land for substations, $65,000; improvements at the Washington Avenue and other buildings, $94,450, and $88,800 for improvements to the steam heat distributing system. Other construction expenses are estimated at $145,550.

FLINT, MICH.—The downtown business district will soon be equipped with a small section of the proposed boulevard lighting system. Alderman John Collins is chairman of the special committee in charge of the work.

LUDINGTON, MICH. — The Stearnes Lighting and Power Company has been awarded a 10-year extension of the city's franchise extending to 1918, and a contract for the lighting of James Street. A $1,000 appropriation was made this year for extending and improving the lighting service on that street.

DELAVAN, WIS.—The L. E. Myers Company of Chicago, Ill., has purchased the Delavan electric light plant from the Milwaukee Electric Company. The former company now owns plants at Lake Geneva, Delavan, Walworth, Fontana, Hebron and Richmond, the latter two towns being in Illinois. These plants will be operated by a subsidiary company known as Southern Wisconsin Electric Light Company. Improvements are planned.

MANITOWOC, WIS.—The Wisconsin Public Service Company, of Green Bay, which owns and operates the big electric power plant at High Falls on the Peshtigo River, has acquired the franchise of the West Side Electric Power & Heating Company of this city, and may extend its line to Sheboygan. Improvements in Manitowoc probably will be made. With the announcement of the purchase came the report that the Wisconsin Public Service Company is now preparing to construct another dam and power plant at Johnson Falls, near High Falls, to generate more power for use as it increases its holdings and franchises.

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RHINELANDER, WIS.—The Rhinelander Light and Power Company has filed an amendment to its articles of incorporation in the office of the secretary of state increasing its capital stock from $100,000 to $125,000. The increase in stock will be used in enlarging the company's plant. E. A. Fordes is president and S. S. Miller is secretary of the company.

TOMAH, WIS.—Plans and estimates for a proposed ornamental lighting system have been prepared by the Landstat-Myer Company, Appleton, Wis., and have been submitted to the Lighting Committee of the Common Council. The committee will also have plans prepared for a municipal lighting plant.

WASHBURN, WIS.—It is planned to put in conduit wiring for a white way lighting system. Mayor E. Bryan is advocating the installation.

WEST ALLIS, WIS.—Mayor J. J. Mulhaney has asked the City Council to consider the installation of a municipal lighting plant and it is believed steps will be taken to bring about the building of such a plant.

CASS LAKE, MINN.—Plans are being discussed by city officials to purchase the local power plant owned by H. L. Hartly.

CYRUS, MINN.—An electric light and power service will be installed here, a franchise having been granted to R. C. Gust.

DANUBE, MINN.—An electric light plant will be installed in this city.

MARIETTA, MINN. — The Interstate Electric Light and Power Company is planning to install an electric power plant to light Marietta and three other towns.

ROCHESTER, MINN.—The St. Paul Southern Electric Railway Company will soon issue $1,200,000 in bonds to finance the construction of a line to Rochester. Z. H. Hutchinson is treasurer, with offices at 1615 Pioneer Building, St. Paul, Minn.

ROCHESTER, MINN.—Bonds in the sum of $265,000 have been voted to purchase flowage rights and necessary property to construct a power plant at Zumbrota Falls. It is expected action will be taken at once so that building operations can be started immediately. The completion of the dam will give Rochester one of the best municipally-owned power plants in the state.

ALEXANDER, IOWA.—At a special election the qualified voters gave the Iowa Falls Electric Company a franchise to furnish power and lights.

BATAVIA, IOWA.—The citizens have granted a franchise to the R. M. Burtis Company of Chicago to build a transmission line from the Fairfield Public Service Company's plant in Fairfield to Batavia. Service for both light and power will be supplied and the improvement is to be completed and in operation by June 1.

CEDAR RAPIDS, IOWA.—City Commissioner Zika recommends the installation of a boulevard lighting system.

CHESTER, IOWA.—An election will be held February 8 to vote on granting a franchise to D. W. Davis for erection and maintaining of poles, wires and other appurtenances necessary for electric power. R. F. Jones is mayor.

EMMETSBURG, IOWA.—The local electric light plant has been purchased by the owners of the Spirit Lake plant, who probably will make improvements.

FRANKLIN SPRINGS, IOWA.—The Progressive Electric Light Company has been organized here to furnish electric light and power. J. W. Dawes, J. B. Coleman and others are interested in the company.

FT. MADISON, IOWA.—Contracts have been signed by local merchants for the installation of a white way on Second Street.

HUMBOLDT, IOWA.—The Northern Iowa Power Company has applied for a transmission line franchise to extend its lines in the vicinity of Humboldt.

INDEPENDENCE, IOWA.—The Board of Supervisors of Buchanan County will construct a transmission line from this city to the county farm.

MAPLETON, IOWA.—The city will vote on the question of granting a franchise to Bert Leitzen to build and maintain an electric light plant.

OSKALOOSA, IOWA.—Under the proposal of the Oskaloosa Traction & Light Company the city is to obtain 30 new street lights at no additional cost above the price now being paid by the municipal lighting.

ST. ANTHONY, IOWA.—An election will be held February 21 to vote on the question of installing an electric light plant.

TRAER, IOWA.—John Reichert of DeWitt, Iowa, has secured an option on the electric light plant here, now owned by F. L. White.

JOPLIN, MO.—C. A. Patterson, Commissioner of Utilities, announced that A. C. Moors of Joplin, a consulting engineer, has been engaged to prepare estimates of the cost of building a new municipal light plant and of rehabilitating the present light plant. He will begin work immediately.

TIFFANY SPRINGS, MO.—Application was filed with the public service commission by H. B. Pert, president of the Kansas City & Tiffany Springs Railway Company, for a partial certificate of necessity and convenience to construct a part of the proposed line, which is to be an electric interurban extending from Kansas City to Tiffany Springs, in Platte county.

ELLINWOOD, KANS.—The City Council has formally decided to maintain its own light plant and arrangements are being made for the purchase of oil engines to be installed at the city plant.

LINWOOD, KANS.—Arrangements are being made to install an electric lighting system here.

MINNEOLA, KANS. — Manager Otto Theis of the Midland Company, Dodge City, has been asked by the City Council to submit a plan for furnishing electric power to Midland. A transmission line 22 miles long will be necessary. The Midland Company is now constructing a line to supply power and light to Ford and Bucklin.

TOPEKA, KANS.—The city electric lighting plant is making extensions of its circuits. E. G. Stahl is superintendent.

CORTLAND, NEB.—A. J. Goodban will install an electric light plant here.

VALPARAISO, NEB.—The local electric lighting plant was destroyed by fire recently. Arrangements to rebuild at once are being made.

ARMOUR, S. D.—The South Dakota Light and Power Company has been incorporated by E. P. Wanzer, John T. Cameron and others.

LESTERVILLE, S. D.—A movement to have a municipal electric light plant has been started by citizens of this city.

NEWELL, S. D.—The Board of Trustees is negotiating for the installation of an electric light plant.

MARION, S. D.—A 20-year franchise has been granted to John Heib to install an electric light and power plant.

DATES AHEAD.

American Institute of Electrical Engineers. Midwinter convention, New York City, February 8 and 9. Secretary F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Illuminating Engineering Society. Midwinter convention, New York City, February 10 and 11. Assistant secretary Joseph Langan, 29 West Thirty-ninth Street, New York City.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Detroit, Mich., February 15-17. Secretary, F. Overbagh, 411 South Clinton Street, Chicago, Ill.

Illinois State Electric Association. Annual convention, Champaign, Ill., February 23-24. Secretary, H. E. Chubbuck, Peoria, Ill.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

HODGENVILLE, KY.—The Hodgenville Lighting Company has been incorporated with a capital of $5,000 by C. L. Herron, J. H. Herron and others.

LOUISVILLE, KY.—The Louisville Gas and Electric Company has decided to spend $1,000,000 enlarging its power plant at Third and Washington Streets. The additions will require a new building as large as the present one. The plans for the work, including the building and the tunnel, are being prepared by the engineers and architects of the company, in charge of Louis S. Streng, chief engineer.

WHITESBURG, KY.—Active work on the large central power station of the Kentucky River Power Company is soon to be started at Glowman, near this city. This station will supply the power for about 20 mining operations in the vicinity.

HUMBOLDT, TENN.—The city is planning extending its electric light system to small towns within a radius of 12 miles.

NASHVILLE, TENN.—The Nashville Railway & Light Company will install within the near future a sub-power station between the West Nashville and the West End car lines, in order to increase the efficiency of the street car and lighting service in that part of the city. It is planned to have the station in operation within 60 days.

SEVIERVILLE, TENN.—The Sevierville Milling Company will build an electric lighting plant here.

ALABAMA PORT, ALA.—The Tidewater Securities Corporation, of Mobile, proposes to establish an electric light plant here.

BIRMINGHAM, ALA.—An electric railway from this city to Warrior River, a distance of 20 miles, to give shippers here direct touch with water transportation, is being advocated by M. W. Bush, president of the Chamber of Commerce, and others. A tentative proposition has been made to the city by President J. S. Pevear of the Birmingham Railway, Light & Power Company. The estimated cost of the line has been placed at $300,000.

DECATUR, ALA.—The Alabama Power Company is taking steps to secure right of way for a transmission line to Hartselle, where the company has acquired the present power plant. It is believed here that the Alabama Power Company is preparing to extend its transmission lines north from Birmingham to Decatur.

DECATUR, ALA.—H. A. Mentz, assistand engineer of the Xavier A. Kramer Electrical, Mechanical and Civil Engineering Company of Magnolia, Miss., appeared before the Decatur city council and laid before that body a plan for the building of a municipal electric lighting and power plant in Decatur. It is estimated that such a plant can be built for about $40,000.

MONTGOMERY, ALA.—The Louisville and Nashville Railroad Company will begin work immediately in installing a block signal system between Montgomery and Calera, a distance of about 35 miles. A. R. Fugina, Louisville, Ky., is signal engineer for the company.

TUSCALOOSA, ALA.—The Tuscaloosa Railway & Utilities Company has bought the plant of the Tuscaloosa Ice & Lighting Company and probably will make improvements.

BOONEVILLE, ARK.—The Booneville Light & Power Company, recently incorporated with $50,000 capital, H. P. Harley manager, plans to construct a 28-mile transmission line to supply four nearby towns with energy. This will be of cedar pole construction with transmission at 16,500 volts, single phase. In addition the company will require equipment for street lighting and distribution, meters and other material.

HARTFORD, ARK.—The city has formed an electric lighting and water works improvement district. The Benham Engineering Company, consulting engineers, Oklahoma City, has been engaged to make investigations and estimates.

NEWARK, ARK.—The Newark Canning Company is considering the installation of an alternating current plant of 300 to 500-light capacity.

DURANT, OKLA.—The Durant Ice & Light Company will construct a high-tension transmission line to Caddo, Okla.

MOUNTAIN VIEW, OKLA.—The city has voted $8,000 in bonds for the installation of an electric light plant.

CORPUS CHRISTI, TEX.—The building of an interurban railroad from Corpus Christie to Ward Island, eight miles west, has been assured. J. J. Caswell has deposited a certified check for $5,000 with the City Council to be forfeited if the road is not completed and in operation within

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12 months. The franchise for this line was granted to Mr. Caswell and associates some time ago.

PHARR, TEX.—The Pharr Ice, Light & Power Company will install new machinery in its light and power plant and enlarge the capacity. Charles Evers is president.

SAN ANTONIO, TEX.—The Houston & San Antonio Interurban Company plans to begin the construction of an interurban electric railway between San Antonio and Houston about February 20. It is announced that cash bonuses aggregating approximately $300,000 have been raised in aid of the project by towns along the route, and that more than $640,000 in stock has been subscribed. The route selected will take in the towns of Seguin, Gonzales, Belmont, Wade, Weimer, Columbus, Eagle Lake, Richmond and Rosenberg.

SULPHUR SPRINGS, TEX.—B. S. Ashcroft & Sons, owners of the local electric light plant, are erecting ornamental light posts in the business district preparatory to the lighting of the town under a contract recently entered into with the City Commission. The residence section also will be included in the white way.

TEAGUE, TEX.—The electric power plant of the Telluride Power Company, which furnished electric lights and power to the city of Teague, was recently damaged by fire. Temporary service will be furnished by means of power secured from the local shops of a railroad company. The plant will be rebuilt.

TERRELL, TEX.—Announcement has been made here that the local plant of the Terrell Electric Light Company will be very soon connected with the transmission circuits of the Texas Power & Light Company. The power will be brought through Kaufman County and Forney and Kaufman patrons will also be served.

VICTORIA, TEX.—The City Council has ordered a survey made to determine the feasibility of building a municipal electric light plant here.

WESTERN STATES.

GREAT FALLS, MONT.—The Montana Power Company of this city intends to erect a transmission line to Sun River Valley for supplying light and power. Work will be commenced in the early spring.

ROUNDUP, MONT.—The city is planning to install a system of lights for the business district to include the installation of 111 posts with cluster lights.

LANDER, WYO.—The Hydro-Electric Power Plants Company has been organized with a capital of $500,000 for the purpose of supplying hydraulic power to the farmers of Fremont County and light and power to the city of Lander. The company is financed by Missouri capitalists, W. E. Cole, William Webster and N. C. Webster, all of Kansas City, being the incorporators.

BOISE, IDAHO.—The Southern Idaho Water Power Company has been granted a certificate of public convenience and necessity to extend its distributing lines into Power and Bingham counties.

RATHDRUM, IDAHO.—The controlling interest in the Rathdrum Electric Company has been sold to F. M. Shields, of the Shields Investment Company, Spokane, Wash. The Rathdrum Electric Company supplies power for lighting to Rathdrum and Post Falls and has a generating plant at Post Falls. Mr. Shields states alterations will be made at the Post Falls plant at once, and that extensions of service lines is contemplated on a large scale during the year. B. E. Kyle has been appointed temporary manager of the company.

ALBION, WASH.—O. C. Lawlor, city clerk, reports the council has decided to order the installation of street lights covering practically the entire city. Bids for materials and installation probably will be called for at an early date.

COLFAX, WASH.—The City Council has decided to install a street lighting system.

MONTESANO, WASH.—The proposition of constructing a municipal light and water plant has been brought before members of the City Council and the matter may be placed before the voters at an early election.

PORT ANGELES, WASH.—Money to be obtained from a bond issue of $30,000 will be used for extensions to the municipal lighting system. J. I. Beam, city clerk, will call for bids for material and installation shortly.

SEATTLE, WASH.—A campaign for the installation of a cluster lighting system on Fourteenth Avenue Northeast, from Thirty-fifth east to Cowan Park, has been started by business men and property owners in the University District.

SEATTLE, WASH.—The City Council has been petitioned by property owners on Lucille Street and Twelfth Avenue South in Georgetown, a suburb of Seattle, for the installation of a street lighting system in that district. A. H. Dimock, city engineer, will furnish an estimate of cost to the Council.

SPOKANE, WASH.—Rumor among Spokane railroad men, said to have its origin in information from high officials of the road, is to the effect that the Great Northern railroad will be electrified from Spokane to Seattle within a year or two. Electricity generated at the plant of the railway just west of Leavenworth, which is used at the present time to haul trains through the Cascade tunnel, is to be supplemented by a larger supply from a plant to be constructed at Shelan Falls, on which engineers have recently made a report estimating the cost of development of the power site at $4,000,000.

ASHLAND, ORE.—The City Council probably will install 40 new street lights as an addition to the present lighting system. Energy for the local lighting system is supplied by the California-Oregon Power Company.

LAGRANDE, ORE.—The Mill Creek plant of the Eastern Oregon Light & Power Company, which was the emergency plant for La Grande, was destroyed by fire recently. It is understood the plant will be rebuilt.

OREGON CITY, ORE.—With the purpose of advocating the construction of a municipal light and power plant, Mayor Hackett is investigating the extent of this city's power rights at the falls of the Willamette River.

OSWEGO, ORE.—A franchise granting permission to the Oswego Lake Water, Light & Power Company, covering power and water privileges, has been granted by the County of Multnomah.

WESTLAKE, ORE.—Horace T. Campbell of Westlake has been granted a permit for the development of 145 horsepower at the outlet of Whoahink Lake in Lane County at a reported cost of $5,000.

BAKERSFIELD, CAL.—Contracts for nine electric plants for pumping water in the Weed Patch District have been secured by the San Joaquin Light & Power Company and extensions of power lines for a distance of 11 miles will be built at once.

LOS ANGELES, CAL.—The Board of Supervisors has set February 7 as the date for hearing a petition asking for the establishment of a highway lighting district to be known as the Graham Lighting District of Los Angeles County.

LOYALTON, CAL.—An ordinance has been passed by the Board of Trustees providing for the issuance of bonds in the sum of $5,000 for the construction of an electric light and power plant.

MARTINEZ, CAL.—The Great Western Power Company announces the proposed construction of a main power station here and of a 100,000-volt tower line from Antioch bay shore to Oakland, to be paid for out of the recent $5,000,000 bond issue.

SACRAMENTO, CAL.—Although definite steps have not been taken, as soon as the construction of the new City Hall of Justice will permit the Supervisors expect to place electroliers around the building.

SAN BERNARDINO, CAL.—The Pacific Light & Power Company has been granted a 50-year franchise to maintain electric transmission lines in San Bernardino County.

TAYLORSVILLE, CAL.—George H. Hall has applied to the Board of Supervisors of Plumas County for a franchise to supply Taylorsville and vicinity with electric energy for light and power purposes.

Financial Notes

Havana Electric Railway, Light & Power Company has called for payment March 1, at 100.5, at the Guaranty Trust Company, New York City, the $2,000,000 six-per-cent two-year secured notes due September 1, 1916.

At the annual meeting of stockholders of the Brooklyn Rapid Transit Company retiring directors were re-elected. Thus far in January earnings of the B. R. T. system have averaged an increase of almost $5,000 a day.

Columbus Railway, Power & Light Company has called for payment through the Commercial Trust Company of Philadelphia the $1,200,000 one-year five-per-cent notes due June 1, 1916, on February 21 at par and interest. The funds for redemption of the notes was secured by the sale of first and refunding bonds of the company.

Chicago bankers are offering, at 95 and interest, $2,000,000 first-mortgage five-per-cent bonds of Michigan Northern Power Company. The issuing company is owned by Union Carbide Company, which guarantees unconditionally the principal and interest of the bonds. Michigan Northern Power Company is one of the main sources of power supply for Union Carbide, and owns a hydroelectric plant and site of 1,200 acres at Sault Ste. Marie, developing 40,000 horsepower of energy.

Consolidated Traction Company, of Pittsburgh, a subsidiary of Philadelphia Company, and operated by the Pittsburgh Railways Company, has sold to the Colonial Trust Company, of Pittsburgh, $500,000 five-per-cent car trust bonds which will be offered at par and interest. The bonds mature in ten annual installments of $20,000 each, beginning with April 1, 1917. The bonds are a first lien on 25 double-truck steel motor cars and 25 double-truck steel trailers, costing $221,000, of which amount $21,000 cash has been paid by the company.

At the annual stockholders' meeting of the Commonwealth Edison Company, Chicago, to be held February 28, 1916, a proposition to increase the authorized stock from $50,000,000 to $60,000,000 will be considered. It is understood that $4,500,000 new stock will be sold during the current year, and probably will be offered to stockholders for subscription at par. The company now has outstanding $45,838,936 stock, and the new issue will be in the ratio of one share of new stock to ten shares of old. The proceeds of the sale will be used for the company's normal additions and betterments.

Standard Gas & Electric Company, through the Philadelphia Trust Company, is asking for tenders until February 17 for as many of the Standard Gas & Electric convertible six-per-cent sinking-fund bonds as may be purchased with $810,700 now available for purpose of retirement of these bonds. Funds for the purchase of these bonds were secured by the sale of $206,000 Ottumwa Railway & Light first and refunding five-per-cent bonds at 90 and $676,000 Western States Gas & Electric first and refunding five-per-cent bonds at 91.5, being Standard Gas & Electric convertible six-per-cent bonds.

At the annual meeting of the stockholders of the Standard Underground Cable Company, the financial report showed that the total business of the company for the year 1915 amounted to $20,500,000 gross and was the largest single year's business in the history of the company. Unfilled orders on January 1 aggregated nearly $3,500,000 which is about three times the amount of unfilled orders on hand at the close of 1914. The following directors were

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 31.	Jan. 24.
American Tel. & Tel. (New York)	127	127⅜
Commonwealth Edison (Chicago)	144½	144
Edison Electric Illuminating (Boston)	242	245
Electric Storage Battery common (Philadelphia)	63	64⅝
Electric Storage Battery preferred (Philadelphia)	63	64⅝
General Electric (New York)	170½	173⅛
Kings County Electric (New York)	128	128
Massachusetts Electric common (Boston)	6	6¾
Massachusetts Electric preferred (Boston)	35¾	35½
National Carbon common (Chicago)	179	165
National Carbon preferred (Chicago)	—	122
New England Telephone (Boston)	132	132
Philadelphia Electric (Philadelphia)	28	28
Postal Telegraph and Cables common (New York)	79	78
Postal Telegraph and Cables preferred (New York)	65½	65
Western Union (New York)	88¾	90
Westinghouse common (New York)	65½	67⅝
Westinghouse preferred (New York)	75	76⅝

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elected to serve for the ensuing year: Joseph W. Marsh, John Moorhead, Jr., Louis W. Dalzell, B. F. Jones, Jr., J. N. Davidson, A. H. Childs, F. A. Rinehardt, Joseph Wood, John R. McCune, president of the Union National Bank of Pittsburgh who has been elected to fill the vacancy on the board caused by the death of William A. Conner.

Dividends.

	Term	Rate	Payable
Am. Util., pf.	Q	1.75%	Feb. 10
Coun. Ry. & Ltg.	Q	1 %	Feb. 15
Coun. Ry. & Ltg.	Q	1 %	Feb. 15
Ill. Trac., com.	Q	0.75%	Feb. 15
Lehigh Val. Tran., pf.	Q	1.25%	Feb. 10
Mid. West Util., pf.	Q	1.5 %	Mar. 1
No. American	Q	1.25%	Apr. 1
Tampa Elec.	Q	$2.50	Feb. 15
Wash. Ry. & Elec., com.	Q	1.75%	Mar. 1
Wash. Ry. & Elec., pf.	Q	2.5 %	Mar. 1
J. G. White & Co., Inc., pf.	Q	1.5 %	Mar. 1
J. G. White & Co., Inc., pf.	—	0.5 %	Mar. 1
J. G. White Management Corp., pf.	Q	1.75%	Mar. 1
J. G. White Eng. Corp., pf.	Q	1.75%	Mar. 1

Reports of Earnings.

PHILADELPHIA COMPANY.

	1915	1914
November gross	$ 2,215,357	$ 1,987,997
Net	1,004,212	748,722
Eight months' gross	16,208,354	15,652,345
Net	6,855,147	5,416,447

NORTHERN STATES POWER COMPANY.

	1915	1914
November gross	$ 502,889	$ 430,392
Net after taxes	298,832	253,510
Eleven months' gross	4,576,488	4,033,582
Net after taxes	2,540,827	2,164,251
Twelve months' gross	5,048,153	.....
Net after taxes	2,808,567	.....
Surplus after charges	1,304,385	.....
Balance after preferred dividends	*717,316	.....

*Equivalent to 12 per cent on $50,975,000 common stock.

COMMONWEALTH POWER, RAILWAY & LIGHT.

	1915	Per cent Gain Over 1914
November gross	$ 1,323,673	11.61%
Net earnings	718,231	12.14%
Surplus after charges	244,899	16.37%
Balance after preferred dividends	164,899	26.41%
Eleven months' gross	12,979,439	2.42%
Net earnings	6,761,147	3.81%
Surplus after charges	1,986,446	2.35%
Balance after preferred dividends	1,106,446	4.30%
Twelve months' gross	14,317,036	1.50%
Net earnings	7,492,904	3.56%
Surplus after charges	2,289,302	2.80%
Balance after preferred dividends	1,329,302	4.91%

CONSUMERS' POWER OF MICHIGAN.

	1915	Gain Over 1914
November gross	$ 377,190	24.20%
Net earnings	244,431	23.93%
Surplus after charges	138,650	34.61%
Balance after preferred dividends	105,150	51.30%
Eleven months' gross	3,484,029	13.12%
Net earnings	2,323,225	16.62%
Surplus after charges	1,264,974	32.32%
Balance after preferred dividends	896,474	41.74%
Twelve months' gross	3,819,528	12.18%
Net earnings	2,547,986	16.80%
Surplus after charges	1,398,170	35.25%
Balance after preferred dividends	996,170	45.90%

Proposals

ORNAMENTAL LIGHTING SYSTEM.—Sealed bids will be received at the office of John Graves, city clerk, Macomb, Ill., before February 17, for all labor and material for installing a street lighting system consisting of 61 ornamental five-light standards, as per plans and specifications.

POWER HOUSE.—Sealed proposals will be opened in the architect's office, Feb. 17, for the construction of an extension to the power house in connection with the Experiment Station, Bureau of Mines, at Pittsburgh, Pa. Drawings and specifications may be obtained from the superintendent of construction, 4902 Forbes Street, Pittsburgh, Pa., or at the office of the Supervising Architect, Washington, D. C.

SCHOOL BUILDING EQUIPMENT.—Separate bids will be received by C. O. Fitts, secretary of the school district of Belmond, Iowa, until February 23 for the construction of a grade and high school building, heating and ventilating, plumbing, electrical work, science and laboratory equipment, gymnasium equipment and seating. Plans will be on file at the secretary's office or at office of G. L. Lockhart, architect, Endicott Building, St. Paul, Minn. and after February 8 at the Builders' Exchange at St. Paul and Minneapolis, Minn.; Des Moines, Iowa and Omaha, Neb.

New Incorporations

NEW YORK, N. Y.—Schultz Electric Company. Capital, $10,000. Incorporators: E. P. Schultz, Y. Schultz and E. Rothstein.

ROCHESTER, N. Y.—Requa Electrical Supply Company. Capital, $25,000. Incorporators: W. A. Requa, D. R. Cole and F. L. Greeno.

WEEHAWKEN, N. J.—Weehawken Tungsten Lamp Company. Capital, $10,000. Incorporators: Joseph Force and others.

CLEVELAND, O.—Electric Purifying Machinery Company. Capital, $10,000. Electrical, mechanical and chemical machinery. Incorporators: Fred Desberg and others.

CLEVELAND, O.—A. B. Wilson Company. Capital, $10,000. Electrical supplies. Incorporators: A. B. Wilson and others.

HEBRON, IND.—Hebron Light, Heat & Power Company has increased its capital from $25,000 to $100,000.

CHICAGO, ILL.—Loop Electric Company. Capital, $20,000. Manufacture electrical appliance and fixtures. Incorporators: G. J. Bumgardner, K. Bumgardner and H. Heap.

CHICAGO, ILL.—Phoenix Electric Company. Capital, $30,000. Manufacture electrical machinery. Incorporators: L. C. Thesen, J. G. Bodenschatz and B. Kortmeyer.

JOLIET, ILL.—Joliet Storage Battery Company. Capital, $2,500. Incorporators: Albert Ohlhauer and others.

ROCKFORD, ILL.—Modern Power Appliance Company. Capital, $5,000. Manufacture isolated electric lighting plants. Incorporators: I. G. Smith, H. H. Rogers and W. D. Knight.

LOUISVILLE, KY.—The Gas & Electric Shop. Capital, $30,000. Incorporators: F. Metz, R. A. McDowell and J. V. Connor.

SAN ANTONIO, TEX.—The Electrolladd Company. Capital, $50,000. Manufacture electrical machines and appliances. Incorporators: R. M. Craig, E. N. Phillips and C. K. Smith.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,845. TELEPHONE SYSTEM, ELECTRIC CLOCKS AND BELLS, ETC.—An American consular officer in one of the neutral European countries states that a firm which is building a post office in his district is in the market for an interior telephone system connectng 200 rooms; 250 electric clocks; 250 electric bells; 150 desk keyboards with from 4 to 6 electric bells each. Correspondence should be in Spanish. Weights and measurements should be stated in the metric system. Discounts, terms, and full details, accompanied by illustrations or photographs, should be furnished.

NO. 19,854. ELECTRIC LIGHTING SYSTEM.—An American consular officer in China reports that a firm in his district is in the market for equipment and accessories for the installation of an electric-lighting plant. It is proposed to install a water-tube boiler, a surface condenser, a reciprocating 100-horsepower engine of 400 revolutions per minute, and a 220-volt dynamo, rated at 60 kilowatts. About 40,000 to 50,000 feet of insulated wire of various sizes will also be required. Correspondence should be in Chinese, but may be sent in English to the consulate, where translation will be made and forwarded to the firm.

NO. 19,872. ELECTRIC BELLS, LAMPS, ETC.—An American consular officer in India writes that a firm in his district wishes to communicate with American manufacturers of electric bells, lamps, telephones, novelties, etc.

NO. 19,885. ELECTRICAL SUPPLIES.—A firm in India informs an American consular officer that it desires to receive quotations from American exporters of metal-filament electric lamps, rubber-covered wires, and lighting accessories. It is stated that the firm will pay cash against documents in New York.

New Publications

SAFETY MAGAZINE.—The *Electrical Safety Magazine*, a bi-monthly pamphlet of safe guards, has been started by Frederick C. Mathews, of Detroit, Mich. The second number is out, and contains several interesting articles, with portraits of the authors.

CANADIAN FUEL.—The Canadian Department of Mines has issued Vol. II. of "Petroleum and Natural Gas Resources of Canada," by F. G. Clapp and others. This illustrated volume of 404 pages deals with a description of occurrences in all parts of the country.

UTILITIES CONFERENCE.—The January issue of *The Utilities Magazine* contains the complete proceedings of the conference on valuation, held in Philadelphia, November 10 to 13, 1915. It is published at $2.00 per copy by The Utilities Bureau, 1009 Finance Building, Philadelphia, Pa.

BUREAU OF STANDARDS.—The following papers have recently been issued by the Bureau of Standards, Washington, D. C.: "Earth Resistance and Its Relation to Electrolysis of Underground Structures" (48 pages), by Burton McCollum; "Protection of Life and Property Against Lightning" (127 pages), by O. S. Peters; "A New Relation Derived from Planck's Law" (4 pages), by P. D. Foote.

Electrical Patents Issued January 25, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,169,110. **Distributer for Type-Setting Machines.** A. G. Baker and F. W. Knott, assignors to Universal Machine Co., Detroit, Mich. Comprises electromagnetic means for moving the type carriage.

1,169,111. **Type-Setting Machine.** A. G. Baker and F. W. Knott, assignors to Universal Machine Co. Electromagnetically actuated type setting-up means and actuating bar for type ejecting plungers.

1,169,117. **Illuminating Sign or Number Plate.** S. Borman, New York, N. Y., assignor of one-half to L. C. Jandorf, Port Washington, N. Y. Arrangement of reflective and non-reflective surfaces on sign and display plates.

1,169,133. **Mounting for Electric Motors.** A. DeKleist and S. A. Swanson, assignors to Rudolph Wurlitzer Mfg. Co., North Tonawanda, N. Y. Unsupported at pulley end with spring tightening belt, other end having resilient support. (See cut, next page.)

1,169,138. **Safety Signal Device.** B. M. Downs, Buffalo, and W. S. Cook, Lackawanna, N. Y. Arrangement of car circuits comprising safety and stop signals.

1,169,174. **Electric Driving Apparatus.** M. B. McLauthlin, Malden, and A. K. Tylee, Brookline, Mass. Electromagnetically operated motor reversing switches.

1,169,179. **Magneto-Armature.** H. C. Meuller, assignor to Evinrude Motor Co., Milwaukee, Wis. Structure of core and winding.

1,169,182. **Thermionic Translating Device.** A. McL. Nicolson, assignor to Western

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Electric Co., New York, N. Y. Has heated input electrode and cathode surface made thermionically active by heat radiated therefrom.

1,169,187. Plug Switching Device. A. S. Pearl and C. A. Jansen, assignors to Delta-Star Electric Co., Chicago, Ill. Details of receptacle and removable hand plug.

1,169,194. Switch Device for Fire Alarms. G. B. Rattermann and W. W. Garrison, Birmingham, Ala. Switch controlled by fusible strip.

1,169,203. Spark Plug. A. Sprung, New York, N. Y. Has two-part insulator.

1,169,211. Electric Conductor. C. J. E. Waxbom, assignor to Jeffrey Mfg. Co., Columbus, O. Support and connection of alined conductor sections.

1,169,213. Electric Heating Unit. H. G. Weeks, assignor to F. C. Austin, Chicago, Ill. Wire coil forms flat element without abrupt bends.

1,169,215. Electric Vulcanizer. E. J. Wiggins, assignor to D. Heyman, Chicago, Ill. Electrically heated, portable, hand device.

1,169,246. Insulator. A. J. Folstad, Balaton, Minn. Wall knob has integral guard hook.

1,169,251. Electric Relay. J. F. Gaffney, Steelton, Pa. Special structure and arrangement of circuits for controlling signal lamp.

1,169,254. Electric Sign Structure. A. W. Gast, assignor to Chicago Miniature Lamp Works, Chicago, Ill. Built up of separable sections.

1,169,258. Cell. W. Hoppie, Lawndale, Cal. Electrode of dry cell coated with glucose and powdery material.

1,169,262. Electric Heater. W. D. Huff, LaFayette, La. Tubular structure for placing about pipe.

1,169,263. Casing for Electrical Apparatus and Removable Locking and Insulating Means. J. Keefe, assignor to Zee Socket & Mfg. Co., Boston, Mass. Cap lining and securing device for cap and shell of lamp socket.

1,169,273. Interlocking Relay for Railway Signals. C. E. Mason, Chicago, Ill. Details of armature and contact arrangements.

1,169,279. Stereotype Matrix Machine. A. Ott, Oberkassel-Siegkreis, Germany. Type wheel applied to matrix by electromagnet.

1,169,291. Telephone System. F. M. Slough, assignor to Garford Mfg. Co., Elyria, O. Selective party-line system.

1,169,304 and 1,169,305. Electric Pump Governor. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. First patent: fluid-pressure-operated switch. Second patent: modification.

1,169,314. Terminal Plug. R. E. Zannoth and V. B. Dickenson, Detroit, Mich. For cord end: details.

1,169,320. Telephone Exchange System. W. W. Dean, assignor to Garford Mfg. Co. Automatic system.

1,169,342. Mechanical Movement for Electrical Switches and Similar Devices. G. H. Morse, assignor to Mutual Electric & Machine Co., Wheeling, W. Va. For rotary, snap switch.

1,169,345. Adjustable Lamp Support. L. E. Nelson, Seattle, Wash. Motor operated.

1,169,346. Electric Cluster Lamp. T. O'Donnell, Ironwood, Mich. Several diverging bulbs, each with filament, have common neck.

1,169,350. Electrical Accumulator. L. W. Pullen, Philadelphia, Pa. Structure of electrode containing active material.

1,169,362. Electric Storage Battery. J. M. Skinner and V. R. Bottone, Philadelphia, Pa. Relates to gas venting.

1,169,372. Bushing for Covered Wires. H. J. White, San Francisco, Cal. Spring grip for securing flexible conduit in friction boxes, etc.

1,169,382. Bridge for Electrical Conductors. L. W. Crompton and E. N. Oliver, Tampa, Fla. For bridging over pipes, etc.

1,169,383. Timer Mechanism for Gas Engine Ignition. W. E. Dow, Braintree, Mass. Duration of opening centrifugally controlled.

1,169,384. Apparatus for Sintering and Smelting Ores. A. S. Dwight, New York, N. Y. Current passed through sintered ore cake.

1,169,387. Automatic Switch for Telephone Systems. K. E. Ericsson, Saltsjo-Storangen and G. W. Dahlstrom, Stockholm, Sweden. Telephone repeating system.

1,169,390. Panel Box. H. J. L. Frank and L. H. Frank, Wheeling, W. Va. Mounting of cover interlocked with switch.

1,169,391. Electrical Switch. H. J. L. Frank and L. H. Frank. Push, snap switch.

1,169,394. Portable Electric Lamp. H. M. Greist, assignor to Greist Mfg. Co., New Haven, Conn. Lamp support with suction cup.

1,169,422. Thermionic Repeater. A. Nicolson, assignor to Western Electric Co., New York, N. Y. Input electrode and cathode are intertwined.

1,169,426. Plug Switch. F. J. Ravlin and J. Lofgren, Chicago, Ill. Three wire.

1,169,428. Means for Removing Static Electricity from Materials. G. D. Rogers, Lakewood, O. Hot air projected from electrical distributer against surface to be treated.

1,169,431. Electrical Connector. G. A. Schaefer, Chicago, Ill., assignor of one-half to F. W. Irving, Chicago, Ill. Comprises spring-pressed contact plates with springs insulated to prevent heating by current.

1,169,450. Controlling Mechanism for Electric Motor Vehicles. S. S. Amdrusky, Rochester, N. Y. Brake and speed control interlocked.

1,169,459. Train Service Coupling. A. J. Campbell, Marion, Iowa. Coupling for signal wires extending along air hose, on hose coupling.

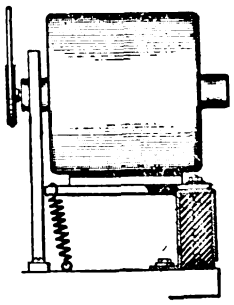
1,169,465 and 1,169,466. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Generator voltage regulation in car-lighting system.

1,169,475. Magnetic Apparatus. G. P. Finnigan, Wilton-on-James, near Richmond, Va. Permanent magnet combined with electromagnet to reduce residual magnetism of latter.

1,169,484. Process and Apparatus for Making Brazed Joints. F. W. Heuser, Gross-Lichterfelde, near Berlin, Germany. Arc process.

1,169,497. Device for Fastening Electric Light Bulbs to a Socket. C. E. Kohlmann, Frenso, Cal. Comprises key-controlled cam ring.

1,169,508. Demand Apparatus. W. E. Porter, assignor to General Electric Co., Schenectady, N. Y. Gearing between driving and recording mechanisms.



No. 1,169,133.—Mounting for Electric Motors.

1,169,516. Brake Control and Signal System for Single-Track Railways. P. Schneider, Oswego, N. Y. Block system.

1,169,518. Electric Starter for Automobile Engines. A. W. Smith, Washington, D. C. Flywheel starter.

1,169,532. Electric Attachment Device. H. W. Denhard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Plug connector having offset plugs on opposite sides of two-part insulating base carrying connectors between plugs.

1,169,537. Combined Alternating and Direct-Current Distributing System. J. H. Gugler and G. W. Colles, Milwaukee, Wis. Arrangement for feeding service circuit from either alternating or direct-current circuit.

1,169,545. Insulator Bracket. F. P. Kobert, Milldale, Conn. Structure of wall plate with insulator arms.

1,169,549. Electrothermostat. T. Lidberg, assignor to Chicago Surgical & Electrical Co., Chicago, Ill. Thermal element is diaphragm of two disks, one hard rubber and other of metal, clamped together at edges and having contact at center.

1,169,550. Regulating Device for Motor-Driven Compressors. F. L. Lucker and A. O. Carpenter, assignors to Ingersoll-Rand Co., Jersey City, N. J. Series of fluid operated switches control resistance in circuit of compressor motor.

1,169,552. Operating Circuit and Switch Arrangement for Car-Motors. J. S. McWhirter, assignor to Prepayment Car Sales Co., New York, N. Y. Movement of controller toward "off" opens circuit which cannot be closed except when controller is in "first" position.

1,169,571. Art of Coloring Glass. H. Rosenthal, Camden, N. J. Glass is subjected to rays from X-ray tube.

1,169,611. Thermo-Electric Couple. W. H. Bristol, assignor to Bristol Co., Waterbury, Conn. Special alloys arranged in primary and extension portions of compound couple.

1,169,612. Magneto Machine. W. Brown, assignor to Webster Electric Co., Racine, Wis. Adapted for hand operation.

1,169,613. Attachment Plug Receptacle. F. V. Burton, assignor to Bryant Electric Co., Bridgeport, Conn. Adapted for either parallel or tandem jack blades on plug.

1,169,617. Thermo-Electric Humidity Instrument. E. W. Comfort, assignor to Buffalo Forge Co., Buffalo, N. Y. Junctions of thermo-electric battery respectively subjected to wet and dry-bulb temperatures of air and humidity indicator in circuit with resistance regulated according to dry-bulb temperature.

1,169,628. Spark Plug. A. C. Ferrier, Lincoln, Neb., assignor of one-half to W. J. Hill, Lincoln, Neb. Chamber between stem of insulator and metal case, the chamber decreasing in area toward the spark point.

1,169,648. Means of Connection Between a Wind Wheel and Dynamo for Storing Electricity. A. V. Johnson, Napoleon, N. D. Gearing to reciprocating rod of wind wheel.

1,169,676. Frequency Converter. P. F. Pichon and A. Meissner, assignors to Geselschaft für Drahtlose Telegraphie M. B. H., Berlin, Germany. Relates to core; magnetically highly saturated and with cooling means.

1,169,692. Alarm Controller for Sprinkler Systems. N. H. Suren, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Alarm circuit controlled by check valve between service and supply.

1,169,695. Stabilizer for Aeroplanes. A. B. Thaw, Pittsburgh, Pa. Electromagnet with gravity-closed circuit controls operating mechanism for balancing planes.

1,169,713. Electric Selective Instrument. T. Bodde, Westfield, N. J., assignor of one-half to A. G. Shaver, Westfield, N. J. For responding to electromagnetic impulses of predetermined frequency.

1,169,723. Protective Device for Three-Phase Motors. N. Joleen, assignor to Associated Engineers Co., Chicago, Ill. Alternating motor-direct generator battery charging set. Failure of motor current in any phase opens generator circuit.

1,169,736. Telephone Exchange System. F. Schoenwolf, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Automatic system.

1,169,744. Spark Intensifier for Spark Plugs. A. F. Gillet, assignor to Jubilee Mfg. Co., Omaha, Neb. Details of device for securing to plug.

1,169,754. Automatic Telephone System. F. Schoenwolf, assignor to Kellogg Switchboard & Supply Co. Arrangement of selector.

Reissue. 14,051. Electric Battery. F. S. B. DeMello, Rio de Janeiro, Brazil. Original No. 1,148,152, dated July 27, 1915. Electrode for primary or secondary battery made by reducing copper sulfid by electrolysis and oxidizing resulting mass.

Patents Expired.

The following United States electrical patents expired on January 31, 1916:

618,391. Electric Furnace. H. Bovy, Geneva, Switzerland.

618,404. Electric Pump. C. Eichemeyer, Yonkers, N. Y.

618,429. Electric Railway. J. F. Munsie, New York, N. Y.

618,562. Ventilating Apparatus. F. P. Donahey, Washington, D. C.

618,578. Alternating-Current Motor. E. C. Newcomb, Brookline, Mass.

618,579. Commutator Short-Circuiter. E. C. Newcomb, Brookline, Mass.

618,604. Signal-Controlling Track Instrument. E. A. Hollaway, Gilroy, Cal.

618,610. Telephone Switchboard. J. M. Overshiner, Elwood, Md.

618,635. Electric Battery. A. R. Adams, Surrey, Eng.

618,646. Electric Illuminated Clock Dial. R. T. Crane, Jr., Chicago, Ill.

618,670. Electric Clock. W. W. Hastings, Jersey City, N. J.

618,674. Trolley Wheel and Support. W. P. Holt, Savannah, Ga.

618,699. Prepayment Electric Meter. F. M. Long and E. Schattner, Norwich, Eng.

618,702. Direct-Acting Reciprocating Electric Motor. J. H. Mason, New York, N. Y.

618,703 and 618,704. Apparatus for and Means of Manufacturing Filaments for Electric Lamps. H. S. Maxim, London, Eng.

618,706. Electric Lamp. J. S. Mead, Mount Vernon, N. Y.

618,727. Armature for Dynamo-Electric Machines. E. D. Priest, Schenectady, N. Y.

618,773. Automatic Circuit Closer. H. F. Blackwell, Jr., New York, N. Y.

618,812. Electrical Protector. D. J. Cartwright, Boston, Mass.

Reissue 11,713. Storage Battery. R. Ashley, Port Republic, N. J.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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VOL. LXVIII, No. 7. **CHICAGO, SATURDAY, FEBRUARY 12, 1916.** ISSUED WEEKLY

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EDITORIALS

TRADE CONDITIONS.

Business conditions in the opening month of 1916 were encouraging from almost every viewpoint, and trade was good in nearly all lines. The great demand for steel has forced operation of the steel mills to their maximum capacity and there is still difficulty about securing deliveries. This may yet cause embarrassment to electrical manufacturers. Copper, on the other hand, has reacted from the maximum price and there is little likelihood of trouble from this quarter. The conmbination of large output with high prices has brought large profits to the mines and refineries, but this does not help the electrical industry.

A disinclination to inaugurate large new projects in electrical construction is still evident in financial circles, and the expected improvement in this direction will no doubt be quite gradual. With the metal and textile industries working under pressure and with the agricultural districts enjoying great prosperity, there can be little doubt of good general business conditions in 1916. Prices for securities show an upward trend, and money is plentiful enough for approved investments.

HIGHER INTENSITIES OF ILLUMINATION.

Practice in illuminating engineering tends steadily toward higher intensities of illumination. These higher intensities are not accompanied by higher brilliancies of visible source in well designed installations, for if sources of higher power are utilized, the intrinsic brilliancies are cut down by the use of diffusing media, or by reflection from a diffusing surface. In both direct and indirect systems of illumination, the one or the other means is utilized to avoid the glare which is inseparable from unscreened sources of high brilliancy.

There are several elements which have contributed to this tendency toward higher intensities. The high efficiency of modern illuminants has so reduced the cost of lighting that it has become commercially feasible to utilize greater amounts of light. The rapidly growing number of "white way" systems, especially in business districts, has inspired merchants and others with ideals which demand higher standards indoors also. Industrial concerns have realized the value of more adequate lighting in stimulating output, improving the quality of product, and in preventing accidents. Hence, higher standards of general illumination in factories have been set up. Familiarity with improved conditions in street, store and factory have encouraged the consumer to attain a standard of more and better light at home.

The central-station solicitor or engineer who is satisfied with recommending installations upon a basis which was considered satisfactory a few years ago, is not only missing an opportunity for creating a larger volume of business, but is sowing the seed for dissatisfaction upon the part of the consumer in the near future. With the cost of light production where it is today, there is no good reason why every new installation should not be laid out upon lines which will insure illumination which is adequate from every point of view.

THE INEFFICIENT HORSE.

The present age of unprecedented industrial development has been characterized by the replacement of manual labor by power machinery. The century following the invention of the steam engine has witnessed more and more numerous applications of mechanical power through various forms of machinery to conduct operations previously done by hand. The result has been a marked advance in our material civilization. Transportation has been revolutionized by the same agency. Although the sailing vessel has been in use for centuries, it has been largely superseded by steam for marine propulsion. On land nearly all long-distance transportation is carried on by means of steam or electricity. The mule-drawn canal boat is almost forgotten. In undeveloped mountainous countries, however, the mule must still be depended upon for transport of supplies and products, but this is recognized as a very inefficient method of transportation and becomes superseded whenever the density of traffic becomes great enough to warrant the investment in a railway.

In local urban transportation, the draft animal has been almost entirely superseded for passenger traffic, both public and private, but he still holds his place for the movement of merchandise and it is estimated that there are about 10,000,000 horses still in use in this country in urban service. While the horse compares more favorably with motor power for short hauls than for long-distance transportation, he is nevertheless an inefficient agency even for the former, and this fact is gradually being impressed upon the consciousness of the public. Transportation involves the application of energy, and a large part of our energy is obtained through the combustion of fuel. One form of obtaining energy through the oxidation of organic matter lies in the physiological transformation which goes on in the draft animal, but the most superficial estimate indicates this to be a highly inefficient transformation. Not only is organic food a very expensive fuel, but the percentage

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of the energy which is obtained in the form of mechanical work is also very low.

An article by Mr. A. J. Marshall in last week's issue pointed out the great inefficiency involved in the use of draft animals for local transportation in cities, as well as the space economy and sanitary benefits which might be accomplished by the substitution of the electric vehicle where rents are high and where large masses of people are brought together in restricted areas. It seems inevitable that eventually the motor vehicle will entirely displace the horse for such purposes. Among different forms of motor transportation, the electric vehicle has an acknowledged place, since it has been demonstrated many times that for certain types of service it is the most economical and most satisfactory. Its adoption upon a large scale would not only be a great economic gain, but would represent an enormous increase in business for the central stations, and through them for other elements of the electrical industry.

Mr. Marshall has quoted figures indicating that the present load of the central stations of this country would be tripled if horses could be entirely replaced by electric vehicles for urban service. With such possibilities in prospect it would certainly seem worth while for every central station, as well as the vehicle manufacturers themselves, to make an earnest effort for the acceleration of the process of consummating this substitution.

VALUATION FOR TAXATION AND FOR RATE-MAKING.

In valuing a utility property for rate-making purposes the effort is made to determine the actual value of every element of the property and arrive at a total which represents the market value of all tangible property and frequently certain elements of intangible values. Whether such a valuation should include all intangible values and thus correspond to the market value or sale value of the utility is a disputed question which need not be answered. Many students of the subject claim that valuations for rate-making and condemnation purposes should not be the same, as certain intangible elements may properly be included in the latter which are not properly included in the former.

In valuing property for taxation purposes, it is seldom that full value is scheduled. In some communities it is definitely aimed to assess all real estate at a specified fraction of the actual market value. Methods of taxing public service corporations vary in different states. In some cases gross earnings or net earnings are taken as a basis of taxation. Where corporate property is treated as other property and valued for taxation purposes, it will usually be found that, like the property of private owners, it is undervalued to a greater or less degree.

Such conditions are not, however, universal. In a case which came up last year before the Supreme Court of Wisconsin for review of the findings of the Railroad Commission, it was disclosed that a property upon which the Commission placed a valuation of $700,000 had been assessed for taxation purposes at $1,000,000, a discrepancy of 57 per cent. While it is obvious that tax assessments are not made accurately enough to form the basis of a valuation for other purposes, it is equally obvious that when a valuation based upon an inventory is made for rate-making purposes, it may form a substantial basis for a tax assessment, and the latter should never bear it such a relation as stated in the above case. To quote the opinion of the court: "Once the state has fixed a value for rate-making purposes and restricted the earning power of the road to a reasonable return on such value, it would seem reasonable to claim at least that the property could not have a materially higher value for purposes of taxation. While a valuation for taxation purposes may not fix the value for rate-making purposes, it may well be that a valuation for the latter purpose might substantially fix the value to be found for the former." There seems to be an excellent opportunity here for tax commissions and public service commissions to co-operate in carrying out so sensible a rule.

NEED OF DEFINING VALUATION TERMS.

The Valuation Committee of the American Electric Railway Association in a recent report has called attention to the confusion arising in valuation work from the use of the same term by different persons to represent different ideas, and the use of different terms to represent the same ideas. That such a condition has been one cause of the widespread confusion which has arisen in the consideration of this matter will not be disputed. Valuation engineers, accountants, lawyers and judges are all included in this difficulty and it is claimed this is partly responsible for the diversity in the decisions in the highest courts of our different states which has already come about and which is producing an unfortunate state of affairs.

The committee suggested that its own association take up with the Interstate Commerce Commission and associations representing other interested parties, the matter of defining the terms applied in valuation work, so that at least there need be no misunderstanding of the ideas put forward in discussing valuation matters. It would then be easier to really understand the opposing contentions of the different interests involved in valuation cases and come to decisions purely upon the merits of the case.

Certainly such a highly desirable clarification of the atmosphere which at present makes this matter so hazy would be of general advantage, for there are sufficient complications in this subject due to different viewpoints without adding those which may be due to misunderstanding. It is to be hoped that the American Electric Railway Association will take this matter up, or, if it fails to do so, that some other representative body will shoulder an obligation which only awaits a volunteer.

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ORGANIZING FOR BUSINESS PROMOTION.

It is only a few years ago when it appeared that the most heinous offense in the eyes of the Government was for a business man to belong to a business organization. So great was the iniquity of business men meeting in conference to establish business standards, to discuss from an ethical point of view ways and means for improving trade relations, and possibly daring to discuss the idea of making a little better profit out of their efforts, that organizations of this kind melted out of sight and their members passed each other upon the street and were impossible of identification except for some, to the uninitiated, passing of the high sign.

For several years business men have been afraid to discuss anything in their business sessions. The fear of government prosecution has to a large extent robbed a manufacturers' or a jobbers' session of a lot of its virility.

In an address before the annual meeting of the Rubber Club of America, at New York City on February 2, Mr. Edward N. Hurley, vice-chairman of the Federal Trade Commission, touched upon these things. Nothing of the foregoing is either his language or sentiment. The thing in this connection of interest at this time lies in the following phrasing: "But today things are different—they are better. Things are really pretty good. The law against restraint of trade has been more fully interpreted by the courts. Business understands more clearly what it may and may not do. The whole tone of the business world has improved under criticism."

Mr. Hurley deplored the unfavorable conditions which exist in certain manufacturing industries. A recent survey of one industry shows that in 1914, 27 of the larger manufacturers, all shipping over $100,000 worth of goods a year, with an aggregate capital stock of $9,000,000, bonds and other indebtedness of $3,500,000 and total sales of $8,500,000, had a net income of only $300,000, which means three and one-third per cent on the capital stock or three and one-half per cent on the sales.

The Federal Trade Commission is confronted with a lack of adequate information regarding industry, and is taking steps to obtain the facts so that remedial suggestions may be made as soon as possible out of the analysis of adequate knowledge of the situation.

Passing over the enumeration of several instances in several industries where the need for collective effort upon the part of the interests involved is easily demonstrated, Mr. Hurley points out the high degree of satisfaction to which manufacturers of every description in Germany have developed co-operative methods. In Germany every important industry is organized into trade associations, and 85 per cent of the manufacturers engaged in those industries are represented in their respective trade associations.

Mr. Hurley says "Germany's success as a commercial and industrial world power is due very largely to the policy of organizing and co-operating, of the working together of its captains of industry, of establishing communities of interest between the small and the big business men for the mutual purpose of promoting trade at home and abroad. The old adage 'In unity there is strength' is put into practice, and has proved to be the backbone of Germany's industrial and commercial achievements, efficiency and strength."

Collective effort has a large opportunity in every industry. There is open a wide field of useful and proper activities. Summing it all up, it appears that the demand for investigation instigated several years ago and the consequent criticism as to the underlying purposes of many of our trade organizations, were due to a misapprehension that these associations were concerned only with the regulation of prices. Under the enlightenment which has come out of the travail men are seeing today as never before the opportunities for organized effort. There need be no dodging and no subterfuges. The welfare of everyone involved in an industrial pursuit, the wage earner as well as the employe and the capitalist, are interested in the regulation of prices. This need not take the form of restraint but of intelligent understanding of all of the conditions involved. A right conception of the share that each element bears to the entire situation and a definite, upstanding coherence to proper standards of business practice will keep business on the right basis and the right basis will regulate prices.

MAINTENANCE OF RESALE PRICES.

The Board of Directors of the Chamber of Commerce of the United States has voted that the report of a special committee of the National Chamber on the maintenance of resale prices shall be submitted to a referendum of the members. At the annual meeting held this week at Washington, D. C., the committee report submitted by Dr. Paul T. Cherington, a professor in the Harvard Graduate School of Business Administration, the majority recommendation favors legislation permitting price maintenance under certain controlling conditions. This report is analyzed quite fully on other pages of this issue.

The advantages argued for and against price maintenance are worthy of careful study, and to all associations of electrical men interested in the question of maintenance of resale prices the referendum of the National Chamber is commended for careful consideration.

HOUSE-WIRING CAMPAIGNS.

The Society for Electrical Development has inaugurated a propaganda for a nation-wide house-wiring campaign this spring, to be known as "Wire Your Home" month. The date designated is for the period from March 15 to April 15, 1916. Already considerable enthusiasm has been aroused among electric light and power companies, manufacturers, electrical supply jobbers, electrical contractors, dealers and consulting engineers. With the recollection of the results achieved by Electrical Prosperity Week we can all of us get behind the present movement with the expectation that intensive effort will be amply repaid by actual cash-in returns.

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Happenings in the Industry

Railway Men Admit Manufacturers to Association at Chicago Meeting—Important Resolutions Adopted by Chamber of Commerce Convention—President Wilson Appeals to American Institute to Prepare Industries for War Conditions—SafetyAwards Made —Annual Dinner of Brooklyn Interests—Static Has Been Overcome in Wireless

RAILWAY MEN ADMIT MANUFACTURERS TO THEIR ASSOCIATION.

Midyear Meeting of the American Electric Railway Association.

At the midyear meeting of the American Electric Railway Association, held at the Congress Hotel, Chicago, on February 4, amendments to the constitution and by-laws were adopted which admit manufacturers of railway materials and supply men to membership in the association upon the same terms as the operating members. This consists of a company membership and the only distinction is that there are fewer steps in classification for payment of dues.

Manufacturers and supply men becoming members will pay annual dues of $25 if their gross business in electric railway material is less than $50,000 per annum; if the gross business exceeds $50,000 and is less than $1,000,000 the annual dues will be $125; up to $6,000,000 dues are $325; up to $10,000,000 dues are $525; over $10,000,000 dues are $750.

The morning session of the association was devoted to the subject of "Valuation," the principal paper on this subject being presented by N. T. Guernsey, general counsel of the American Telephone & Telegraph Company. He defined value, discussed how it could be ascertained, and what use should be made of it when ascertained.

Discussions were presented by George Weston, of Chicago, and Philip J. Kealy, of Kansas City. Mr. Weston objected to making use of any of the gross receipts of a utility company for payments into the municipal treasury or for carrying on functions which properly belonged to the municipality, such as taking care of the streets. The entire fare should be devoted to providing service, return upon the investment, maintenance of the property and welfare of employees. Mr. Kealy pointed out some difficulties in applying the method of reproduction cost to valuation and showed why the same methods could not be used in all cases. He emphasized the necessity for clearly defining the terms used in this work in order to avoid the confusion which is developing, even in court decisions.

The afternoon session was devoted to a discussion of "Rate of Return." This discussion was opened by a paper which was written by J. D. Mortimer and read by Mr. Doolittle. This pointed out that capital for extensions could only be secured if the returns from present investments made them as attractive as other possible investments. He discussed the hazards incident to the electric railway business and showed how these affected the stability of the investments.

A paper by D. C. Jackson discussing "Actual Returns in the Past" was read by D. J. McGrath, of the Massachusetts Institute of Technology. This paper was devoted to electric railways in Massachusetts, where the capitalization has been limited closely to actual investments. In 1890 the actual dividend of electric railway companies was 7.1 per cent. From 1901 to 1912 the average was under 5 per cent and at the present time it is 4.7 per cent. At the present time some Massachusetts railways are paying good returns and some are paying none.

A discussion by O. B. Willcox on "Competition with Other Investments" was read by L. S. Storrs. This paper pointed out the differences in the available field for electric railways as compared with industrial enterprises and advocated greater publicity to impressing the public with its own great interest in the railway utilities.

In the evening, a joint banquet was held with the American Electric Railway Manufacturers' Association. Addresses were made by Presidents Charles L. Henry and Thomas Finnigan and by Senator Oscar W. Underwood. The latter's topic was "Public Regulation and our Transportation Systems."

Important Resolutions Affecting Business Presented at Chamber of Commerce Convention.

Among the resolutions submitted to the fourth annual convention of the Chamber of Commerce of the United States held in Washington, D. C., February 8, 9 and 10, were the following:

A proposal by the Cincinnati Chamber of Commerce that "The Federal Reserve Act, which now authorizes national banks to make bankers' acceptances based on export and import trade, be amended to authorize national banks to make such acceptances based on domestic trade and transactions."

A proposal from the Providence Chamber of Commerce to ask Congress to adopt a uniform national incorporation law because of "the enormous development of the foreign trade of the United States which is creating problems and complications increasingly difficult of solution because of the indefinite status of corporations engaged therein, due to the wide diversity of laws."

A petition from the Pittsburgh Chamber of Commerce that the President of the United States and Congress pass a new tariff schedule "tending upward" especially to cover goods made and accumulated abroad during the war.

A move toward "industrial efficiency" from the Boston Chamber of Commerce, criticizing the so-called "Deitrick Amendment" to the army appropriation bill of 1915-1916 "which prohibited the making of time studies and the payment of premiums and bonuses to employees."

A plan from the Chicago Association of Commerce providing for certain construction and inspection safeguards in the merchant marine, among them the creation in the Department of Commerce of a board of naval architects.

A proposal from the Philadelphia Bourse, concerning the recently enacted Seaman's Act, urging the immediate repeal of that law, and all those "sections of our other laws relating to shipping and navigation which handicap our deep-sea merchant marine in world competition for trade on the high seas."

Opposition to government ownership of telegraph and telephone lines, from the Philadelphia Bourse.

In the field of transportation as related to increased military preparedness, the Rome (Ga.) Chamber of Commerce proposes government aid in building of highways and river transportation.

A plan by the American Specialty Manufacturers' Association to amend Federal laws dealing with unfair competition so as to permit independent and individual judicial recourse by persons injured by unfair competition.

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PRESIDENT WILSON ASKS AID OF AMERICAN INSTITUTE IN PREPAREDNESS.

Mid-Winter Convention of American Institute of Electrical Engineers at New York Considers Important Topics.

President Wilson has asked the American Institute of Electrical Engineers to nominate a representative from each state to collect data as a basis for organizing our industries in preparedness for war. This was the announcement made by President J. J. Carty in opening the mid-winter convention of the Institute in New York, on Tuesday, February 8.

These representatives are to act with others from the National Societies of Civil, Mechanical and Mining Engineers and Chemists. It is proposed that they will organize the industries for furnishing war munitions.

Following President Carty's address two papers were presented: "The A. I. E. E. and the Technical Committees," by D. B. Rushmore; "Municipally Operated Electric Utilities of Western Canada," by A. G. Christie.

Mr. Rushmore pointed out the unsatisfactory condition which has resulted from the growth and broadening of electrical engineering and made some suggestions with regard to the organization of the technical committees of the Institute so as to meet present needs.

Mr. Christie gave a discussion and analysis of the electric utilities in the cities of Western Canada, including costs, financing, management and charges. He found them usually efficiently managed and free from political interference.

Mr. Rushmore's paper was discussed by Philip Torchio, E. H. Martindale, A. W. Gray, C. F. Scott, William A. Delmar, Louis T. Robinson, Comfort A. Adams, Farley Osgood, Henry G. Stott and J. J. Carty. Many conflicting opinions were brought out. Prof. Christie's paper was discused by Philander Betts, Henry G. Stott, Farley Osgood, Reginald P. Bolton, G. A. Cheney and Clayton H. Sharp. It was brought out that in this country, lack of proper accounting and political interference prevented results being obtained similar to those in western Canada. Centralized reponsibility is also lacking.

At the afternoon session the following papers were presented: "Crest Voltmeters," by C. H. Sharp and E. D. Doyle; "The Crest Voltmeter," by L. W. Chubb; "The Voltmeter Coil in Testing Transformers," by A. B. Hendricks, Jr.; and "Notes on the Measurement of High Voltage," by William R. Work.

Dr. Sharp described an instrument consisting of an electrostatic voltmeter in parallel with a condenser and in series with an electric valve of the kenotron, or vacuum-tube type. Tests show that it will register the peak value of the voltage wave.

Mr. Chubb also uses the hot cathode in a vacuum tube as a valve, but measures the current which flows into a condenser, this current being proportional to the maximum voltage at a given frequency. He points out the advantages of this method over the spark gap for measuring high voltages.

Mr. Hendricks pointed out how a voltmeter coil must be used to give correct values of high voltage. Mr. Work dealt with the same subject, and found this method superior to the measurement of primary voltage or the use of a spark gap. When corrected for crest-factor, the correct maximum voltage may be obtained.

These papers were discussed by E. E. Creighton, F. W. Peek, Jr., F. M. Farmer, Frederick Bedell, Comfort Adams, W. I. Middleton, John R. Craighead, Chester Dawes, John B. Whitehead, L. W. Chubb, Lewis J. Robinson and M. G. Newman.

The advantages and disadvantages of the various methods were pointed out, and other methods of measuring crest voltage were suggested as by observing corona and by using an electrostatic ocillograph.

On Tuesday evening a subscription dinner-dance was given at the Hotel Astor and was well attended.

The session on Wednesday morning was devoted to a symposium on electric railway operation. The following papers were presented: "Operation on the Norfolk & Western Railway," by F. E. Wynne; "Chattering Wheel Slip in Electric Motive Power," by G. M. Eaton; "The Liquid Rheostat in Electric Motive Power," by A. J. Hall.

Mr. Wynne's paper discussed the advantages of electric service in handling coal trains on a division of the Norfolk & Western Railway which includes the Elkhorn tunnel. These are an increase in traffic handled to nearly double, increased safety, smaller number of locomotives required (12 electric in place of 33 Mallets), better control and less delays. Chattering slip was observed on this road by Mr. Eaton, who gave the reasons for it, and the means of measuring and rectifying it. It is characteristic of all types of electric motive power. The liquid rheostat used on the Norfolk & Western locomotives was described by Mr. Hall. The results obtained have demonstrated the advantage of this method of control.

Mr. Wynne's paper was discussed by A. H. Armstrong, R. E. Hellmund, F. P. Shepard, B. A. Rehrend, W. I. Schlichter, C. F. Scott, W. Arthur and H. M. Hobart. The advantages and disadvantages of the constant-speed motor were brought out. There has been less damage to equipment on the Norfolk & Western under electric operation with its better control. Single-phase transmission is used on account of the great objection to two trolleys.

Mr. Eaton's paper was presented by Paul M. Lincoln and was discussed by S. T. Dood, W. I. Slichter, Charles F. Scott and W. L. Merrill.

Mr. Hall's paper was presented by R. E. Hellmund and was discussed by C. D. Knight.

At the final session on Wednesday afternoon the first paper presented was entitled "A Method of Determining the Correctness of Polyphase Wattmeter Connections," by W. B. Kouwenhoven. The author considered the usual methods of checking connections unreliable. This is shown by a mathematical and experimental investigation of the registration under all possible circumstances, the results being tabulated. Rules for correct connections are worked out.

This paper was discussed by W. H. Pratt, George A. Sawin, L. W. Chubb, Comfort A. Adams and Lewis T. Robinson.

The final paper was one by John B. Flowers entitled "The True Nature of Speech." The author has analyzed the speech tones corresponding to the letters of the alphabet, and finds each to be characterized by a definite succession of relative intensities. A string galvanometer and telephone transmitter were used for photographic records. A voice-operated writing machine has been designed which automatically records speech in this phonographic alphabet.

This paper was discussed by H. B. Williams, Lewis Robinson, A. C. Crehore, William Maver, Jr., William J. Hammoer, L. W. Chubb and Comfort A. Adams.

The registration was 363.

Interchange of Power Facilities at Tacoma, Wash.—Two amendments have been introduced in the council, to the ordinance providing for connection between the Municipal Power Plant and the plants of the Stone & Webster Corporation. The amendments provide that the city shall furnish to the Tacoma Railway & Power Company customers current for lighting at the same rate as to the city's regular customers. Also that five minutes' notice must be given each party to the agreement before ceasing the use of current from the other plant. In case of low water in the Nisqually River, the Tacoma Railway & Power Company must serve the city's lighting system.

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American Museum of Safety Awards Medals at Its Annual Meeting.

The annual meeting and banquet of the American Museum of Safety was held at the Waldorf-Astoria, New York, N. Y., February 3. President Arthur Williams introduced

Anthony N. Brady Memorial Medal.

the Hon. George B. Cortelyou, who acted as toastmaster. Addresses were delivered by Henry W. Hodge, newly appointed Public Service Commissioner of New York; E. A. Sperry, president of the Sperry Gyroscope Compass Company; W. A. Fairburn, president of the Diamond Match Company, and W. H. Tolman, director of the American Museum of Safety.

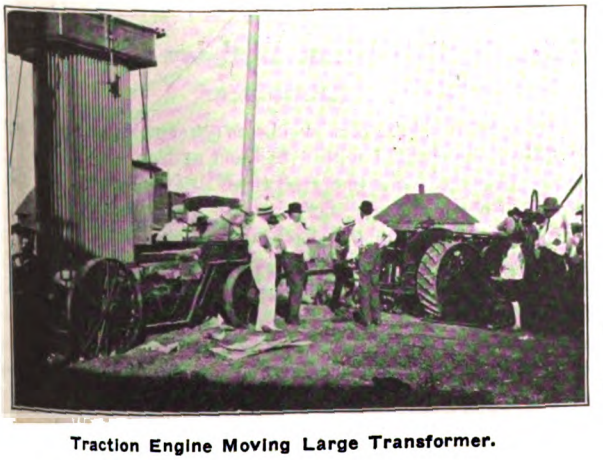
Among the medals presented by Professor Hulton, chairman of the Jury of Awards, were those to E. A. Sperry, the Scientific American Medal; and to the Union Traction Company of Indiana, H. A. Nicholl, general manager, the Anthony N. Brady Memorial Medal. A very substantial growth of the Museum of Safety was reported.

Moving Transformers With Despatch.

In Texas where the railroad stations are not so numerous as they are in the North and where sidings are not available it is sometimes necessary on account of large power loads to move transformers long distances.

The steel gin wagon shown in the illustration has been the means of saving much time and labor in hauling heavy machinery in this district where cotton gins constitute a good proportion of the central-station load.

The transformer shown on the wagon is a 400-kilovolt-ampere, 60,000-volt outdoor transformer which was connected to the high-tension transmission lines of the Texas Power & Light Company. By means of the traction engine shown this transformer was moved with little effort.



Traction Engine Moving Large Transformer.

Rocky Mountain Municipal Electricians Elect Officers.

The Rocky Mountain Association of Municipal Electricians, including the States of Colorado, Wyoming, New Mexico and Utah, held its annual convention at the Albany Hotel, Denver, Colo., on January 20 and 21, 1916, which was largely attended.

President C. L. Reasoner, city electrician at Colorado Springs, presided during the early part of the meeting, but was called out of town, and David Reed, superintendent of the Denver Alarm Telegraph System, was appointed chairman pro tem.

The meeting was opened by an address of welcome by Fire Chief Healy of the Denver Fire Department, and after the ordinary business, such as reports of secretary and treasurer, appointment of nominating and other committees, etc., the morning session closed with a general discussion of standard electrical material and appliances.

Thursday afternoon there was a large question box in which a number of important questions regarding municipal wiring discussed.

On Friday, January 21, B. C. J. Wheatlake of the General Electric Company, read a paper on Wiring and Wiring Appliances, which aroused a large amount of discussion among the members, particularly in reference to the new code wiring.

In the afternoon an inspection trip was made to the Denver Gas and Electric Light Company's power-house, and in the evening the members attending were presented with tickets to the National Stock Show.

The meeting closed with the election of the following officers:

President, Lawrence Stone, city electrician of Denver.

First vice-president, David Reed, superintendent of telegraph, Denver.

Second vice-president, G. L. Smith, city electrician, Fort Collins.

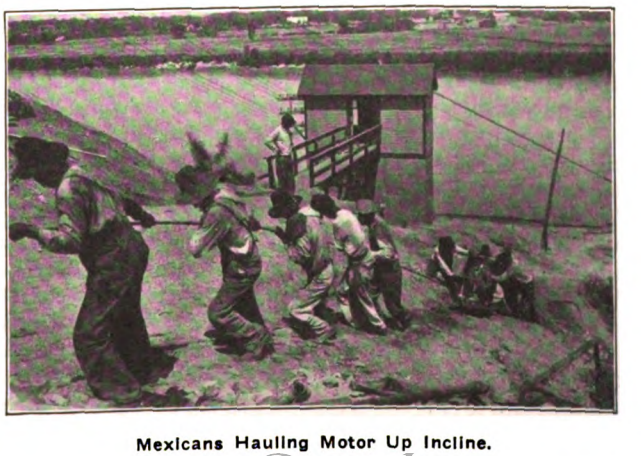
Secretary-treasurer, L. A. Varley, Rocky Mountain Fire Underwriters' Association.

Mexican Power vs. Man Power.

Many tales have been told recently in connection with the turbulent scenes on the banks of the Rio Grande in Texas, but here is an illustration from the border that shows another side of the story.

Mexican labor is comparatively cheap in this vicinity and men are frequently employed for various tasks where in a place of high priced labor blocks and tackle would be rigged up.

The photograph shows nine Mexicans pulling a motor up the bank of the river to be used in a new pump house which is to supply water for the generating plant of the International Electric Company.



Mexicans Hauling Motor Up Incline.

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Brooklyn Edison Gives Annual Dinner to Electrical Men.

The Edison Electric Illuminating Company of Brooklyn gave its tenth annual dinner to the electrical men of Brooklyn at the Academy of Music, in that borough, February 2, 1916, at seven o'clock. There were over 400 guests, and the large dining hall was beautifully illuminated with colored flood lighting, and the walls were adorned with appropriate electrical mottoes made up of miniature electric lamps.

T. I. Jones, general sales agent of the Edison Electric Illuminating Company, presided, and among others at the guest table were W. F. Wells, vice-president of the Edison Electric Illuminating Company; Hon. Lewis H. Pounds, president of the Borough of Brooklyn; Hon. William Hayward, Public Service Commissioner; Commodore Alfred Brooks Fry, consulting engineer, Department of Water Supply, Gas & Electricity; Louis Kalischer, ex-president of the Kilowatt Club; P. R. Atkinson, Theodore Beran, Frank Conn, H. M. Edwards, J. C. Forsythe, Bernard Gallagher, Thomas E. Murray, W. H. Onken, Jr., Charles W. Price, Frank M. Tait, F. W. Smith and E. W. Voorhies.

There were a number of well known electrical men present, including J. F. Becker, F. C. Bates, Dr. George F. Sever, M. S. Seelman, Jr., H. F. Frasse, E. A. Leslie, Thomas E. Murray, Jr., W. S. Rugg, H. A. Sinclair, George Weiderman, George Weiderman, Jr., and W. H. Wells.

The speakers were called upon gracefully and appropriately by Mr. Jones. They were Messrs. Wells, Pounds, Hayward, Kalischer and Fry, and there was a general tone of appreciation of the Edison method of handling its large business in the Borough of Brooklyn and the excellent growth of the use of electricity.

A unique and interesting feature was the presentation, on a screen at one end of the hall, of portraits of the guests of honor, with a brief history of what they had done in the electrical field.

A number of really quite appropriate parodies on well known songs were sung with enthusiasm. An example of these is shown in the following on "My Old Kentucky Home":

The sun shines bright on my modern Brooklyn home
All summer, all winter we're gay,
The house is wired and electrically equipped
And the maids make music all the day.
My vacuum cleaner glides smoothly o'er and o'er
So neatly, so sweetly, so light
That the kids may now roll around upon the floor,
For my modern Brooklyn home's cleaned right.

Chorus.

Sweep no more, my lady,
O, sweep no more today,
It is half past nine, and the cleaning's done on time
And the old broom's thrown far away.

Tacoma and Power Company Agree on Contract.

Acceptance of the power contract and franchise authorized by the City Council has been filed by the Tacoma Railway & Power Company. Under the terms of the contract the power plants of the Tacoma Railway & Power Company and the Tacoma Municipal plant will be connected for mutual protection. The power company agrees to furnish the municipal plant energy to the amount of 10,000 horsepower; in return, the city will be required, in case of necessity, to furnish only the excess power from the Nisqually plant. In connection with the franchises, the contract includes the extension of the Pacific Avenue line to South Forty-sixth Street by the Power Company, changing the present route of the South Tacoma line over the Tacoma Avenue fill, and the connection of Tacoma Avenue and Point Defiance lines at Division Avenue. The city of Tacoma agrees to restore to the power company its franchise for power which was forfeited some time ago because the power company sold energy for lighting, thereby violating a charter provision, which forbids the sale of energy for lighting by any concern other than the municipal plant.

Additional Power Plant Facilities Necessary at Louisville, Ky.

A bond issue of $1,000,000 is to be issued by the Louisville Gas & Electric Company to provide funds for largely increasing the capacity of its Waterside plant at Louisville, Ky. Plans have been completed to increase the capacity of the plant from 22,000 to 37,000 kilowatts. An addition to the power house will be erected on a site immediately south of the present structure. The existing plant has four units, while the new 15,000-kilowatt plant will have one unit. According to Donald McDonald, vice-president and general manager of the company, the present capacity will soon be exceeded if the present rate of increase continues. Another addition to the plant will be necessary in two or three years.

Puget Sound District Visited by Destructive Storm.

Following the devastating storms that occurred on the California coast during January comes the news of a blizzard in the Puget Sound district last week. The accounts say the heaviest snowfall in thirty years has crippled power and communication lines in that district. The Puget Sound Traction, Light & Power Company's street railway and interurban service at Seattle was completely tied up. Telephone and telegraph communication was maintained only by the greatest effort, and transcontinental railroads made no attempt to run trains through the Cascade Mountains where in some places 19 feet of snow fell.

Later accounts state that the storm period has passed, and power and communication utilities are now nearly returned to normal conditions.

Pupin Announces Static Has Been Overcome.

The New York Electrical Society held a notable meeting at the Engineering Societies Building, New York City, on January 27, when Michael I. Pupin spoke on "Wireless Transmission Problems." The audience numbered over 300.

The address was remarkable in many respects. Not only were various problems involved in the recent new triumphs in long-distance talk transmission analyzed and solved with a simplicity and clarity which delighted those who had the good fortune to be present, but Dr. Pupin stated that one of the greatest discoveries in history, the conquest of the menace and bugbear of all time—the static—was about to be given to the world, and he said that this discovery, which had cost him seven years of experimentation, not to mention the work of others, will make possible the transmission of messages by wireless telephone to every part of the world.

The following life members were elected: Bion J. Arnold, Putnam A. Bates, P. G. Gossler, H. G. Stott, John Bottomley, Francis B. Crocker.

Edison's Sixty-Ninth Birthday Celebrated by Employees.

The Edison Club, composed of 600 employees of Thomas A. Edison, celebrated with a banquet at Newark, N. J., February 5, the sixty-ninth birthday of the inventor, which occurred February 11.

Hudson Maxim made the only set speech of the evening. He eulogized Mr. Edison as the man who has done more for his fellows than any other, also giving him credit for the formation of the Naval Consulting Board, of which he is chairman. Dr. M. R. Hutchinson, Mr. Edison's chief engineer and president of the club, was toastmaster. One of the distinguished guests was Rear Admiral O. Dyntson, of the Russian Navy, who proposed a toast to Mr. Edison.

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Miscellaneous News Notes

Summer Convention of Electrical Engineers.—The annual convention of the American Institute of Electrical Engineers will be held this year at Cleveland, O., during the last week in June.

Iron and Steel Engineers Meet in Chicago.—The annual convention of the Association of Iron and Steel Electrical Engineers will be held this year in Chicago and the time has been set as September 18 to 22.

Detroit to Use Canadian Power.—The Federal Light & Power Company of Windsor, Ont., has received permission from the United States government to lay cables in the Detroit River for the purpose of transmitting electric power from Ontario to Detroit and vicinity.

Electric Heaters for Traffic Police.—The city of Lancaster, Pa., has been conducting experiments with electric heaters for use by traffic police. One has been installed in a manhole of the Edison Electric Company's system, and has proven so successful that others will be added.

New Mexico Association Will Meet in February.—The second annual convention of the New Mexico Electrical Association will be held in Albuquerque, N. M., February 14, 15 and 16, with headquarters at the Alvarado Hotel. C. M. Einhart is president of the Association and E. A. Thiele of Roswell, N. M. is secretary and treasurer.

Electrical Organization for South Dakota.—Central station owners and operators in the state of South Dakota propose to organize an electrical association, and a preliminary meeting for that purpose has been called for February 22, at the Hotel Carpenter, Sioux Falls, S. D.

Power Company Gives Dinner.—The Greenville (Ohio) Electric Light & Power Company was host at a "co-operation dinner" given in Greenville February 2. D. L. Gaskill, secretary of the company, reports a very enthusiastic gathering of men of the electrical industry enjoyed the occasion.

Sullivan County Electric Company Buys Plant.—The holdings of the Jasonville (Ind.) Water & Light Company, which company operated power plants in Jasonville, Hymera and Coalmont, Ind., have been purchased by the Sullivan County Electric Company, Clinton, Ind. The latter company furnishes power to Sullivan, Shelburne and Farmersburg.

Cincinnati Electric Club Discusses Subway.—At a meeting held January 31, of the Electric Club of Cincinnati, of which Thomas J. Ryan is president, questions concerning the traffic situation in Cincinnati were discussed by E. W. Edwards, chairman of the Rapid Transit Commission; Walter Draper, president of the Cincinnati Traction Company, and Mayor Puchta.

Quad City Builders' Exchange Hold Banquet.—Three hundred contractors from Davenport, Iowa, Rock Island, Moline and East Moline, Ill., attended the first annual banquet of the Quad City Builders' Exchange, at Rock Island, January 12. H. L. Lewman, president of the National Association of Builders' Exchanges, was the principal speaker. Electrical contractors of the four cities form one department of the Quad City Exchange.

American Association for the Advancement of Science.—The next meeting will be held in New York City during Christmas week, 1916. The 1917 meeting will probably be held in Pittsburgh. At the recent meeting at Columbus, Charles R. Van Hise, of the University of Wisconsin, was elected president; H. A. Burnstead, of Yale University, vice-president for section B, physics; and E. L. Corthell, of Brown University, vice-president for section D, engineering. R. A. Millikan was elected president of the American Physical Society.

Bill to Facilitate Public Ownership of Utilities.—A bill has been filed with the clerk of the Massachusetts House of Representatives which provides that any railroad, railway, system of telephone or telegraph, lighting or heating plant may be purchased by the state or any municipality, on petition of five per cent of the registered voters for a referendum on such purchase.

Leeds, England, Increases Use of Electric Heaters.—The Leeds electric lighting department reports an increase of 71 per cent in the output of electric energy for electric heating during the past six months. Improved appliances and the low price of energy are responsible for the large increase.

Wisconsin Contractors to Hold Summer Meeting.—At the annual meeting of the Eelctrical Contractors' Association of Wisconsin recently held in Milwaukee it was decided to convene at Oshkosh early in August. As a social feature of the meeting an interesting trip is being planned for members and their wives. The itinerary of the trip will be: Special steamer to Fremont and Gills Landing; by rail to Chain of Lakes; Waupaca for a day; by rail to Gills Landing, to Winneconne and back to Oshkosh.

Election of Officers by New Jersey Contractors.—At the annual meeting of the Association of Electrical Contractors of New Jersey, at Trenton, January 17, the following officers were elected for the ensuing year: President, E. P. Strang, Camden; vice-president, Charles R. Newman, Passaic; treasurer, Paul H. Jaohnig, Newark; secretary, ewell Van Dyke, Asbury Park. The following directors were appointed: Carl F. Adams, Trenton; Richard P. Ward, Dover; Charles R. Newman, Passaic; Benjamin F. Sprague, Long Branch, and H. C. Heidrich, Newark.

Jovian Congress to Meet in Detroit, February 16.—Fourteenth Jupiter, Thomas A. Wynne, vice-president and general manager of the Indianapolis Light & Heat Company, has called a meeting of the Fourteenth Jovian Congress at Detroit, February 16, coincident with the meeting of the Jobbers' Association. A number of very important policies affecting the future work of the Jovian Order with particular application to its relations with other electrical organizations will be discussed in detail and decided upon for the guidance of the Order during the year.

Additional Plants Proposed for Connecticut River.—Plans for an extensive development of the upper Connecticut River are being worked out by the Connecticut River Transmission Company and Stone & Webster, Boston, which will involve an expenditure of several million dollars. The hydraulic works include the construction of three dams, 160, 100 and 80 feet in height, respectively, and the raising of the lower Connecticut Lake about 17 feet, to provide increased storage facilities. The first and highest dam will span a gorge at Monroe, N. H., while the second dam will be constructed at Waterford, and the third near North Littleton.

Large Aluminum Plant One of Norway's Newest Projects.—An extensive aluminum smelter is being organized at Höyanfjord, Norway, where there is a waterfall which may furnish 60,000 horsepower. It is proposed to develop 20,000 horsepower at once, to provide for the production of 4,000 tons of aluminum per year. The capital stock of the company is fixed at $3,350,000, of which $2,680,000 is subscribed. The banks of Christiania and Bergen have declared a willingness to underwrite a loan of $1,000,000 for the company. A number of bauxite beds have been secured in southern France, where the ore will be worked into oxides and shipped in this concentrated form to Norway for the final conversion into metal by electrical furnaces.

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Electrical Features of a Modern Hotel

Construction Details and Electrical Equipment of the New Hotel Vancouver Erected in Vancouver, B. C., Without Affecting Operation of Old Building Which It Replaced

The rapid growth in population and business in Vancouver, the metropolis of British Columbia, in recent years has created a big demand for hotel accommodations. This demand has been met by the construction of a great number of fine hostelries. Prominent in this new development stands the Hotel Vancouver, which, on account of its location at the junction of the transcontinental railroad and Oriental and Pacific Coast steamship lines, under the control of the Canadian Pacific Railway Company, occupies a position of vital importance in the chain of hotels owned and operated by this company in the Dominion.

Characteristic with its policy to make ample provision to meet the demands of progress throughout its entire system, the Canadian Pacific Railway Company in 1912 began the construction of a new and capacious building on the site of the old hotel. It is most advantageously located on the brow of a hill overlooking the harbor. This location is further enhanced on account of the wonderful panoramic view of the city, the various bodies of water, the hills and snowcapped mountains that are within vision from this point.

The original hotel building was constructed in the form of a letter "L" and in a separate structure at the rear was located the power plant and laundry. From the beginning the exhaust steam from the various units in the power plant was the chief factor in the heating of the hotel. It was also used for drying purposes in the laundry.

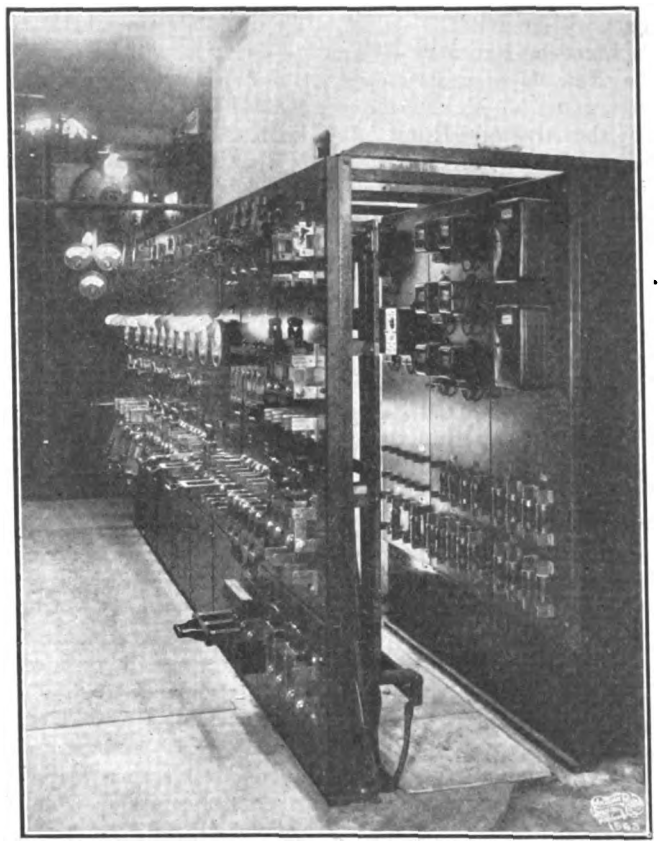
As the pace in the growth of the city warranted new sections were added to this structure and the power plant was correspondingly increased. To provide accommodations which would otherwise be curtailed during the construction of the new hotel, a large apartment building was erected in the form of a letter "L" on one of the rear corners of the hotel site. The business of the hotel was continued throughout the entire construction period. The sections were razed one at a time as the work of construction progressed until at the present time a magnificent structure occupies the entire site.

The first work to be undertaken was the erection of a new power plant and laundry building. A seven-story structure of reinforced concrete was erected at the rear of the apartment building.

The engine room was laid out to take advantage of space not otherwise usable and occupies the areaway under the lane on the hotel side of the power plant and extends at right angle to the rear of the hotel.

The original plans of the hotel were drawn up with a view of installing hydraulic elevators throughout, and elevators of that character were installed in the apartment building and power plant when they were erected.

The source of supply for all other power was to be derived from a 110-volt, direct-current, two-wire system. With the exception of one generating unit the equipment in this power plant was new and consisted of the following: Three 400-horsepower water-tube boilers, all necessary boiler auxiliaries; two 175-kilowatt, 110-volt generators, direct-connected to vertical compound engines, one 75-kilowatt, 110-volt generator, direct-connected to a simple crank engine (this unit had been in service in the old plant for 10 years), one five-panel switchboard, consisting of three generator and two feeder panels; one horizontal duplex pump for house service, and two 25-ton refrigerating machines and condensers.



Main Switchboard in Hotel Vancouver Showing Fuses.

This plant was put in operation early in the year 1913. Since that time conditions have arisen which warranted the abandonment of the installation of hydraulic apparatus and necessitated the adoption of the electric drive for the elevators in the new hotel.

As none of the power-driven appliances throughout the hotel had been contracted for up to this time, and as the electric wiring installation throughout the hotel building had but reached its preliminary stage, a complete revision of the entire power and lighting equipment was made with a view of establishing the plant on the most economical basis possible, consistent with the changed conditions.

After due and careful consideration of all the problems involved, it was decided to convert the plant over to the 110-220-volt, three-wire system for lighting, all motors in operation at that time and those on the new schedule of one horsepower in size or less to be wound for 110 volts and the remainder to be wound for 220 volts. While it is a recognized fact that in the majority of three-wire installations, isolated two-wire, 110-volt block loads are apt to produce unsatisfactory balance conditions of the system, it was possible at this plant, at a small expense, to rearrange the existing two-wire feeders so as to maintain a satisfactory balanced condition.

Plant Rebuilt without Interruption.

To revise the plant to meet all the new conditions presented a problem that was complicated in the extreme inasmuch as it necessitated a considerable rearrangement of apparatus and a complete change of feeder distribution. Provision for every possible emergency was made and the work conducted without interruption in the operation of the existing plant.

Briefly, the new arrangement included three 100-kilo-

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watt, 110-220-volt turbogenerators, and a new eight-panel switchboard. The 75-kilowatt generator was removed and one refrigerating machine and the two large pumps were moved to other locations so as to make room for the turbogenerators. A new switchboard consisting of five generator and three feeder panels replaced the old board and was located on the same foundation.

The engine room was laid out in the form of a letter "L," the 175-kilowatt units occupying the base, the switchboard in the corner and the other apparatus beyond in the following order: Three turbogenerators, two refrigerating machines and condensers, vertical pump and horizontal pump. The boilers are located below the base of the "L."

The boiler plant comprises three 400-horsepower water-tube boilers, each being built up of 14 sections of 13 four-inch tubes, 18 feet long. These boilers are designed for a working pressure of 190 pounds. Each boiler is equipped with forged-steel superheaters, designed to give 75 degree Fahrenheit superheat at the boiler nozzle. Each boiler is equipped with patent fuel-oil furnaces.

The burner control valves are located at the boiler front, the pipes conducting the steam for atomization and the oil from the control valves to the burner tips passing under the furnace floor through that part of the setting commonly known as the ashpit.

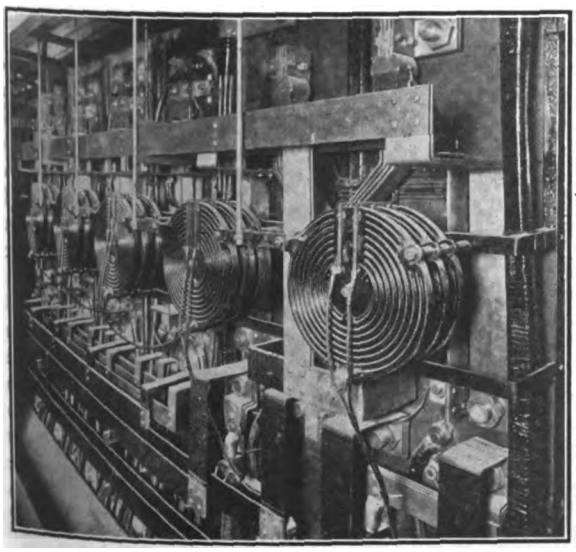
The boilers are also set with extra high furnaces so as to permit the most economical combustion of coal on chain grate stokers should the relative prices of coal and oil make it desirable to use coal fuel. Provision is made throughout the boiler room for the easy handling of coal and ashes by labor-saving devices, conveyors and hoppers.

In connection with the burning of oil fuel as is now installed there is provided an oil-pumping system of ample capacity for the operation of 1,400 horsepower of boilers. This set consists of two special duplex oil pumps mounted on a cast tray over a special condenser type of heater, thus making a compact self-contained pumping system.

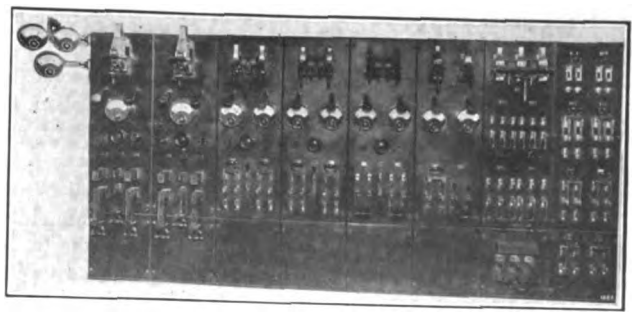
The feed water is supplied the boilers by two boiler-feed pumps. These pumps handle the returns from the heating system and make up water which is heated by a 1,000-horsepower Cochrane feed-water heater. The return from the heating system is pumped to the feed-water heater by two Burnham low-duty vacuum pumps. A motor-driven submerged type of centrifugal sump pump, located at one side of the boiler room, drains the ash tunnel and low points of the boiler room floor.

Electrical Equipment.

There are 175-kilowatt, 110-volt, direct-current compound-wound commutating-pole type generators, which are direct-connected to vertical compound engines running at 400 revolutions per minute. These generators are so connected that they may be operated in series on a three-wire system or independently on an emergency 110-volt bus, the functions of which are fully described later.



Rear of Switchboard, Hotel Vancouver.



Main Switchboard Showing Arrangement of Instruments.

The new electrical equipment consists of three 100-kilowatt, 110-220-volt, three-wire turbogenerators, operated at a speed of 3,600 revolutions per minute. These generators are compound-wound, commutating-pole, each having two series fields on opposite sides of the armature and necessitating two equalizer connections for parallel operation. For deriving the neutral connection, each generator is provided with a compensator located close to the generators. These turbines are of the Curtis type and are equipped with all of the latest improved features.

As the various buildings, including the opera house block, which is also served with light, heat and power, are heated by the exhaust steam from the combined units, the engines and turbines are at present operated non-condensing. However, provision has been made to equip the turbines with a condenser so that they may be operated condensing during such periods as the amount of exhaust steam is in excess of that required for heating.

The refrigerating plant consists of two 25-ton ammonia machines. The compressor cylinder is arranged in tandem with the steam cylinder. The condensers and brine coolers are of the double-pipe type.

Brine circulation is used throughout the entire system of refrigeration, while direct expansion is used in the ice-making tank which has a capacity of 5 tons per 24 hours. The brine circulation system is very complete, including refrigerators on each floor.

The switchboard consists of eight panels of uniform size, 66 by 24 inches, with sub-panels 24 by 24 inches, or a total dimension of 16 feet by 7.5 feet. The material used is the best quality of slate, two inches in thickness and painted with Egyptian lacquer so as to present a lasting dull-black finish which harmonizes perfectly with the polished copper appliances mounted thereon. The board rests on a six-inch channel iron base partly imbedded in the cement floor and is supported by a two-inch angle-iron frame and brace from the wall by material of light character.

Switchboard Wiring.

The board was designed with a view of locating the instruments and switches in the most natural position for the convenience of the operator and in the accompanying illustrations it will be noted that the instruments are on a level with the eye and the switches are at the proper height for the average person.

Beginning at the left, the first five are generator panels, being connected in rotation according to their location. Following these are the panels for 220-volt power, three-wire lighting, two-wire lighting and 110-volt power. The last panel on the right provides connection for the old two-wire system and double-throw switches were used to per-

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mit the inter-switching of feeders in the event that any undue unbalance on the system should arise.

The circuit-breakers on all generators are connected between the generator and main switch and those on the turbogenerators are actuated only by the armature current.

The main or three-wire busbar is connected to all panels. The main equalizer bus is connected to all generator panels. The auxiliary power bus is connected to the turbogenerator panels and the power panel. Auxiliary equalizer bus provides a 110-volt connection between the 175-kilowatt generators and panels No. 7 and No. 8 and would be used only in the event that one of the 175-kilowatt generators would be out of commission during peak-load periods. The auxiliary power is provided in order to make possible the isolation of the elevator and heavy 220-volt power load during such time when the fluctuating condition of this load might disrupt the voltage regulation of the system. All busbars are supported by substantial brackets and hangers.

The generator rheostats are mounted on an angle iron frame firmly bracketed to the frame work of the switchboard.

In back of the main board is placed a fuse and meter board, consisting of three panels of 1.5-inch slate identical in size with the switchboard panels. These are in the same alinement with and 36 inches to the rear of panels No. 6, No. 7 and No. 8. The rear of this board is inclosed by a steel cabinet 10 inches deep and is provided with doors for each panel. On this board is mounted the fuses and meters for the various feeders. The load of the system has been so distributed that no feeder has a connected load of more than 400 amperes except the 220-volt feeders which are protected with circuit-breakers. Instead of metering the output of each generator as had been done previously, each outgoing feeder was provided with a watt-hour meter so that the load distribution may be accurately recorded.

On account of the limited amount of space permissible between the switchboard and the wall, and to accommodate the large number of cables that lead to and from the switchboard, a cable pit, 30 inches wide and 36 inches deep, was built the entire length and at the rear of the board and this was racked off for cable supports. All cables are run underground in conduit. These end in this pit and the cables are carried from the conduit ends to their terminals on porcelain cleats. The pit is floored over with two-inch cement panels, 24 by 24 inches, supported by an angle-iron frame. The intervening space between the floor and switchboard foundation is left open to permit the passage of cables leading to and from the board. Openings are provided in the rear pit wall which extend to the rear of the meter board for the passage of cables in connection with that board. Notwithstanding the fact that but a 30-inch space was permissible behind the switchboard and that the busbars and rheostats would occupy a considerable amount of that space, all details were worked out in such manner so as to leave an ample and unobstructed space, which permits any part of the board being easily accessible to the operator. As a precautionary measure against trouble at the terminal boards on the generators which are in an unprotected location, they were inclosed in sheet-steel boxes.

The main elevator feeders run direct from the switchboard to the distributing board located in the penthouse on the roof, 600 feet distant.

The 200-volt general power and the three-wire feeders run to a main distributing board, centrally located on the tunnel floor of the new hotel. This board is laid out in five sections, one for 220-volt power, and the other four for the three-wire distributing feeders that run to the various panel boards.

The elevators and dumb waiters consist of the following: three passenger elevators of the one-to-one traction type, having a speed of 500 feet per minute and operated by 35-horsepower motors running at 63 revolutions per minute; one service elevator of the worm-gear traction type, operated by a 40-horsepower motor running at 800 revolutions per minute; one baggage elevator same as last mentioned; and one kitchen service elevator same as last mentioned, but operated by a 20-horsepower motor. There will be eleven dumb waiters distributed throughout the hotel, driven by motors varying in size from 3 to 10 horsepower.

An elaborate system of ventilation has been installed, which continuously supplies pure air tempered to suit the prevailing atmospheric conditions and simultaneously removes impure and obnoxious odors.

President Snyder, of Iron and Steel Engineers, Sees Great Opportunities for Electrification of Mills.

The important work done by the Association of Iron and Steel Electrical Engineers in the application of electricity to the iron and steel and allied industries was touched upon in the address made by W. T. Snyder, the newly elected president of the Association, at its first monthly meeting of the year, held in Pittsburgh, Pa., January 15, 1916.

Mr. Snyder, who is superintendent of the electrical department of the National Tube Company at McKeesport, is well fitted for the presidency of the Association, having spent many years in the study and promotion of electrical apparatus in steel-mill industries and his program and policies, as outlined at the meeting, if carried out, will undoubtedly increase the usefulness and prestige of the Association in the industrial field.

The magnitude of the iron and steel industry and the extent to which it was represented in the Association was illustrated by showing the number and location of all the blast furnaces in the United States, together with the number and the location of members of the Association, showing that the Association was more largely represented in the industrial centers in which local meetings of the members are held.

Much of the present highly advanced state of the iron and steel industry is due to the application of electricity to the various processes. Present achievements in electrical application is largely due to the pioneer and subsequent development work of the members of this Association.

Promotion of local activity of members in the different industrial centers was strongly urged.

The Association should adapt itself to the modern trend, it should not be content with past achievements. Much has been accomplished in the past, but it is small in comparison to what remains to be done.

It was President Snyder's impression that this Association should begin to so shape itself that it can adapt itself to conditions that will be brought about by future developments, the trend of which is toward the consolidation of small units into larger organizations and the universal applications of electrical energy to the exclusion of less useful and efficient forms. It should look into the future a few years when use will be made of the vast amount of water power now going to waste in our country; when the waterfalls of the Rocky Mountains will help to roll steel in the eastern states at the same time that it is helping to grind wheat in Minnesota; when there will be universal application of electrical energy even for domestic purposes; when the day that Dr. Steinmetz predicts will come and our country is covered with a network of transmission lines; when the electrical engineer will be the man behind the gun.

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Compelling Utilities to Serve the Public

Two Recent Court Decisions Affecting Electric Central Stations Establish Important Precedents in Utility Operation

By William E. Mooney

The Marianna Electric Company was a public service corporation engaged in the business of furnishing electricity for light and power to the citizens of the city of Marianna, Ark. The company had been operating for a number of years a 133-cycle system and the users of the electric energy had, of course, installed motors and machines for this frequency. The company later found it advisable, in the interest of efficiency, to change to a 60-cycle system. A number of the users of electric current complained at this change, stating that they would have to change their motors and machines or go to great expense in readjusting or repairing them to meet the new system.

The rule of law applicable to this case is one of reason. The electric company had the right to make the change in its system and method of operation as, in the exercise of an honest judgment on the part of the managing officials, it was necessary to a proper service to the public. Thus it may be noted that the company was sole judge of the matter except that it could not make a change needlessly or capriciously.

The users who complained adopted a novel plan, for, since their motors and equipment was rendered useless, it was held that the electric company should bear the expense of furnishing them with either new equipment to meet the requirements of the new system or to repair and readjust the old equipment. The Court held that if this theory was good that the company, in order to meet this expense would have to consider it as an item in the fixing of its rates for service, and that ultimately the expense would fall upon all the consumers of electricity, and would be an expense borne by the general public. (Hunt vs. Marianna Electric Company, 170 S. W. 96.)

The rule enunciated in the foregoing case is naturally but the necessary result of following a few older illustrations. Waseca, Minnesota, had a problem somewhat similar a few years ago. The city owned and operated an electric plant which had been installed at public expense. One of the merchants of the city, W. J. Armstrong Company, was in the business of operating a bottling works, and required electric power. The Armstrong Company installed two three-phase motors with the intention of operating them by electric current to be furnished by the city. After these were installed, application was duly made to furnish electric current and power. The city refused to furnish the current unless the Armstrong Company would install two transformers, which, if purchased new, would cost about $80. In this case the Court went about the matter in a peculiar manner. It first decided that the Armstrong Company was entitled to electric power service and said that inasmuch as the Armstrong Company found it necessary or advantageous to install three-phase motors "it was the duty of the city to furnish such power and to install such appliances as were necessary." So far the decision would appear to be entirely against the electric company. But then the court went on and held that if "a particular consumer desires service which the city can supply only by the installation of transformers at an expense which is substantial, and which is not entailed in furnishing power to others, the consumer who occasions such special expense should bear the burden thereof. (State, etc. vs. City of Waseca, 122 Minn. 348.)

Another recent case, Gainesville vs. Gainesville Gas & Electric Power Company (62 So. 919), seems to go farther than any other reported case in requiring a public service company to serve even those with whom it has no specific contract. It is common knowledge that there is rarely more than one public service company serving one community; the nature of the service requiring almost a monopoly in the territory. The franchise they receive is in effect nothing more than a contract between the authorized representatives of the public and themselves. In the case above noted the city of Gainesville, Fla., consented to the construction of an electric lighting and power plant, and the company thereupon entered into the business of the manufacture and sale of electricity for illuminating and power purposes. Later on, for some reason not appearing, the company determined to close down and discontinue the public service business. This move was undoubtedly taken because of harsh and arbitrary ordinances passed by the city of Gainesville. A suit was filed to restrain the company from discontinuing its public service business, and the court held that a corporation engaged in furnishing electricity to a municipality or its inhabitants and using public streets or exercising other franchises or privileges in doing so, is thereby performing services of a public nature, and such a corporation is subject to lawful governmental regulations to enforce its duties to the public it undertakes to serve. As the company had received and accepted from the State a charter authorizing it to engage in the business of manufacturing, generating and selling electric current for lighting and power purposes, the company thereby assumed the duty imposed by implication of law to render a reasonably adequate service during the time its rights and duty may lawfully continue, and such duty may be enforced where no adequate excuse is shown.

The foregoing rules are based upon the general law governing public service companies. These rules were first developed in relation to gas companies. There are a number of judicial decisions requiring gas companies to not deprive themselves during their franchise period of their facilities for doing business without consent of the public or their authorized representatives.

Radio Phone Experiments Prove Successful in Winter Maneuvers.

Important experiments in radio telephony are being conducted by the Atlantic fleet during its winter maneuvers off Cuba. These are the result of the successful outcome of experiments carried on for the past year by the American Telephone & Telegraph Company and the Western Electric Company in co-operation with radio stations under the jurisdiction of the Navy Department by which long distance wireless telephony has been made possible. The experiments are being carried on in an effort to ascertain the military applicability of the wireless telephone to the work, tactics and strategy of a great battleship fleet.

Radio-telephone transmitters have been installed on the *Wyoming*, Admiral Fletcher's flagship, and on the *Texas*. These transmitters are being used in sending messages to the other units of the fleet, which, while not equipped with the telephone transmitters, are able to receive the messages by means of radio-telegraphic sets.

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Central-Station Costs in Massachusetts

That actual manufacturing costs in the production of electrical energy by well equipped, modern steam generating stations, operating under favorable conditions, are about 0.8 to 0.9 cent a kilowatt-hour, is indicated by the returns of leading electric lighting companies in Massachusetts, to the Gas and Electric Light Commission of that state. In certain instances the manufacturing costs may be as low as 0.6 cent a kilowatt-hour, and they run well above one cent in many central stations, but the average of the larger and better plants may safely be reckoned at the figures cited. These, of course, are the costs entirely apart from fixed charges and the expenses of management, distribution, etc.

The United Electric Light Company, Springfield, Mass., the Edison Electric Illuminating Company of Brockton, and the New Bedford Gas & Edison Light Company, New Bedford, all operate modern turbine stations. These companies' manufacturing costs per kilowatt-hour are, respectively, 0.911, 0.852 and 0.867 cent.

Boston Edison Company.

The principal station of the Edison Electric Illuminating Company is at East Bridgeport, Mass., and has the following equipment:

	Horse-power
4 Babcock & Wilcox boilers, Taylor stokers, at 525 equals	2,100
2 Edgemoor boilers, Taylor stokers, at 600 equals	1,200
Total	3,300
	Kilowatts
2 Curtis turbos, at 2,000 equals	4,000
1 General Electric turbine	5,000
Total	9,000

The source of condenser and boiler feed supply is the Matfield River. Coal is brought by rail, the average cost being $4.778; 15,625 tons were used during the year. Kilowatt-hours of electricity generated, 16,285,691. The manufacturing expenses were as follows:

	Total Cost	Cost per Kilowatt-hour Cents
Fuel, deposited at works	$ 74,660.27	0.460
Oil, waste and packing	745.69	0.004
Water	3,083.41	0.019
Wages at station (26 employees)	29,221.39	0.180
Station tools and appliances	3,716.77	0.020
Station structure repairs	12,875.98	0.080
Steam plant repairs	11,291.80	0.070
Electric plant repairs	3,181.41	0.019
Totals	$138,776.72	0.852

New Bedford Company.

The generating station of the New Bedford company is located on the water front and enjoys the advantage of water-borne coal. Its equipment now in service consists of:

	Horse-power
7 Babcock & Wilcox hand-fired boilers at 508 equals	1,016
4 Babcock & Wilcox hand-fired boilers, at 600 equals	2,400
Total	3,416
	Kilowatts
2 General Electric turbines, at 4,000 kilowatts equals	8,000
1 Westinghouse jet condenser turbine	1,000
1 General Electric jet condenser turbine	300
1 General Electric non-condenser turbine	100
Total	9,400

Sea water is used for condenser supply, and the boiler feed is from the city mains. Coal used or unaccounted for aggregated 10,934 tons and cost an average of $3.60 per ton. Kilowatt-hours generated, 8,356,375. The manufacturing expenses were as follows:

	Total Cost	Cost per Kilowatt-hour Cents
Fuel, deposited at works	$ 39,456.84	0.460
Oil, waste and packing	249.80	0.003
Water	3,174.91	0.038
Wages at station, (23 employees)	25,864.76	0.300
Station tools and appliances	2,067.28	0.024
Station structure repairs	898.81	0.011
Steam plant repairs	2,225.95	0.026
Electric plant repairs	437.08	0.005
Totals	$ 74,375.43	0.867

Holyoke Water Power Company.

Total manufacturing and distributing costs of electricity generated by the Holyoke (Mass.) Water Power Company, operating a hydroelectric and steam auxiliary plant on the Connecticut River, are given in returns for 1915 to the Massachusetts Gas and Electric Light Commission, as follows:

Coal for auxiliary plan	$ 9,921.47
Rental of waterpower	13,858.07
Oil, waste and packing	105.44
Water for boilers	75.26
Wages at station (10 employees)	9,176.91
Station tools and appliances	55.00
Hydraulic plant repairs	38.85
Steam plant repairs	275.86
Electric plant repairs	42.11
	$33,548.97
Distribution expenses (to 7 customers)	$ 341.79
Office expenses and management	3,942.45
Taxes	1,974.48
Miscellaneous expenses	1,467.37
	$ 7,726.09
Total operating expenses	$41,275.06
Kilowatt-hours generated, hydroelectric plan	2,094,180
Kilowatt-hours generated, steam auxiliary	1,634,890
	3,729,070
Manufacturing costs per kilowatt-hour	$0.009
Total cost per kilowatt-hour	0.011
Manufacturing cost, exclusive of water rental, per kilowatt-hour	$0.00525

Sales of electric power aggregated $47,451.63, leaving a balance to profit and loss account of $6,176.57.

The company operates its steam plant, which is installed under the same roof with the hydroelectric generating equipment, only in times of extremely high or low water.

Turners Falls Power Company.

Returns made by the Turners Falls Power & Electric Company to the Gas and Electric Light Commission show the following manufacturing costs for 7,265,900 kilowatt-hours of energy generated at its hydroelectric plant during 1915:

Wages at station	$4,645.87
Oil, waste and packing	338.78
Station tools and appliances	87.22
Station repairs	28.37
Hydraulic plant repairs	852.76
Electric plant repairs	279.54
Total	$6,232.54

United Electric Light Company.

The United Electric Light Company's steam plant, at State Street, Springfield, has the following equipment:

	Horse-power
4 Porcupine boilers, with Murphy stokers, at 400 equals	1,600
6 Porcupine boilers, with Murphy stokers, at 400 equals	2,400
6 Williamson boilers, with Murphy stokers, at 400 equals	2,400
5 Williamson boilers, with Murphy stokers, at 400 equals	2,000
3 Hazelton boilers, with Murphy stokers, at 300 equals	900
Total	9,300
	Kilowatts
1 Westinghouse Parsons turbine, Le Blanc condenser	4,500
1 Westinghouse Parsons turbine, Le Blanc condenser	3,600
1 Westinghouse Parsons turbine, Le Blanc condenser	2,500
3 Westinghouse Parsons turbines, Deane condenser, at 1,000 equals	3,000
Total	13,600

The source of the condenser and boiler feed supply is the Connecticut River. Coal is procured by rail, at a cost, delivered, of $4.27; 31,954 tons were used during the year. The following were the manufacturing expenses (total kilowatt-hours generated, 24,093,070):

	Total Cost	Cost per Kilowatt-hour Cents
Coal, deposited at works	$136,686.24	0.570
Oil and waste	1,178.83	0.005
Water	898.10	0.004
Wages at station (60 employees)	38,679.53	0.160
Station tools and appliances	1,833.38	0.008
Station structure repairs	12,450.85	0.050
Steam plant repairs	19,776.92	0.081
Electric plant repairs	8,028.69	0.033
Totals	$219,533.54	0.911

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

National House-Wiring Campaign Projected.

Plans have been formulated by the Society for Electrical Development for a nation-wide house-wiring campaign to be conducted from March 25 to April 25. The object of the campaign is to co-ordinate various individual house-wiring campaigns conducted each year by electrical interests into a general comprehensive effort. The fact that not eight per cent of the homes in this country are wired for electricity and that not 20 per cent of the houses on the existing lines of the central stations have electric service strengthens the belief that if a nation-wide campaign was inaugurated to wire more homes with all interests co-operating, greater results could be obtained than by a series of disconnected campaigns.

Considerable assistance will be offered in the way of advertising copy for central stations and contractors as well as ideas for window displays and other literature designed to be helpful. A booklet entitled "Successful House Wiring Plans," is to be prepared by the Society and 25,000 copies will be mailed shortly to those interested. The booklet will contain suggestions for conducting house-wiring campaigns and how various central stations and contractors have effectively worked them out.

A committee comprising P. L. Thomson, T. J. McManis, Elliott Reid, N. H. Boynton, Joseph F. Becker, George Weiderman, H. W. Alexander, A. J. Edgell, J. T. Kelly and Hill Griffith has been appointed to supervise the campaign.

Reading Gas and Electric Meters Simultaneously Effects a Saving of $200 Per Month.

On January 1, 1915, the New Orleans Railway & Light Company adopted the plan of having one meter reader read both gas and electric meters in a customer's premises on the same trip. Since this plan has been in effect a minimum saving of $200 per month has been effected, as the salary of one meter reader is saved as well as a bill distributor, and considerable economy has been effected in printing, stationery, stamps, etc., due to using one billhead for combined gas and electric service.

The items comprising the saving are made up as follows:

Two meter readers at $60	$120.00
One bill distributor	60.00
Miscellaneous (including printing, stationery, stamps, etc.)	20.00
Total	$200.00

The company states that one of the main purposes in combining these bills was to satisfy its customers, as numerous complaints were registered relative to receiving a bill for electric service on one day and the bill for gas service another day with discount periods that did not correspond. This complaint has now been completely obviated and in addition it has relieved the congestion at the teller's window and enabled collections to be handled very efficiently.

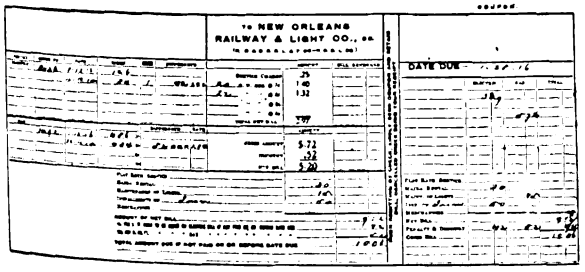

Fig. 1.—Combined Gas and Electric Bill Used by New Orleans Company.

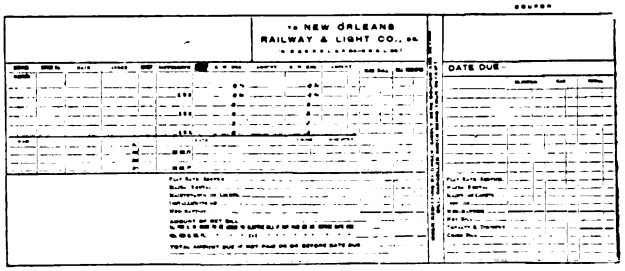

Fig. 2.—Bill Used Where There Is More Than One Gas and Electric Meter.

The meter readers read on an average of 225 meters a day, including those where service is to be discontinued. The company has 19,749 electric meters and 26,309 gas meters installed.

Fig. 1 shows the type of bill used where a customer has one electric meter and one gas meter installed. Fig. 2 shows the bill used when customer has more than one gas and electric meter and Fig. 3 shows the style of bill used for billing customers using service under the wholesale schedule.

"Electricity Our Best Servant."

Twelve prizes were distributed January 8 by the Rutland (Vt.) Railway, Light & Power Company, to students in schools in the company's territory, six prizes being awarded to pupils in Rutland and six to pupils in the outlying district, for essays on "Why Is Electricity Our Best Servant?"

The first prize, of $10, for the Rutland district was awarded to Anna F. Callahan, aged 18, a pupil in Mt. St. Joseph's Academy, and was as follows:

"The word servant, as generally understood, is applied to that which labors for, or serves another. In private or public life, the servant most highly prized is the one who proves himself most useful, reliable, faithful and trustworthy; who studies, provides and looks after the household's wants, interests, comforts and pleasures.

"A human servant possessing these attributes would indeed be prized; but does not electricity possess all these characteristic traits of a perfect servant? Proceeding from

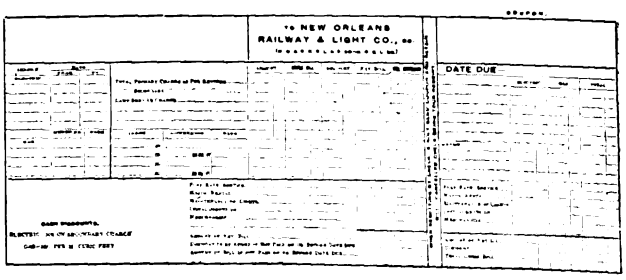

Fig. 3.—Billhead Used Where Customer Is Under Wholesale Schedule.

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the general to the specific, one has but to look about him to see in the various uses of electricity these attributes of the perfect servant in full operation. Its constant use for lighting, heating and motive power in the home is an assurance that electricity is useful, reliable, faithful and trustworthy; the thousands and one inventions which reduce domestic labor so materially and which are dependent on electric power for operation, evidence this. Else, why the rapidly increasing call for electric grills, urns, toasters, irons, etc.? Could there be a stronger demonstration of the assertion that electricity is the one desirable servant to look after the wants, interests, comforts and pleasures of the family home?

"Electricity in the service of the national family bears likewise the same characteristics of the thoroughly 'tired and not found wanting' helper. The constant whirr of machinery in the nation's mills, shops and factories, the hum of the trolley cars, the metallic click of the cable messages, the never ceasing ring of the telephone bells, the 'S. O. S.' calls of distressed ships at sea, the X-Ray photographers, all attest how this very efficient servant ministers to the nation in its every phase, whether industrially, socially, commercially or scientifically.

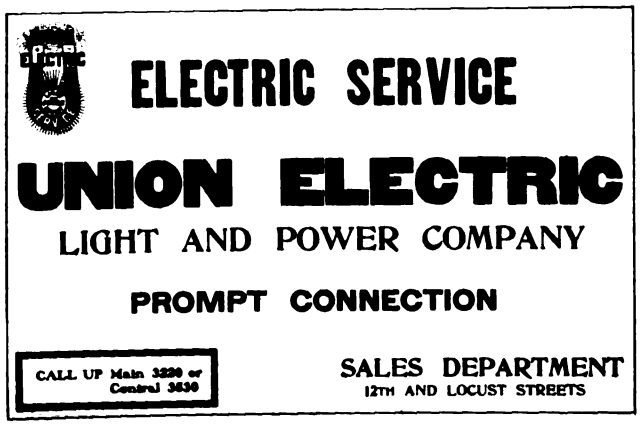
"Viewing the untold valuable services rendered by electricity today, and contrasting its position with that of hardly a century ago, when 'it was known only as a flash which man could neither hinder nor make,' one's amazement is unbounded. And yet Edison, to whose magical genius this power responds, as did Aladdin's lamp to the burnishing, declares that modern use is putting it only to its minimum test, that we are only beginning to know what this wonderful servant can do for us.

"Electricity, so universally helpful today, what will you be a century hence?"

Co-operating with Real Estate Agents Brings Results in St. Louis.

As a step to insure the greatest percentage of households to use electric service when moving into buildings wired for electricity, the Union Electric Light & Power Company, St. Louis, Mo., has taken every possible means to eliminate "red tape" in providing service. In furtherance of this idea, the company is co-operating with renting agencies so that new tenants are at once reminded of the possibilities of securing service without undue delay.

The accompanying illustration shows the back of a "for rent" sign, measuring 14 inches by 21 inches, which is printed by the central station and contains on the opposite side the customary announcement of the real estate agent. In addition to this, the company furnishes an attractive key card for use by real estate firms, which gives the name of the real estate agent, the monthly rent of the vacant house, number of rooms, etc., on one side and on the opposite side contains an announcement of the Union Electric Light & Power Company that electric service can be secured promptly by telephoning the contract department.

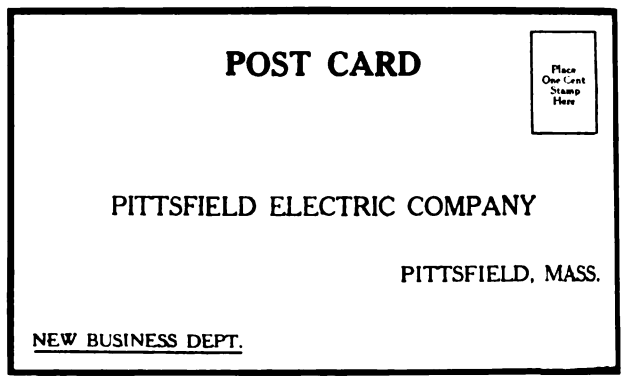


Reverse Side of a "For Rent" Sign Used in St. Louis.

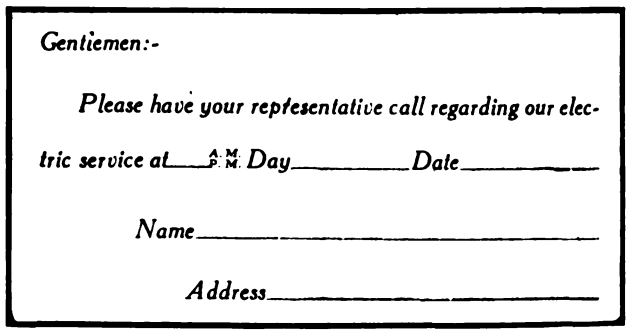
It is reported by F. D. Beardslee, sales manager of the company, that numerous requests for service are traced directly to the advertising which appears on the signs and key tags.

Pittsfield Company Facilitates Renewals.

During the year 1915 the Pittsfield (Mass.) Electric Company secured 800 renewals from customers changing their place of residence. At least a portion of this business is attributed to a little tag which is hung on the front-hall fixture of every wired house when service is disconnected. The tag, as shown in the accompanying illustrations, has the address of the company printed on one side and on the opposite side space is left to indicate when a representative of the company can call to close a contract for service. These cards are perforated at the end so that they can easily be detached and used as a mailing card.



Face of Tag Hung on Fixtures in an Unoccupied House.



Back of Fixture Tag Which Is Used as Mailing Card.

Telephone Canvass for Business is Productive.

The value of the telephone in securing new business is forcibly brought out by a campaign conducted during January by the Pittsfield (Mass.) Electric Company. The "All Nite Lite" was featured in the campaign and the results are shown in the accompanying table.

Total calls made	312
Not interested	53
Balance	259
Houses not wired	154
Balance	105
Have Nite Lite	11
Sent on approval	8
Sold	2
Will call in office	15
Will call on telephone	29
Will consider	9
Send representative, wiring, etc.	16
Wired but not using	15
Total	105

It will be seen that of the 312 telephone calls made only 53 reported that they were not interested. The expense of this campaign is negligible when compared to the results that were secured.

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Post Cards Used for Advertising House-Wiring Campaign.

In an effort to reduce the cost of direct advertising and at the same time to encourage responses from prospective customers, Robert Montgomery, commercial manager of the Louisville Gas & Electric Company, is working out a post-card advertising series, the set consisting of six large-sized cards. These, illustrated with special drawings and with text provided, will be mailed at intervals to the 7,000 householders living in unwired houses on the distributing lines of the company. Several interesting drawings, all of them such as to attract attention and with text to suggest wiring, are being made. Practically all of these prospects are now gas consumers and their credit ratings are thus assured. Heretofore the company has been using circular letters, inclosing stamped post cards, making each letter cost about five cents. The returns have not been thought sufficient to justify continuation of that plan. By the plan which Mr. Montgomery is now working out it will be possible to reach all these people, in probably as effective a way, six times instead of once, at a cost of between six and seven cents for the whole number of times.

Municipal Lighting Committee, N. E. L. A., Meets in Cleveland.

Active work on the report of the committee on Municipal and Highway Lighting, Lighting Sales Bureau, N. E. L. A., of which Thomas F. Kelly, Dayton Power & Light Company, is chairman, was commenced with a meeting of the committee in the office of N. H. Boynton at Nela Park, Cleveland, on January 31. Members of the committee present were : Thomas F. Kelly, chairman; R. C. Bach, Edison Electric Illuminating Company, Brooklyn; S. B. Cushing, Public Service Company of Northern Illinois, Chicago; Ward Harrison, National Lamp Works of General Electric Company, Cleveland; F. A. Ritchings, United Electric Light & Power Company, New York; H. A. Tinson, Edison Lamp Works of General Electric Company, Harrison, N.,J.; N. H. Boynton, National Lamp Works of General Electric Company, Cleveland; and A. W. Young, Public Service Electric Company, Camden, N. J.

Written reports were received from committee members F. D. Shaffer, Public Service Company of Oklahoma, Chickasha, Oklahoma; S. H. Conkey, Minneapolis General Electric Company, Minneapolis; C. M. Masson, Southern California Edison Company, Los Angeles, Cal., and S. N. Clarkson, Union Electric Light & Power Company, St. Louis.

Plans were adopted for the preparation of a report on ways and means for the sale of lighting for all classes of municipal thoroughfares and roads under the jurisdiction of various political divisions as states, counties and townships. It is the intention of this committee, as expressed by Chairman Kelly, to make its report of as much practical value as possible to central stations seeking business having to do with the lighting of public thoroughfares of all classes. Another meeting of the committee will be held late in February.

Hull, Mass., Municipal Plant Sold.

The municipal generating station at Hull, Mass., was closed January 11 and the Weymouth Electric Light & Power Company began to furnish energy under a 10-year contract which it is said will reduce the annual appropriation about $7,000 and bring about a lower rate to private consumers. The distributing end of the municipal plant will be continued, with a corps of clerks having headquarters in the plant building.

Salary and Commission Best Basis for Paying Salesmen.

That it is necessary to pay central-station salesmen a commission on business secured in order to obtain the best results was the consensus of opinion of sales managers in attendance at the recent convention of the New-Business Committee of the Ohio Electric Light Association at Akron, O. After eight or ten years of experience, A. K. Young, new business manager of the Toledo Railways & Light Company, is convinced that the salary and commission plan is the most satisfactory. At present salesmen of this company are paid a salary of $50 per month plus a commission of 50 per cent of the profit on each appliance sold. This plan was adopted about one and one-half years ago and it has resulted in increased sales for the company, higher salaries for the salesmen and a much more desirable arrangement for all concerned.

A somewhat similar experience has been had by the Springfield (O.) Light, Heat & Power Company, J. E. North, commercial manager, reporting that after paying salesmen a straight salary for several years, it was decided that a salary and commission would serve to stimulate activity among the sales force and eliminate unproductive employees.

An experimental schedule was adopted, providing of a salary of $40 per month plus a commission of 10 per cent on electrical appliances except irons on which a commission of 50 cents each is paid. For house-wiring a commission of 25 cents per outlet is paid and 5 cents per outlet for electric signs. Power salesmen receive the same salary and a commission of 75 cents per horsepower installed. No commissions are paid until the company has received full payment for appliances. In the case of old houses, the commission is not paid until the customer has been connected.

Colorado Power Plant to Be Enlarged.

Announcement has been made that the Arkansas Valley Railway, Light & Power Company would at once begin extensions and improvements to its property at Canon City, Colo., that would cost $500,000. Sixty thousand dollars will be devoted to the enlargement of its generating and power plant and about $100,000 for its equipment with new machinery, including boilers, generators, transformers and super-heaters. Ten thousand horsepower will be added to the capacity of the plant, which now is 6,500 horsepower.

The remaining money to be invested will go into the improvement of the power transmission lines to the Cripple Creek district and to various coal camps supplied with electricity from the Canon City plant. The enlargement of the capacity of the plant is made necessary by the demand for greater economy in operations, the general reduction in the rates charged for electric power and to take care of new business in the mining camps reached by the company's lines.

Incubator Campaign in Maine.

Appropriately to the season, the Central Maine Power Company is featuring electric incubators for farmers' use in that territory. The merits of the "Lo-Glo" incubator are pointed out, with the assurance that it will hatch chicks free from germs and insects, and that from actual tests at the company's Waterville store it is found that the chicks grow faster than when hatched by the mother hen.

Another Massachusetts Municipal Plant Buys Its Electricity.

The Amesbury (Mass.) Electric Light Company has closed a contract with the Selectmen and Electric Light Commissioners of the town of Merrimac, Mass., to supply electricity for a term of 5 years, for street and commercial lighting.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

SELLING POWER TO A STRUCTURAL IRON PLANT.

A Resume of the Arguments Advanced by the Power Salesman That Were Later Substantiated by Marked Economies.

In negotiations with the Louisville (Ky.) Bridge & Iron Company previous to writing of the contract by which that company adopted central-station service, representatives of the Louisville Gas & Electric Company had a straightforward proposition to work out. The company was closed with last June, has been using central-station service since then at the rate of about $250 a month and in the files of the commercial department is a letter in which the company states that it is thoroughly satisfied with the service and would not go back to steam under any conditions.

The Louisville Bridge & Iron Company is one of the old manufacturing concerns of Louisville and has a long and honorable record. Incidentally the sales representative of the electric company or its predecessors have been striving to secure this business for several years. It was obvious that the time was shortly coming when improvements in the power plant would be imperative. The old equipment was showing wear; it was not as efficient as it should have been. The question was whether replacement should be in the form of new steam equipment, or whether the plant should be electrified. First of all the company obtained estimates necessary for replacement of equipment similar to that in use.

Then one of the engineers in the commercial department of the Louisville Gas & Electric Company obtained permission to show what his company could do. He made a careful study of the operations of the company. He found the boilers in one end of the plant and the engine, an old slide-valve proposition, at the other. Power was communicated to the various machines by means of line shafting, the main shaft extending the length of the factory, a stretch of about 100 yards. Among the other machines belted to this shaft was an old generator which the company used to generate energy for lighting and to operate a few small motors. A 20-horsepower motor and two 15-horsepower motors, direct current, were used on the large shears and on the traveling cranes in the yard. These were supplied by the central station.

After making various tests and the necessary and usual computations the engineer worked out the plan for electrification. His figures, including the changing over of the central-station motors already in use and the small ones taken care of by the isolated plant, called for a connected load of approximately 350 horsepower, with various alternations, changes in fixtures, etc., which would cost the bridge company approximately $8,500. The changes included throwing out the old steam-driven air-compressor for operating the hammers, to an electric compressor, throwing out of two big ventilating fans and replacing them with five smaller fans, besides changing over the old direct-current equipment on shears and cranes.

Comparing this with the cost of installing the steam equipment, the boilers alone to take the place of the antiquated and failing ones then in use, would cost the company $6,000. These would greatly increase the efficiency of the plant, admittedly, even with the old engine and the wastefulness of the long shaft. But they would have had to be accompanied with a new engine. If the company was to go further and install an isolated plant to generate its own electricity the cost would have mounted higher, going even as high as $10,000. Also there would be some salvage to reduce the cost of the electrical installation, while if steam were to be replaced the salvage would represent a very small item.

Saving in Overtime Operation.

So much for the initial cost of the competitive installations. This initial cost was a matter which could be presented advantageously from the angle of the central-station salesman. And it was. But this advantage was slight compared with the gain in efficiency which could be counted on with motor equipment. In the first place the wasted energy unavoidable through use of the long and heavy shafting and innumerable pulleys represented a big advantage for electric drive. If there was no occasion to use any machine in the mill other than the cold saw, for instance, the whole of the shaft had to turn. Now that saw is operated by a 10-horsepower motor, 1,150 revolutions per minute, geared to the saw.

Again there were the two large rotary fans, both belted to the center shaft. If one of the forges in the far end of the building was in operation, the whole equipment had to operate and power enough was demanded to clear the whole structure of the overheated air. Now fans of smaller capacity to which the motors of from 7.5 to 10 horsepower are belted do the work instead and only so much power is needed as is required to clear the air where the air needs clearing.

Much of the work done by the Louisville Bridge & Iron Company is contract work and the time element is a very important factor. It is, therefore, often necessary to work longer hours than normal in order to get a job out on specified time. There is frequently, for instance, boring work that will run throughout the night. Heretofore when this work has been necessary the company had to keep the steam plant in operation all night, and to keep the fireman and engineer on duty, as well as the crew handling the jobs. Under the present arrangement overtime of this kind would require operation of only a small portion of the equipment. Besides requiring no services of engineer, firemen, etc., the gain through elimination of wasted energy is an exceedingly big item.

An interesting feature in connection with this particular installation is that the promises of the power salesman came true immediately after the installation was completed. On one contract which the company took hold of there were 24 hours of straight boring. It was a rush job and meant that the machine had to be kept going a day and a night. Under the old dispensation this would have meant that the whole plant, virtually, be kept operating on a 24-hour trick. Under the new system the costs

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were reduced to just the actual requirements of the job.

Throughout the whole plant there were arguments of this same character. Even the electrically driven tools used previously depended upon operation of boilers and engines to be available. When the plant shut down the generator upon which these smaller motors depended also was inoperative. Equipped on the old basis the plant could hardly turn a wheel unless the whole business was going, with the accompanying cost and waste.

In this plant there was not the frequently encountered question of what to do for heat and steam for other purposes. In the first place the plant is one exceedingly difficult to heat. It is a high-roofed shed, designed to let the excessive heat escape, rather than to conserve it. The air is always tempered by the forges in which metals worked are heated. In summer the fans hurry this overheated air out of the structure. The heating proposition, therefore, did not enter into the consideration.

Saving in Operating Costs.

Footing up the advantages of central-station electric drive, compared with steam power or isolated plant, showed such an overwhelming advantage on the side of the central-station proposition, that it was not necessary to go into elaborate detail. The estimates were sufficient. The first cost of the various types of equipment were virtually enough to determine the answer. Examination of the estimates of the operating costs were also favorable to the electric company contract.

An interesting feature of the requirements of the bridge company, which is worth considering, is that its peak comes when the load on the generating equipment of the electric company is comparatively light. It is this item which makes the bridge company a doubly valuable customer.

Involved also in the selling argument in this case is the matter of competition. Any manufacturer, of course, is always keen to reduce his operating costs and all other costs. Usually if he can be shown that the proposed installation will give him that kind of reduction he is ready to sign the contract. But if under the prevailing system he is able to show a profit from his operations there are more than a few who will not be so ready to make the change. "Let well enough alone" is a motto held to still by a great many shop managers.

But in other cases as in this one there is the competitive element to back the electric salesman up. The Louisville Bridge & Iron Company, for instance, is in active competition, not only with a number of Louisville competitors who are using central-station service, but it is also in competition with the outside companies which operate nationally. These have their special advantages over plants operating in smaller territories.

So it becomes not only a question of whether electrical equipment will enable the manufacturer to reduce expenses but whether it is not necessary so to equip in order to meet competition and still realize a profit on operations. This does not imply that this argument was used on the Louisville Bridge & Iron Company. As a matter of fact it was not. But it is calling attention to a point that more or less frequently will serve the power salesman to drive his other arguments home.

Equipment installed in the Louisville plant included 24 separate motors, which range in capacity from 3 to 125 horsepower. There is one of the small size, belted to an emery wheel, and one of the larger size driving the air compressor. Eight motors are of 10 horsepower. Most of these motors make above 1,100 revolutions per minute. Numbers are belted to small counters belted to various machines. Machinery equipment of the plant is usual to establishments of this character.

Electric Motor Saves $200 Over Gasoline-Engine Costs.

The rapidity with which the electric motor has ousted the gas engine and stopped its progress is one of the most remarkable features of recent industrial history. A few years ago the gas engine confidently challenged the electric motor; nowadays the only direction in which the gas engine has any field worth talking about is where electric power is not available.

Recently, in a large industrial center, there was a firm which adhered tenaciously to the gas engine. It was a conservative firm, which regarded the electric motor as a new-fangled arrangement too good to be true.

For a long time this firm resisted the arguments in favor of electric driving, but at last it consented, under protest, to a trial installation in part of the works driven by a single gas engine. Very careful records were kept of the performance of both; and the following was the result of the comparison, both as regards capital expenditure and running costs:

COMPARISON OF ACTUAL FIGURES OF GAS PLANT AND MOTORS RUNNING UNDER IDENTICAL CONDITIONS.

GAS PLANT, 26 HORSEPOWER.	
Capital cost, including installation and foundations	$1,070.00
Interest, 5 per cent	53.50
Depreciation, 10 per cent	107.00
Oil	61.00
Attendance	92.50
Water	7.30
Maintenance	53.50
Gas	340.00
	$ 714.80
MOTORS, 30 HORSEPOWER.	
Capital cost	$ 390.00
Interest, 5 per cent	19.50
Depreciation, 5 per cent	19.50
Oil	2.40
Attendance	4.90
Maintenance	9.70
Electricity	457.00
	$ 513.00

When we add to this direct saving the enormous incidental benefits of electric driving—the simplicity, convenience, reliability, absence of vibration, instantaneous control in starting up, saving in space, and so on—there can be no doubt about the economy of the electric drive. This demonstration was so convincing to the firm that the other gas engines were straightway condemned to the scrap heap.

Electric Heat for Shoe Machines.

Welting machines, shoe stitchers and bobbin winders, with electrically heated wax pots, are gradually being introduced in the shoe factories of Lynn and Brockton, Mass., replacing steam operated machines. An early type of stitcher, in common use by repair shops and small shoe shops, was equipped with a gas steam-generating wax pot. This is still operated in some shops, but since it requires about 1.5 hours to bring the wax to the proper point for application to the thread, the disadvantages are obvious. With the electric attachment, only 20 minutes are required to produce the necessary result. The steam-heated arrangement has its disadvantage, in that it requires a constant supply of high pressure steam. This is impracticable in shops of the smaller type. The electric equipment is solving problems associated with gas and steam operation.

At a shoe factory at Lynn, where gas heat was formerly used, the manager stated that the cost of electricity consumed was only about 20 per cent of that for gas.

At the office of the United Shoe Machinery Company, Boston, the concern that manufactures and rents the electrically-operated machines, it was stated that the consumption for wax pot heating averaged about five kilowatt-hours a day, which at two cents a kilowatt-hour would be 10 cents a day per machine.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Effective Lighting of Bathrooms.

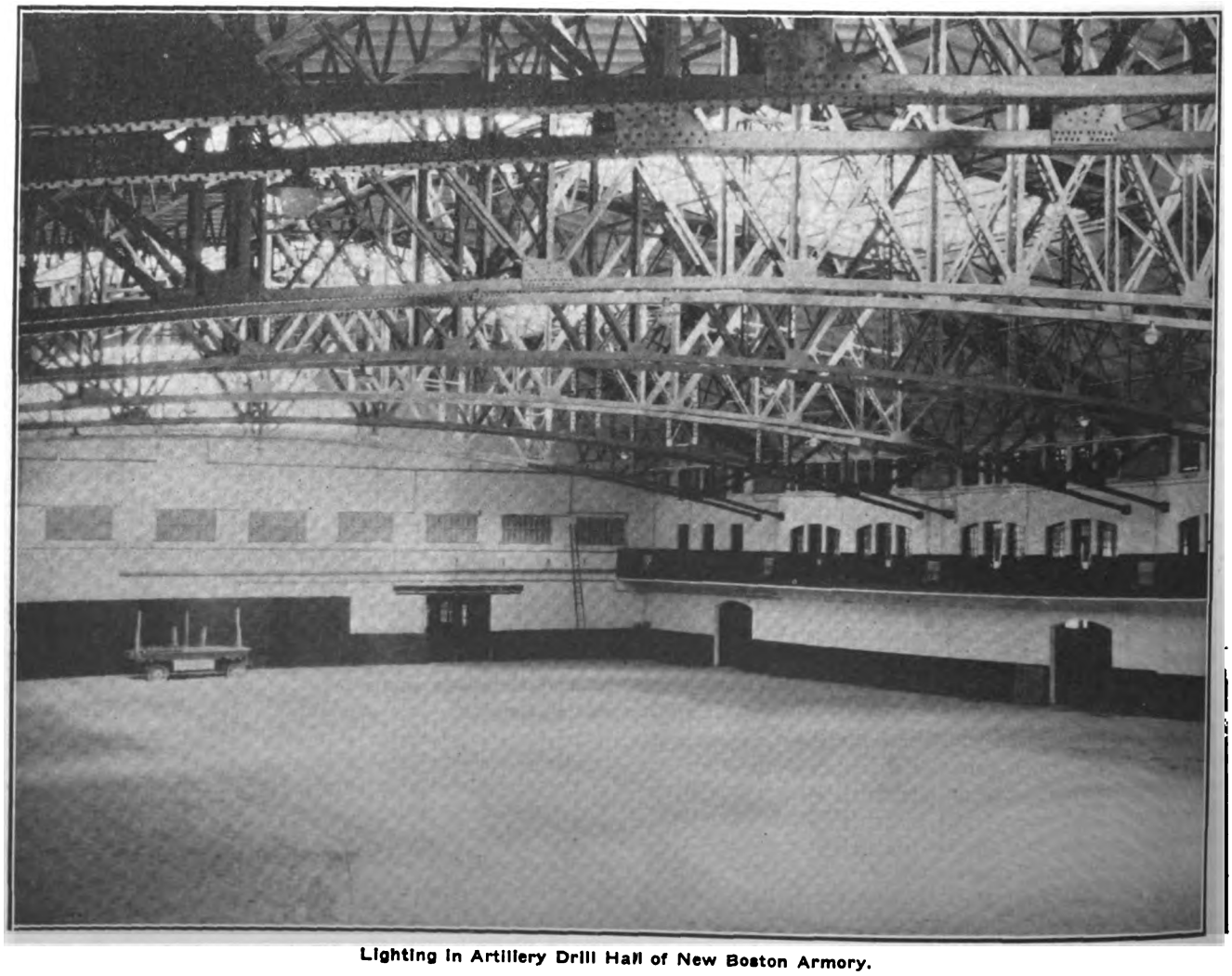
A novel and effective method of lighting a bathroom that should prove of interest to architects and contractors is decribed in *Lighting Journal.* The main consideration in such lighting is to provide satisfactory illumination for shaving, combing the hair, etc., before the mirror; the remainder of the room requires only a fair intensity and usually proper lighting of the mirror provides this as well. A central ceiling outlet or a single bracket at one side of the mirror does not give proper lighting for shaving because of annoying shadows. A bracket over the center of the mirror has the same objection. Placing a bracket on each side the mirror solves the problem fairly, if well placed; in many cases even this does not give as uniform illumination over the entire face, head and neck as desirable. The best solution is to use all-frosted tubular lamps, such as type T-8 Mazda; one is installed on each side of the mirror. Its base is supported by a standard angle-cap socket; the tip end is protected by a corresponding socket shell, which although only a dummy socket, looks exactly like the real one. The sockets are mounted to bring the bottom of the lamps 58 inches above the floor.

UNIQUE ELECTRICAL INSTALLATION IN BOSTON ARMORY.

Special Provisions Necessary in Designing an Effective Lighting Installation.

The use of nitrogen-filled lamps is a feature of the illumination of the new Massachusetts Armory recently erected by the State, on Commonwealth Avenue, Boston, at a cost of about $1,000,000. This structure contains an artillery drill hall 300 by 175 feet, said to be the largest in the country, not excepting Madison Square Garden in New York. There is also a cavalry drill hall 260 by 100 feet.

Lighting of the artillery hall is by means of 750-watt type C Mazda lamps, and of the cavalry hall by 500-watt units of the same type. The former hall was laid out for 1,000-watt units, which may ultimately be used. The lamps are installed singly in enameled-metal reflectors with a 10-inch globe held in place by a ring and bayonet joint. The fixtures hang from conduit thwarts extending between steel trusses of the roof, which are seven feet apart. They vary in height with the arching roof, being 31 to 38 feet above the tanbark floor.



Lighting in Artillery Drill Hall of New Boston Armory.

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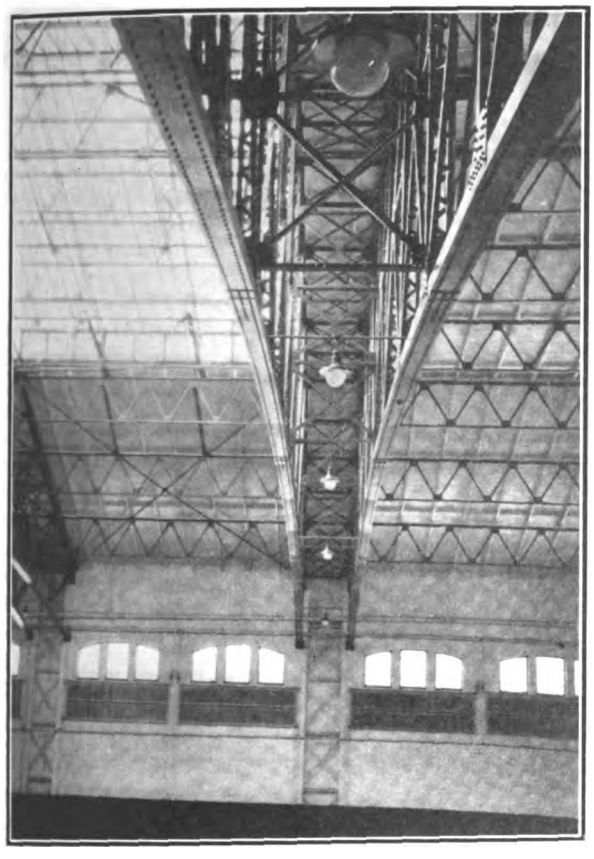


Method of Suspending 750-Watt Lamps Between Girders.

In the cavalry hall the same type of fixture and support is used. At the center of each conduit section is a condulet fitting with hook and ring support, to give vertical suspension to the fixture. The spacing in the artillery hall is on 36 by 43-foot rectangle, and in the cavalry hall 34 by 29 feet, and 20 to 22 feet high.

On the wall above the gallery which runs along two sides of the larger ring, and in the mounting corridor, living quarters, stables and harness rooms are 1,235 tungsten units, ranging in size from 250 to 15 watts capacity. The total lighting load is 128 kilowatts.

The motor installation includes a five-horsepower vaccum pump, a 20-horsepower motor operating a passenger elevator, and duplicate 15-horsepower motors operating sewage ejectors.

Plug outlets in the stables provide for motors to operate a hay and grain lift, a grain crusher, and horse-clipping machines. Holophane metal shades are installed in connection with lamps in all the workrooms and in the stables.

The lighting fixtures at the main entrance are particularly handsome, being of Druid glass in Stonehenge design. The same type of fixtures is used for wall brackets above the gallery, and for the officers' quarters.

Energy is procured from the Boston Edison Company, that for lighting being single phase, and for power three phase.

The light and power equipment was installed by the Lord Electric Company, Boston.

Safety Suggestions for Foremen.

The San Joaquin Light & Power Corporation, Fresno, Cal., is continually impressing upon its foremen that their attitude towards the prevention of accidents will be reflected by the men and that utmost care should be exercised to indicate the right spirit for safety in all departments of work. To emphasize the necessity for keeping the men inspired with the thought of safety first in the fulfillment of their duties, the company has issued the following list of suggestions to foremen:

Make it your business to talk safety to the men, both individually and collectively. Have regular and frequent meetings, if only of short duration, to talk safety first.

Survey a job carefully and consider whether it is being done in the safest way. Is an accident likely to occur?

Keep safeguards in place and insist upon safety devices being used.

Stop dangerous practices whenever you see them. Remember that two-thirds of all accidents are due directly to thoughtlessness, recklessness and ignorance.

Keep the premises about your work orderly. See that proper light is provided.

Use accidents and near-accidents as a text, drawing lessons from them as to what not to do.

Watch for loose sleeves, flopping blouses and flying neckties—anything which may catch in the machinery and draw the man in.

Take an interest in your men. Have every injury, no matter how trivial, attended to by the doctor.

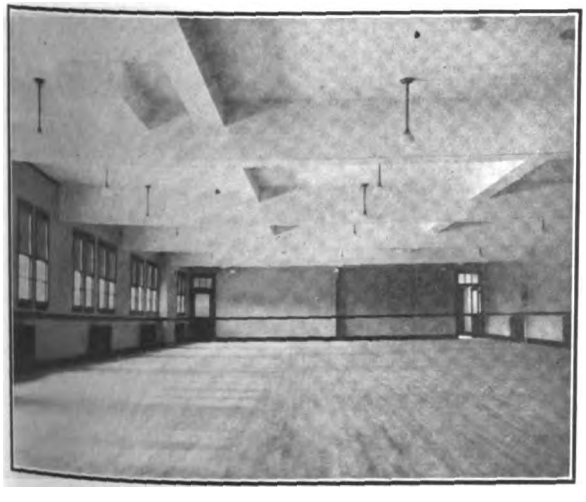
Never overlook a careless act on the part of any workman—point out what such action may result in.

If your duties sometimes take you away from your men, appoint one or more men as "safety overseers," who, in addition to their regular duties, will watch for dangerous places and dangerous practices.

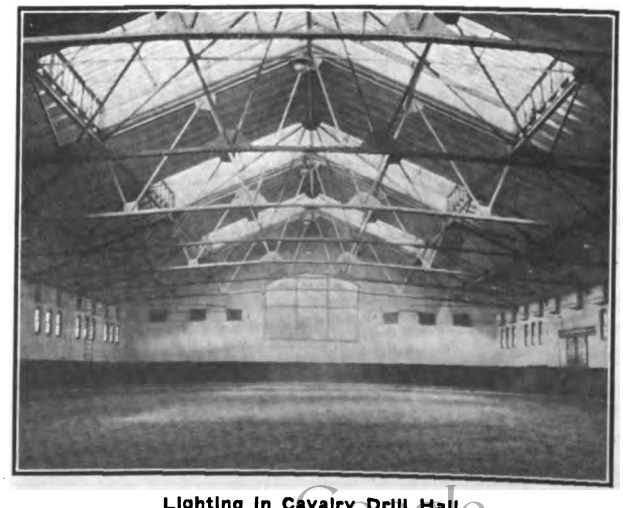
Ask your men for suggestions on how to make things safer.

New Police-Signal System for Gardner, Mass.

A 10-box three-call police-signal system for Gardner, Mass., is recommended by the Chief of Police in his annual report. It is estimated that $5,000 would cover the cost installed.



Lighting in Infantry Drill Hall.



Lighting in Cavalry Drill Hall.

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Business Building for Electrical Contractors

By George W. Hill

This is the third of a series of articles by Mr. Hill dealing with pertinent questions for electrical contractors. The philosophy of salesmanship and business building is discussed in a manner that should encourage serious thought and a greater consideration of the qualities that are essential to building a successful business. Another article by Mr. Hill, on "Organization," will be published in an early issue.

For a good many years past, it has been the opinion of those embarking in the electrical contracting business that this business was a trade rather than a business or profession.

This is, no doubt, due to the fact that usually men who enter the business are those who have come up from the rank and file of the journeymen electricians and who have spent the greater part of their time and energy in gaining a practical and technical education to the almost absolute neglect of a most important element, which is the science of business.

Some men challenge this remark and claim there is no science in business.

If it will be admitted that science is classified knowledge, or classified common sense, then it is an easy matter to prove that the great amount of knowledge pertaining to business building may be classified, just as the knowledge of farming has been in more recent years classified until we now have scientific agriculture colleges all over this country and the farmers no longer laugh at the idea of scientific farming, for this science has been applied, and the soil has been brought to a higher state of cultivation. Salesmanship and business building is the science of service, the power to make permanent profitable patrons.

Every normal man or woman has some of the qualities, in fact all of the qualities which enter into salesmanship. Some have them to a more marked degree than others, but they all have them, and it is simply a matter of bringing these qualities together and to develop and use them for the purpose of building or getting more business.

Must Know Yourself.

In order to become a good salesman you should know yourself first. Know your goods or business thoroughly, and then know your customer. Knowing your customer means to be able to read human nature.

In order to know yourself, you should adopt some simple, yet comprehensive method of checking yourself. Learn your weaknesses and then eliminate those weaknesses so far as possible and nourish and develop the opposite or positive quality.

Some of the most valuable qualities of salesmanship are tact, memory, earnestness, desire, honesty, concentration of thought, ability to analyze your business or proposition, etc. There are a large number of success qualities but these few will be sufficient to form a basis of study of yourself. After you have begun to develop these you will naturally find others.

Did you ever call on a business man whom you had perhaps never seen before, and after having been invited into his private office, he invites you to sit down at his desk and you begin to tell him about your proposition, and you felt so easy and comfortable that there seemed to be something unexplainable set up between you, that caused you to have confidence in him, and to feel that you had gotten off on the right foot as it were, and you begin to feel at once that you were going to make the sale? You almost knew it from the beginning. This is confidence. Confidence in yourself, in the goods you were selling, in the customer, and the confidence which you had produced in the customer. Consequently, confidence is the true basis of trade.

This confidence which your customer had was induced by your actions when you entered his office and the manner in which you presented your proposition and perhaps of what he knew of your concern. He felt that you were going to give him the straight of your proposition. That you were there to render a service, which, by the way, is one of the most potent factors in business building. On the other hand you felt that this man had confidence in you and you were conducting yourself in such a manner as to not produce a negative thought in the mind of your customer, which would amount to loosing the sale.

The brief and concise manner in which you had presented your proposition to him; the true knowledge of your business which you had displayed, gained his confidence. Without confidence and service you cannot expect to build much business.

I once knew a contractor in Illinois who was the most successful business closer I had ever known. He would get 90 per cent of the contracts he went after, provided, of course, that the men he had to deal with were business men and knew and understood the value of confidence and service.

It was my good fortune to be invited to attend a meeting of the City Council with him. This was in a small town in Illinois where the city was contemplating building an electric light plant. This plant was to be a municipal plant and the people of the township had voted bonds for a certain amount of money and everything was in readiness for letting the contract.

The city fathers had conceived the idea of purchasing the material and hiring men and building this plant themselves; that is, under the supervision of the City Council. The contractor had, however, made a bid to furnish the material and labor and turn this plant over to the city complete with a guarantee of satisfaction.

After the meeting had been called to order and the preliminary work of the organization had been finished, the discussion of the plant question was taken up. In the discussion they found themselves facing several problems with which they were not familiar and they asked this contractor many questions with relation to matters on which they were not perfectly clear. They found that this gentleman was glad to answer all questions. In answering these questions he made it a point to be perfectly frank, and went to some trouble to make himself understood, even though some of the answers seemed at the time to be to his disadvantage.

Finally, one councilman got up and moved that the City Council purchase the material and hire the labor and build this plant themselves. There was a second to this motion, and it seemed that if there was ever a time that the chestnuts should have to be pulled out of the fire it was then. This contractor asked permission before they took a vote on this to talk to the council and also to ask the gentleman who had made this motion some questions. He was granted permission.

He asked the gentleman who had made the motion if he did not see him looking at his watch a few moments ago. The gentleman answered that he did. Well, then, you depend upon that watch to tell you the time of day, do you not? The answer was in the affirmative. How long have you carried that watch? He thought a moment and

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said that he had carried it close to 30 years. The contractor then asked him what he should do if he should lose it. Why, he said, I would buy another.

The contractor then said to him, you have carried that watch for 30 years, or in exact figures, you have owned and carried that watch 8,740 days or 262,200 hours, and figuring that you have looked at this watch 25 times each day, which is the average number of times that a man looks at his watch, you would have looked at it 219,500 times during the time you have owned it. Now, let me ask you if you were to lose this watch, would you buy the material and try to make one for yourself, or would you go to some good jeweler who was selling watches, made by an expert watch maker, and buy a watch? The answer was that he would depend upon some expert watch maker to furnish him with a time piece. The contractor then said: "Well, you know a lot more about that watch than you do about electricity, and it would seem that it would be much more ridiculous, therefore, for you to attempt to build an electric light plant than it would be for you to attempt to make a watch, yet you have just made a motion to the effect that you gentlemen here, who know nothing of the electrical business, to build a plant for your constituency who have elected you to office to safeguard their interest. You do not even know whether the material which has been proposed to do this job is sufficient. You have no knowledge of the amount of labor required to perform this work. Perhaps, when you have the material bought and some of the labor performed, that it will exceed the amount which has been voted for the plant. What will you do then? Can you go back to your constituency and tell them that you have made a mistake in undertaking to build this plant, and had run out of money, and that you were back to them for more? They might ask you if you did not receive a bid from some one to do this job complete for an amount within the amount voted. What would you tell them? Now, do you not think that it would be a great deal better to let an expert build your electric plant as well as your watch?" The gentleman scratched his head a moment and then said, "Mr. Mayor, with the consent of my second, I withdraw my motion." The second by this time was glad to withdraw and the result was that this same man made a motion that the proposal of this contractor be accepted, and it was carried unanimously. This was tact and ability, and establishing confidence.

Must Gain Confidence.

It sometimes only takes these little concrete examples to cause even the most broad-minded men to understand your proposition. Don't be afraid to use the simple, honest little methods of gaining the confidence of your prospective customer, no matter how big a man he may be. He will appreciate it.

I want to say to you that when you have gained the confidence of the business men of your community, when you have good goods to deliver, when the people of your city come to know that your motto is service, and to the end of satisfaction, then it is that you will not be compelled to meet the competition of the contractor who believes in barter, or the doctrine "Let the buyer beware."

Where do you tell your boys to go for a new suit of clothes? You tell them to go to Merchant Jones, for instance, where you know from past experience that the goods are right, that the service is right, and where satisfaction is guaranteed.

I know of an electrical contracting concern in Milwaukee, Wis., who have so thoroughly instilled confidence into the minds of their patrons that today 90 per cent of the work which they do is time and material. Why? Because their customers know that they will not be taken advantage of. They know that this is a perfectly reliable concern and that no matter what happens in the way of an accident to their work that it will be made perfectly good. They know that when they buy devices there that they are the best and that they will give satisfaction, and the result is that this concern is making money every year and doing a comfortable business.

The two greatest elements in trade are quality of the goods and excellence of service.

Quality of goods does not mean that you should handle the highest priced articles, but such goods as are adaptable to the needs of your customer and to his pocket book, and suitable to conditions and economy in use.

If the contractors would conduct themselves and their business in a manner that would gain for them the confidence of their customers and would be more eager to serve, the matter of money making would take care of itself. If you will give the service you will get the money.

There is no doubt but that there are men who are natural born salesmen and business builders, and if they are so fortunate as to have this natural bornness, they should so appreciate it as to have a desire to become even more efficient in their business and study how they can improve each one of the many qualities with which nature has been so generous.

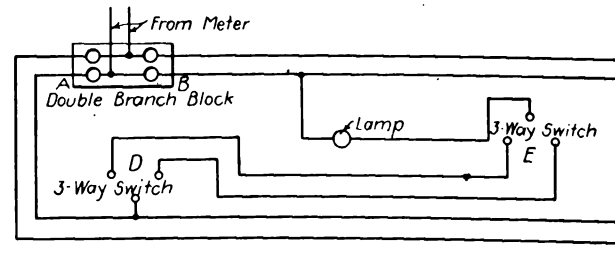
Study yourself, analyze yourself, learn wherein you are weak and then learn how you can improve upon your weaknesses and bring them to a point of perfection, and they will become positives rather than negatives.

Study your business. Know all there is to be known about your business. Study your employees and your patrons. This is the study of human nature. Learn what your patrons like. Learn what their demands are, and to the end of satisfaction attempt to meet these demands, and without any thought as to what your competitor is doing, you will increase your business year after year.

Salesmanship and business building is merely the power to know how and when to serve and to be able to understand your business, yourself, and your patrons and to be absolutely sure that you are doing this.

Locating Trouble on Three-Way Switches.

Several times while hanging fixtures I have run across trouble from the switches of three-way lighting circuits being improperly connected, resulting in the three-way circuits being dead. On investigating these cases I found the trouble in many instances to be due to the cause illustrated herewith. In



Wiring Diagram Showing Switch Trouble.

order to save time, labor and wire, the wireman frequently connects on to the most convenient wires regardless of whether or not these are on the same circuit. This is perfectly proper, if care is taken in connecting the three-way circuit to opposite sides of the line. However, when the branch blocks are put on in finishing, the two wires that are tapped on for the three-way light may be connected so as to have the same polarity, as shown in the diagram. When this is found, the remedy is to reverse the wires on one side of the branch block, as at *B*. In case of a big job with many circuits, the best way is to short-circuit the switch wires at *D* and *E* and then reverse one circuit at a time. Of course, before doing this it is necessary to look for any possible wrong switch connections and defective switches.

J. B. Story.

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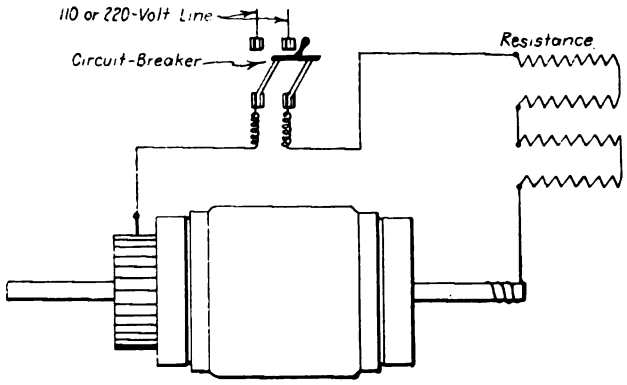
Locating and Removing Grounds in Armatures.

In one of the recent issues I noticed a method described for easily locating a ground in the armature of the generator or motor without using expensive instruments. For this purpose I have used a method that I think is simpler than the one described.

According to my method, simple and handy devices are used for locating slight grounds. The necessary equipment consists



Method of Locating Armature Grounds.

of a bank of resistances, or lamps, which will allow the passage of about 10 amperes of current from the lighting circuit. A double-pole circuit-breaker is used, although a simple double-pole fused knife switch can be used in place of this, if no circuit-breaker is at hand; however, a circuit-breaker is much more convenient as it takes much less time to close the breaker than it does to reload a fuse. Connect from one side of the circuit-breaker to the resistance and from the opposite side of the resistance connect a wire to the armature shaft. Connect from the other side of the circuit-breaker to the commutator. Close the circuit-breaker and watch for smoke or sparks at any place on the armature. If this does not show where the ground is located, I cut out some of the resistance and raise the current to 25 or 30 amperes. If the trouble is only a light ground, this will usually locate the exact place where the trouble is.

Should this fail to locate the ground, raise the tap coils out of the commutator and test each bar separately. When the bar that is grounded is reached the lower coil can be raised and tested to determine whether the coil or the commutator is at fault.

J. H. Daniel.

Cleaning Brass Mountings on Electrical Apparatus.

The following method of cleaning brass articles, which has been found completely successful, may prove of value to electrical contractors and dealers as well as manufacturers. It can be used for fan-motor blades, fixture parts, name plates, etc.

The brass mountings should be first cleaned of dirt by dipping for a short time in boiling soda lye made by dissolving 4 parts by weight of the lye to 1,000 parts of water. This usually requires only three or four minutes with slightly discolored goods. The time never exceeds 20 minutes. While still warm, if possible, the articles are dipped into a mixture of nitric acid, 60 parts by weight; sulphuric acid, 40 parts; common salt (sodium chloride), one part, and lamp black, one-half part. This pickling mixture must be carefully made in advance, as there is considerable heat generated when pouring the sulphuric acid into the nitric acid. The sulphuric acid should be poured in very slowly, keeping the mixture constantly agitated, and keeping the face well away from the tank or jar. The place should be well ventilated, as when the salt is introduced chlorine gas is formed. This gas is hard on the respiratory organs. The mixture should be made and kept in a glass or earthenware jar, not metal; it must be at least 24 hours old to give good results. The objects will take on a fine golden-yellow coloring after dipping. After the article is dipped it should be rinsed in plenty of clean water and dried on a hot iron plate. An electric disk stove is good for this operation.

After the articles have thoroughly dried and while still warm they should be lacquered. The gold lacquer or varnish as supplied is too thick for dipping or brushing. This should be thinned with alcohol, 1 part by volume of lacquer to 10 parts of alcohol. The articles should be dipped and then put on the hot plate to dry.

H. E. Weightman.

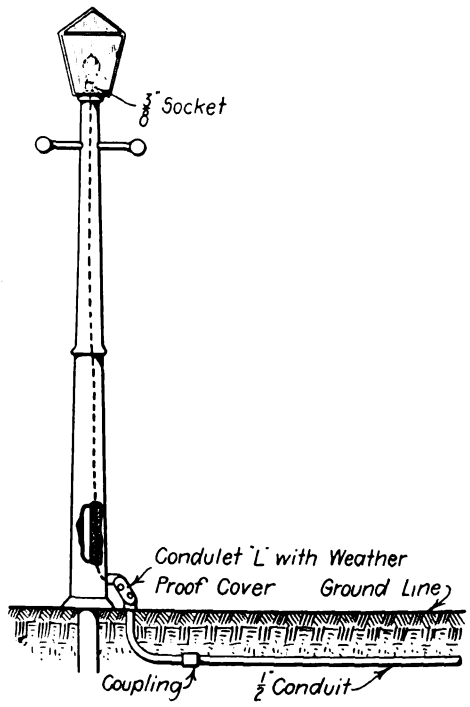
Connecting Flush-Type Switches.

I find if a flush-type switch is connected up with the blades in the "On" position, there is less tendency for the inside mechanism of the switch to be drawn out of place by the connection screws than if it were connected up in the opposite position.

Walter S. Fretz.

Wiring Old Gas Lamp Posts for Electric Light.

Recently I had a job equipping some old-fashioned cast-iron gas lamp posts for electric light. The gas had been turned off from the posts for some time. The problem was to install the wires with the least trouble and cost. I drilled and tapped out a hole for one-half-inch pipe just a few inches above the ground line; I found the wall thickness of the post to be only about one inch, leaving a space inside three inches in diameter. I put into this hole a close nipple and to it screwed a weatherproof L-shaped Condulet. From this an ordinary conduit ell and coupling connected with one-half-inch conduit laid in a six-inch trench running to the cellar. The cover of the Condulet L is just above ground and is easily accessible in case of trouble. It was an



Wiring Old Lamp Posts for Electricity.

easy matter to fish brewer's cord down through the post and connect it to duplex wire within the L Condulet. With this arrangement it is not necessary to take up the post or conspicuously interfere with it. If a post in a narrow sidewalk were to be dealt with, it would be better to tap the post at either side instead of nearest to the building.

J. B. Story.

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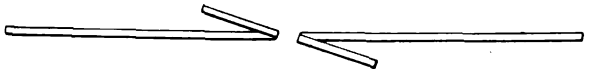
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necesary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Hooking Snakes.

In fishing through long runs of conduit in which the fish tape is not long enough to reach the other outlet or where there are too many bends in the line, it becomes necessary



Scheme for Fishing Through Long Runs of Conduit.

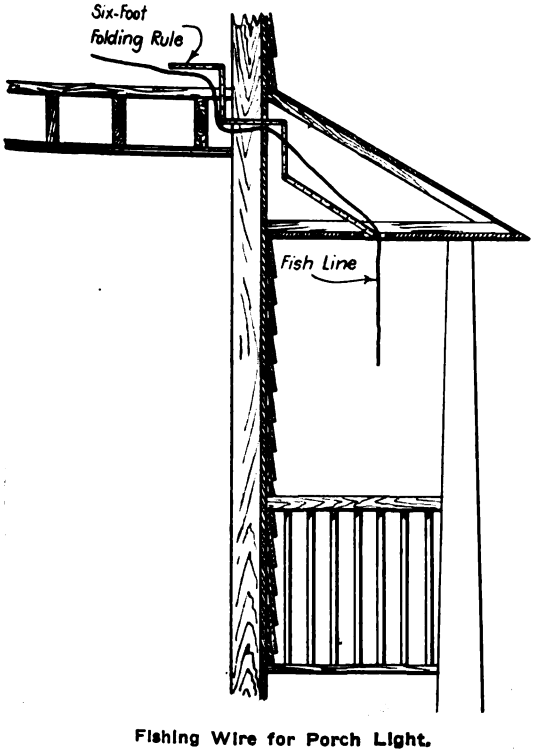
to use another fish tape from the opposite outlet and catch the hook of the first tape.

In making the hooks, just make an ordinary hook, then twist sidewise a little more than the width of fish tape. By this method the hooks will always catch, thereby saving time, labor and quite often your temper.

Charles W. Myers.

Fishing to Drop Ceiling on Porch.

Frequently the wireman has trouble in running a snake through to the outlet when dealing with a drop ceiling, such as is commonly used on front porches. I find that a six-foot rule is a handy article to use in this case, since after getting it into the pocket in the floor and through the sheeting boards, it can be opened up six inches at a time and with a fish line attached to the end it can easily



Fishing Wire for Porch Light.

be pushed directly into the outlet opening. A piece of capping, such as supplied for wood molding, will also work, as it can be bent in almost any corner without breaking.

J. C. Walsh.

A Simple Burglar Alarm.

The two accompanying sketches illustrate two forms of a continuous-ringing burglar-alarm system actuated through a solenoid coil and a return ground. The simplest form

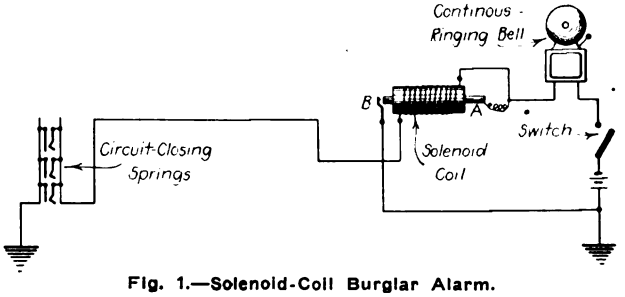


Fig. 1.—Solenoid-Coil Burglar Alarm.

of this is shown in Fig. 1. The iron core *A* of the solenoid is arranged so that when the coil is energized it pulls the rod in, thus causing the end of it to make contact with the the point *B*. This closes the local circuit including the continuous-ringing bell. The latter will continue to ring until the switch is opened. The iron rod *A* can then be pulled back into normal position.

A modification of this is shown in Fig. 2. In this case

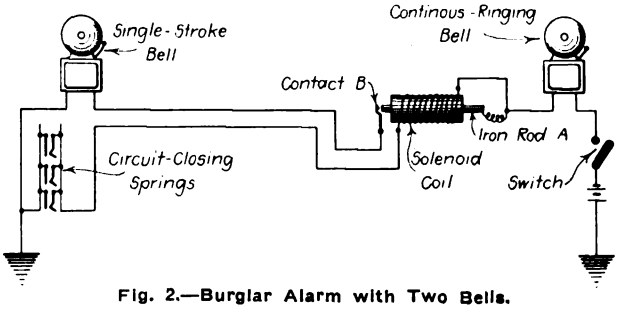


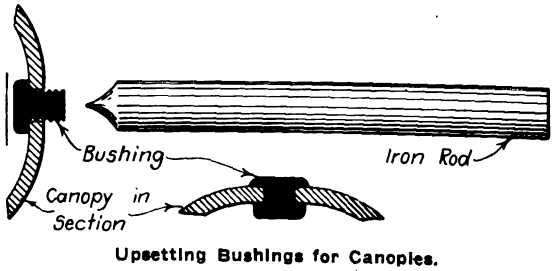
Fig. 2.—Burglar Alarm with Two Bells.

instead of a simple local circuit there is provided an additional single-stroke bell. When any of the circuit-closing springs makes contact and the solenoid is energized, the iron rod *A* engages the contact *B* and thus closes the circuit of both bells. This system is both cheap and effective. I have used it repeatedly with good results.

Edward Kemp.

Upsetting Bushings for Canopies.

In putting one-eighth-inch rubber bushings into canopies, etc., I use a small tool, such as the one illustrated in the accompanying sketch. It consists of a piece of round three-eighth-inch iron ground to a point having about the same bevel as a center punch. By slightly heating the end of the iron and applying this to the rubber bushing, the small end thereof is turned up against the metal of the canopy and is thereby tightly locked in place, making a tight, smooth and good-looking job. For three-eighth-inch



Upsetting Bushings for Canopies.

bushings, a rod five-eighth-inch in diameter should be used. This scheme can also be used for bushings in portable table lamps and the like, which are easily worked loose unless upset in the manner indicated.

J. B. Story.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

WINDOW TRIMMING A MERCHANDISING FACTOR.

Proper Attention to Timeliness, Illumination and Detail of Window Displays Necessary.

The following paragraphs were prepared from an article by W. E. Clement, the commercial manager of the New Orleans Railway & Light Company. The article appeared in the January issue of *The Bulletin*, the monthly publication of the United Gas & Electric Engineering Corporation, New York, N. Y.

The art of the window dresser can be compared to that of the stage director. How often have we witnessed productions by eminent actors, in which something essential to success was lacking in the production; that is, success beyond mere mediocrity. At the time, we may have been at a loss to comprehend the situation, but upon analyzing it the secret was found to be some inattention to detail in plot, scenery or settings. Therefore, in window trimming, use only the best, which includes accessories, as well as window-dressing talent.

The comparison is not entirely out of order, as the best dressed windows in nearly all cases portray a scene of some sort, which, to be most effective, should be "psychologically correct," or chime in with some popular movement or subject in order to get the public interest. This class of window dressing has been found far superior to the old method, which consisted of piling goods with large price tags in a window. While this may sound elementary, it is of such importance that one must lay stress upon it.

The writer has seen windows, which essayed advertising one's own, and in some cases other classes of merchandise, that were dismal failures, all due to the eagerness of the advertiser to cram all he could in the window in a mad effort to reach the buying public. This fault is by no means confined to the small or inexperienced dealer. Make it a rule never to place more goods in a window than is necessary to produce the desired effect.

Advertising two different classes of goods in the same window is very poor form, and always fails. Concerns having but one display window should never advertise two different lines at the same time. To do so is about as deplorable as advertising electric fans, using a snow scene for a background instead of one depicting the pleasant breezes of spring.

Proper Illumination.

The purpose of all display windows is to advertise not only by day but by night as well. The advertising of many windows is lost when night comes. This should not be, for the hours after dusk are the most valuable. The business cares of the day being over, the minds of pedestrians are in a more receptive mood than during the business hours. Great care should be taken to see that windows are properly illuminated, as one not properly illuminated compared to one that is would be just as odious as comparing the wax candle to a Mazda lamp. The lighting of display windows is not always a question of expense, but of efficiency. The properly lighted window first attracts the attention of the onlookers and then holds it.

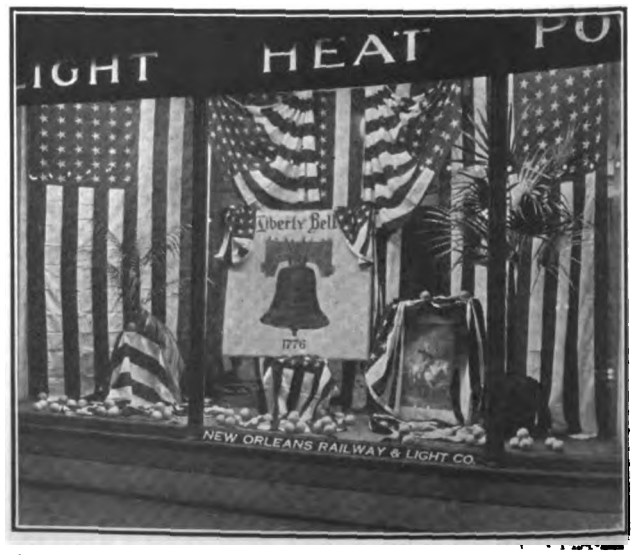
In order to attract attention the window must be brilliantly lighted so that it is conspicuous at a reasonable distance. Every window, however, presents a distinct problem in lighting. Too much time cannot be given to selecting the right type of reflector, one that will conceal the lamp filament from the passerby and at the same time illuminate the window evenly. In short, concentrate all of the light in a brilliant flood on the goods and prevent the glare of the lamp striking the eyes.

Windows should be kept lighted as long as the streets are full of people because the majority of people only have opportunity for observation after closing hours.

Seasonable Advertising.

The majority of articles sold by the electrical merchandiser can be classed as "hardware," and all window dressers will agree that it is the *hardest* class of goods with which

An Attractive Arrangement of Show Cases and Portable Lamps in a Display or Sales Room.



Window Decoration Suitable for Washington's Birthday or Other National Holiday.

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Appliance Window Display Which Attracted Considerable Attention in New Orleans.

to make an effective display. Therefore, endeavor to make your window trimming as nearly seasonable as possible. Under the term, "seasonable advertising," is meant, for example, Hallowe'en. This event should be taken advantage of, as it makes an admirable subject for the window trimmer to work out. "Ye Olde Time Hallowe'en" may be depicted and should prove a drawing card. Some may say, "Only for children," but such would not be the case, for the older people can enjoy these creations as well. For instance, place in one of your windows a modern electric range, with but one placard upon it, reading, "All modern Hallowe'en suppers are cooked by me." As the majority of children are accompanied by their elders, the window would receive its full share of patronage, and that wonderful "human interest" incentive would be brought fully into play.

All seasons, such as Thanksgiving, Christmas, New Year's, Easter, Fourth of July, special local celebrations, carnivals and the like should be taken advantage of in advertising. No expense should be spared in order to have the window trimmed appropriately during the seasons.

Joint Advertising.

Part of the aim in advertising is to impress upon the public the convenience as well as the low cost of operating electrical appliances, and this could not be accomplished without the aid of the newspaper. Fully 75 per cent of those who view show windows, or who come to purchase, have been continually reading the advertisement in the newspapers, proclaiming the benefits to be derived from the use of the goods. The remaining onlookers may only be those who accidentally passed. The newspapers educate and the show windows accomplish the desired end by appealing to the prospective purchaser and instilling the desire to learn more about the appliances shown. Therefore the newspaper is indispensable and should always be used in conjunction with window advertising.

Again we say, bring in the "human interest" motive, and in working out your plot or scenario, as it might be called, attempt always to keep in mind that "pictures of life" are of the most absorbing interest and never fail to attract attention and produce sales.

Electric Cooking in California.—A San Francisco newspaper tells of a hobo who has been following one of the electric traction lines in that state, and cooking his meals electrically. His apparatus is connected between the third rail and the main track. He also carries an attachment intended to connect to trolley wires. A country where electrical conveniences are in such general use, and where the climate permits of sleeping out of doors, would seem to have solved the problem of the high cost of living.

SUGGESTIONS FOR AN INEXPENSIVE WAY OF MAKING YOUR COLLECTIONS.

A Successful System Based Upon Methods of Persistency and Courtesy.

By W. B. Parker.

Slow and bad accounts cause the average business man much annoyance and loss and are often the direct cause of bankruptcy. It therefore follows that any method of handling this class of accounts that shows a maximum of efficiency with a minimum of effort, friction and expense is worthy of serious consideration.

This article will outline a system that is the result of over fifteen years' experience of an attorney and credit man for several large business houses. It is adapted to either a large or small business and has "made good" wherever adopted.

The basic idea is that a business man can, in most instances, handle his own collections to better advantage than by turning them over to collection agencies or others, and that it is neither necessary nor politic to use bluffing or intimidating methods. It has been found that the basic elements of a successful collection system are persistency and courtesy, not bluff and threats. You know that a severe storm, or a series of them, will have small effect on stone, while a constant dropping of water on the same spot will wear it away.

The system here outlined consists of five letters and a legal postal card follow-up system, and will keep after the slow debtor over forty-five days at a total postal cost of not exceeding 20 cents. The forms given for the letters are to be written on the letterheads of the business house using them and the card form on ordinary government postal cards. They will not be nearly as effective if printed and afterwards "filled in" and they are so short that it is not at all necessary to do so, even where several hundred accounts are involved, as only 25 minutes of a typist's time is required on any one account, even if it is necessary to continue the system to the very last card, which will very seldom happen.

When intending to use this system on a certain number of accounts it is best to make an alphabetical list of them on a long sheet of paper, noting the name, address, amount and date of the last item, leaving about an inch of blank space after each account in which to note the dates of mailing the form letters and cards. When an account is paid, or satisfactory arrangements made, it should be crossed off the list, thus leaving a correct list for the next mailing.

Letter No. 1.

Mr. Slow Pay,
Chicago, Ill.
Dear Sir:—
In looking over our books today we find a past due balance standing against you in the amount of $....., running back to .....
Will you kindly mail us your check for this amount or advise us at once if you find the balance incorrect.
Thanking you in advance, we remain
Yours very truly,

Letter No. 2.

Mr. Slow Pay,
Chicago, Ill.
Dear Sir:—
We wrote you ....., regarding a past due balance on your account of $....., running back to ....., and so far have received no reply.
Please let us hear from you at once, so that we will know whether you consider the balance correct, and when we may expect your check.
Yours very truly,

Letter No. 3.

Mr. Slow Pay,
Chicago, Ill.
Dear Sir:—
Our letters of ..... and ..... regarding a past due balance of $..... on your account remain unanswered.
It certainly seems to us that you might at least grant us the courtesy of an answer, even if it is inconvenient for you to send us your check just at this time.
Kindly favor us in this regard, and oblige,
Yours very truly,

Letter No. 4.

Mr. Slow Pay,
Chicago, Ill.
Dear Sir:—
We are much surprised at your failure to answer any of our several letters regarding your past due account. Our letters have certainly been courteous, and we feel that we have treated you fairly in every way.

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You know, of course, that unless we hear from you we will be compelled to adopt other means of collection, which we very much dislike to do.

It will save both of us useless expense and annoyance if you will let us hear from you at once, stating just what you propose to do.

The writer will hold this account on his desk until the morning of ....., and will depend upon hearing from you by that time.

Yours very truly,

Letter No. 5.

Mr. Slow Pay,
Chicago, Ill.

Dear Sir:—

As we did not hear from you this morning we have fully decided to take other steps to enforce settlement of that past due account.

However, a business acquaintance advises us that he believes you to be entirely prompt and reliable, and we have therefore decided to wait a few days longer.

You must certainly realize that your credit standing depends on your fair dealing, and fair dealing certainly requires you to answer our letters.

Of course, we realize it is entirely possible that you have neither received nor read our previous letters personally in view of the statement referred to above we shall expect to hear from you at once.

Yours very truly,

Postal Card Form.

We wrote you ....., ..., ..., ..., and ..... No reply. Why? It is important that we hear from you at once.

Send the letters weekly and cards every other day for 20 days, following letter No. 5, allowing three days for answer to last letter. Fill in the blank spaces in the second line of card form with the dates of the five preceding letters, as 1/1, 1/7, 1/14, 1/21 and 1/28, thus making a second line of dates, *in figures*. Add nothing to the wording of card form except signature, which should be written with pen, down toward right-hand bottom corner of card; do not date.

It will be noted that the first three letters are very short indeed, and yet they say all that is necessary or advisable to say at this stage of the correspondence, and also ask a question that demands an answer whether the debtor is able to pay just at that time or not. They are so mild that they can be sent without giving offense, to perfectly good, but slow, debtors and yet they form an effective basis for the letters that follow to the slower and more doubtful debtors.

The fourth letter takes the place of the usual "threat-to-sue" letter and is fully as effective, without committing the writer to any definite action whatever, but leaves the matter open so that he can effectively continue his mail campaign. The fifth letter is a reversal of the "threat-to-list," or let other business men know of the indebtedness, and is even more effective without being offensive. It flatters instead of threatens and winds up by giving the debtor an excuse for his past failures to respond to the letters that have been sent him.

But some men do not read letters and it does not much matter what you write them. Here is where the postal cards come in. While they say nothing whatever about an account, and are consequently perfectly legal, yet they furnish an inexpensive form of persistency that certainly does get results.

In conclusion, it is emphatically stated that this system will not get money from a man who has none, or secure any other impossible result, but it will bring in the most money out of the past due hundred dollars, if used according to instructions, and it certainly will not involve the user in unnecessary expense or useless litigation.

Window Display Operated by Twelve-Year-Old Girl Wins First Prize.

Winners have just been announced in a window-display contest recently conducted by the National Lamp Works of the General Electric Company. Sixty prizes, ranging in value from an automobile to $5, were awarded, to which were added 80 "honorable mentions" of $1 each. The contest was operated on a basis which gave each distributor of Mazda lamps equal opportunity to win any of the 50 general awards or the special award offered for distributors in his class or territory. One feature which stimulated interest in the contest was the stipulation that any contestant was privileged to enter as many displays as he wished, though no single display could win an award under more than one classification.

Window Display That Won First Prize in Contest.

Entries were judged on scale of ten points, divided as follows: Selling value, five points; attention value, two points; unusual ideas, two points; harmonious arrangement, one point. The judges were Homer E. Niesz, Commonwealth Edison Company, Chicago; A. J. Edgell, Society for Electrical Development, president of the International Display Managers' Association, and N. H. Boynton, manager Publicity Department, National Lamp Works.

First prize was awarded the Lehigh Valley Light & Power Company, Allentown, Pa., for a clever display which told a convincing story about National Mazda lamps by means of a series of 17 placards operated by a 12-year-old girl. The window was arranged to represent the library of a home, with lamps and the placards as the center of attraction. So effective was the display that over 1,500 lamps were retailed during the two days it was on exhibition.

Ingenious Maintenance of Service in a Moving Telephone Exchange.

"Service First" is coming to be more and more the slogan of utility companies, and many ingenious schemes have been resorted ot in order to maintain service continuously, or to restore it as speedily as possible after an emergency interruption. A most original achievement in this line must be credited to R. E. Alleman, of the Jennings (Okla.) Telephone Company.

The Jennings company recently bought a 330-line Western Electric switchboard, which was originally installed in a one-story frame building. The building was hardly up to the standard of the rest of the telephone company's equipment, so Mr. Alleman soon decided to erect a two-story brick building of more pretentious size and appearance.

It was planned to use the same ground lot, so one morning the old frame building, operators, switchboard, office and all, were moved bodily into the street, and construction on the brick building began. Telephone service had not been interrupted an instant. The average man would have been satisfied with a performance of this kind, but to Mr. Alleman, who has a store of ideas on uninterrupted service, it seemed almost commonplace.

The switchboard room in the new building is on the second floor. Before the work was quite complete a frame elevator was erected upon the sidewalk between the old and new exchanges, and everything placed in readiness. On moving day the switchboard and its two operators were rolled out of their old exchange, into the elevator, hoisted to the second floor, and rolled inside, without losing a single connection.

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REFERENDUM ORDERED ON MAINTENANCE OF RESALE PRICES.

Committee of the Chamber of Commerce of the United States Presents Exhaustive Report.

The Board of Directors of the Chamber of Commerce of the United States have voted that the report of a special committee of the National Chamber on the maintenance of resale prices shall be submitted to referendum. The committee had reported to the Board that it was not able to present a unanimous report.

There are ten members of the committee. Its chairman is Paul T. Cherington, a professor in the Harvard Graduate School of Business Administration. The reports of the different groups of the committee cover something like 19 printed pages, and have 75 pages of appendices.

A majority recommendation favoring legislation permitting price maintenance was signed by seven members, two of them, however, modifying their assent by filing a supplementary report. With the majority report came the comment that a National Chamber committee had rendered a report last February favorable to the principles of price maintenance and the majority members saw no reason in any way to modify the conclusions arrived at and given to the Chamber at that time.

Back Up Report Favoring Price Maintenance.

"But on the contrary," the comment continued, "after additional exhaustive investigation by consulting a large number of organizations, composed of many thousands of members in all branches of trade and industry, as well as many individual producers, distributers and consumers, and after having collected evidence from a great many sources, we repeat the language of the committee's previous resolutions of February, 1915, as our report and conclusions, viz.:

"'Your committee is convinced that legislation permitting the maintenance of resale prices, under proper restrictions on identified merchandise, for voluntary purchase, made and sold under competitive conditions, would be to the best interest of the producer, the distributer and of the purchasing public, or consumer.'"

Federal Trade Commission Aid Suggested.

The supplementary report, signed by two members who also signed the majority report, recommended that injurious price cutting be included within the scope of the jurisdiction of the Federal Trade Commission over unfair methods of competition.

Advantages Argued for Price Maintenance.

Conclusions of the majority are that the advantages of price maintenance are partly economic and partly social.

(1) A properly regulated system of price maintenance on identified merchandise made and sold under competitive conditions puts the emphasis in competition upon quality and service, while at the same time, it provides for the public adequate protection against extortion.

(2) Price maintenance under these conditions preserves the social advantage of an adequate incentive to invent and devise new products.

(3) Price maintenance under these conditions serves to prevent monopolistic control of production processes by powerful distributors.

(4) Price maintenance under these conditions preserves the social advantages of such distribution conveniences as are represented by neighborhood stores and by small, but skillful merchants. In some trades, it is the sole guarantee of the preservation of the accepted system of distribution. For instance, it assures the preservation of the book stores as individual enterprises. If the social value of such factors as these is less than their economic cost they are not worth preserving. But who is ready at this time to encourage their annihilation? It is noteworthy that the agitation in favor of restoring to producers the control of resale prices originated with the small, independent retailers, and that most of the opposition to it comes from the large and powerful retail concerns.

(5) The right of the producer to set resale prices is an accepted principle of business law. It has been restricted recently in this country by close decisions of the Supreme Court, none of which was decided on the basis of general principle alone. The committee believes that in the long run the public interest will be best served by legislation specifically permitting this method of doing business in identified articles made and sold under competitive conditions.

Proposed Federal Trade Provisions.

Signing the supplementary report were E. S. Rogers and Professor Cherington. It proposes to insert in Section 5 of the Federal Trade Commission Act in statutory language provisions which will have the following effect:

In regard to products that are identified in their sale to the public by name, brand, or trade-mark—and that are made and sold under competitive conditions: No merchant, firm, or corporation shall offer such articles for sale at a price other than that stipulated by the producer for the original sale of the articles at retail (provided the producer has given due notice of such price to the retailer by mark upon the article or otherwise); with the purpose or effect of (a) Making it unprofitable for other retailers to handle said articles. (b) Promoting the sale of a substitute or imitation. (c) Attracting trade away from competitors, where the result is to injure the reputation of said articles or the good-will of their producers or materially to impair the general distribution of said articles.

While the work of the committee has been confined in its instructions to identified merchandise, it believes that the principle involved in this recommendation is capable of extension to a much wider field and that the predatory cutting of prices on merchandise in general has been and is a favorite method of oppression on the part of unfair business to destroy small competitors and local producers and that legislation could very properly define such practices as an unfair method of competition.

Oppose Federal Legislation.

With the formal report which makes its adverse recommendation in a space of four lines, the minority filed an explanatory statement. They take the ground that the recommendation of the majority is directly contrary to the conclusions of Federal and State courts on matters of principle, that the right to fix resale prices supposed to exist for a short time was never understood to exist except as an incident to patents, and that anti-trust provisions in the constitutions and laws of twenty-nine states indicate a policy expressly inconsistent with the idea of maintenance of resale prices. The minority dwell upon the importance of trade being "unhampered and unshackled by the requirements or commands of any men, or combinations of men, or any systems whatsoever," recalling the well-known principle of the common law that there could be no valid restrictions governing the transfer of articles of trade from hand to hand. Finally they take the stand that legislation legalizing price maintenance will give rise to a situation such that it will become difficult for men who seek to enter manufacturing and small merchants to establish themselves.

With the minority report, as with the majority, a brief of the law as interpreted by this side is printed.

Russian Nitrogen Plant.—A plant for the fixation of atmospheric nitrogen is to be established in the northern part of Russia, near the White Sea. It will use the Birkeland-Eyde process.

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PUBLIC SERVICE COMMISSIONS

A Resume of Important Decisions of the Week Affecting Electric Utilities

MAINE.

The Bethel Light Company has asked approval of an issue of new stock to the value of $21,000, the proceeds to be used for the purchase of property of the Morrill Springer Company, Bethel, Me. A hearing will be given by the Public Utilities Commission on February 15, at Augusta.

Limerick Water & Electric Company. The Limerick Water & Electric Company has petitioned the Public Utilities Commission for authority to purchase the property of the Steep Falls Lighting Company, and the latter company asks permission to sell. A hearing will be held on the two petitions at Augusta.

KANSAS.

Judge C. F. Foley, of Lyons, Kan., has been reappointed by Governor Capper as a member of the Public Utilities Commission of Kansas, for a term of three years. Judge Foley was appointed December 8, 1913, to fill the unexpired term of Henderson S. Martin, who resigned to become vice-governor of the Philippine Islands.

MARYLAND.

Testing facilities and voltage variation were the principal topics taken up at the first day's session of the conference between representatives of Maryland light and power companies and the Maryland Public Service Commission. It is proposed to require, according to the rules which were prepared by Chief Engineer Phelps of the Commission, that each utility company shall after May 1, 1916, provide portable indicating voltmeters for testing voltage regulation and that each utility serving more than 250 consumers shall in addition provide one or more portable recording voltmeters giving a continuous record of not less than twenty-four hours' duration. The records made shall be preserved for the inspection of the Commission. Testing equipment for service watt-hour meters, switchboard instruments, recording voltmeters and other electrical instruments in use must be provided by March 1 next. Reference standards of all kinds will be adjusted by the Commission at least once a year.

NEW YORK—First District.

Governor Whitman appointed Travis H. Whitney, the present secretary of the Public Service Commission of the First District, as Public Service Commissioner to succeed J. Sergeant Cram, whose term expired February 1; and Charles S. Hervey, deputy comptroller of the City of New York, as Public Service Commissioner, to succeed George V. S. Williams, who resigned January 31. Governor Whitman has now made five appointments to this Commission—the full membership.

The Public Service Commission for the First District has requested the Interborough Rapid Transit Company to make provision for supplying electric current to the New York Municipal Railway Corporation for the operation of its lines under the Dual System contracts. These contracts allow the New York Municipal Corporation to purchase power for ten years after the new system is placed in operation. The Interborough will have power-house capacity to produce much more current than it will need for the operation of its own system, and the Commission therefore suggests that it will be a saving both to the companies and to the city if it should allow the New York Municipal Corporation to purchase the needed power. In this connection the New York Municipal Railway Corporation recently submitted a proposal to the Commission to purchase power from the Transit Development Company at a flat rate of one cent per kilowatt-hour. The Commission disapproved this proposal on the ground that the flat rate was too high. No reply has yet been received from the Interborough Company.

PENNSYLVANIA.

Towamensing Electric Company.—An opinion has been filed by Commissioner Breit overruling the objections filed by the borough of Lansdale to the granting of a certificate of public convenience to the Towamensing Electric Company, to operate in the township of that name in Montgomery County, and the charter application will be sent to the governor. The decision was rendered in a case which has attracted general attention because of the effect it may have in other parts of the state. The borough furnishes power to consumers living outside of its limits and declared through its representatives that it was furnishing enough to meet the demand.

The opinion says that the borough claims to have the right to furnish power outside of its corporate limits, under the borough code, but this question need not be determined now, said the Commission. It is declared "it could not be safely maintained when service is furnished from the surplus current of a municipal plant, that the same diligent effort will be made to develop the territory and install facilities within the reach of everyone desiring service as would be the case with a private company, since the latter is always more or less engaged in seeking ways and means of pushing forward its plant operations."

Philadelphia Electric Company.—In presenting testimony before the Commission in the case of the City of Philadelphia vs. the Philadelphia Electric Company, President Joseph B. McCall, of the latter company, gave some interesting figures tracing the development of his company since its incorporation.

In submitting estimates of the present value of the stock of the company, Mr. McCall said that the Philadelphia Electric Company, of New Jersey, was incorporated on October 5, 1899, with a capitalization of $25,000,000 at a par value of $25 per share. The first assessment on this stock, amounting to 10 per cent, was made on November 1, 1899, and the last one, an assessment of 20 per cent, was made on December 1, 1913. The capital stock issued, he said, totals $24,987,750. Only $18.50 per share has actually been paid in, $4 having been credited to the stock from the surplus of the earnings. The average returns to stockholders since 1899 have been 7.42 per cent.

Mr. McCall also showed that $15,014,142 worth of securities have been issued, and that the total number of share and security holders is 14,300. He said the Philadelphia Electric Company, of Pennsylvania, the defendant, was incorporated on October 27, 1902, with an authorized capital stock of $25,000,000 of which $17,000,000 has been issued at a par value of $100.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hubbell Three-Wire Plugs and Receptacles.

Although portable electrical appliances that can be operated from extension cords with attachment plugs are now almost invariably of the two-wire type, there is likely to be an increasing development of such devices for three-wire service. Thus there may be calls for three-wire, two-phase or three-phase motors, or split-phase, single-phase motors, triple-voltage, direct-current motors, larger electric heaters or other devices that require three-wire service direct to the device itself.

Anticipating these and other already developed needs, the firm of Harvey Hubbell, Incorporated, Bridgeport,

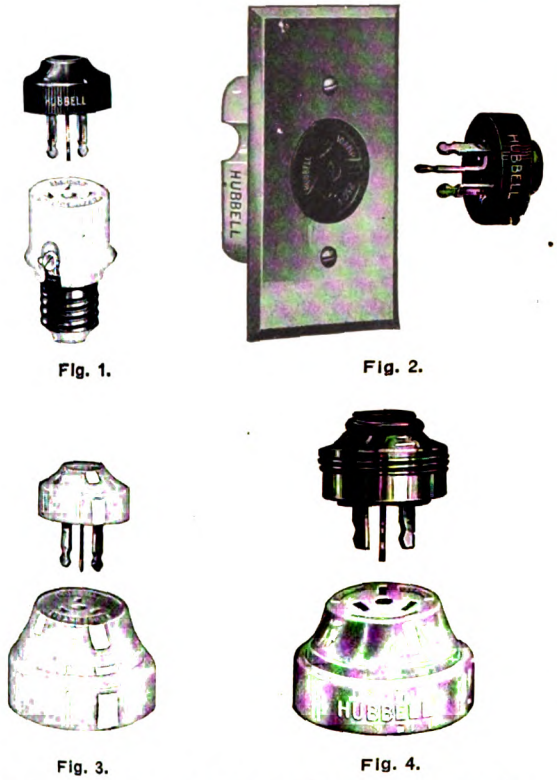


Fig. 1. Fig. 2.

Fig. 3. Fig. 4.

Several Forms of Hubbell Three-Wire Plugs and Receptacles.

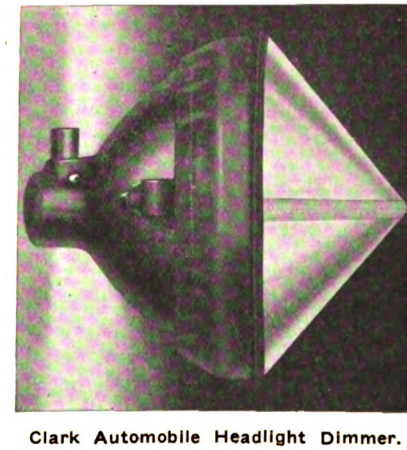
Conn., has placed on the market a line of three-wire attachment plugs and receptacles. Fig. 1 shows the separable plug, which has a composition cap and special porcelain base. A three-wire flush wall receptacle with the same type of plug or cap is shown in Fig. 2. A porcelain receptacle with two kinds of caps is shown in Figs. 3 and 4; one of these is the composition cap, while the other is metal-covered.

In all cases it will be observed that the three contacts of the cap as well as the slots in the receptacle or base part are arranged so as to insure putting the two parts together in but one way, which is always the right way. This arrangement was used to insure proper polarity in case of direct-current circuits and of proper connection of the neutral where a neutral wire is included in the three-wire supply. The longer contact and the radial slot are always made neutral. This contact is made first and broken last.

Among the uses for this new line of plugs and receptacles already developed is on portable telephones in restaurants, hotels, etc., on double bell systems operated from extension cords with two push buttons; for grounding the frames of electrically operated cash registers, the neutral contact being connected to ground. This type of plug will likely find many other useful applications.

The Clark Headlight Dimmer.

The accompanying illustration shows a new diffusing dimmer designed for automobile headlights which effectively prevents glare and at the same time permits of an adequate driving light being projected to the roadway. The Clark dimmer is made of pyraline with an expansible material that fits snugly over the outside rim of the headlight, which holds the dimmer in position regardless of



Clark Automobile Headlight Dimmer.

weather conditions. It has a seam through the center which permits of its being collapsed when not in use.

The Clark dimmer is being manufactured by the Cherry-Clark Guard & Dimmer Company, 115 South Dearborn Street, Chicago.

Improved Form of Horn-Gap Lightning Arrester.

The horn-gap lightning arrester is the simplest device of the kind, and on account of its inexpensive and rugged construction is still used very extensively despite its disadvantages. The principal one of these is that when it flashes over to relieve excess potential on the line it discharges not only this excess, but also practically short-circuits the line. This action, although entirely effective in relieving the excess pressure, is needlessly violent and disturbs the continuity of service.

To overcome the disadvantage of this form of arrester and at the same time utilize its simple and rugged features, there has been invented and patented by E. O. Schweitzer

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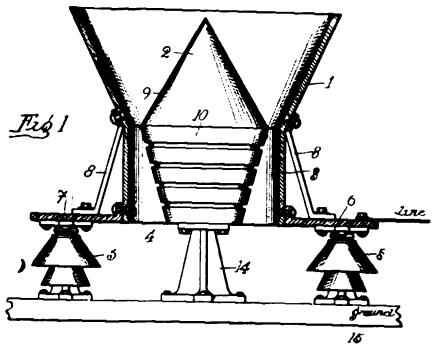

One Form of Improved Horn-Gap Arrester.

and N. J. Conrad, of Chicago, an improved form of horn-gap arrester. The idea in this improvement was to develop means by which the arrester will discharge only the excess pressure and not the line pressure. This is done by providing a series of selective discharge paths of different discharge capacity, those of lower capacity coming into use as soon as the pressure reaches a predetermined excess over the line pressure. The paths of greater discharge capacity come successively into use in case the first path is insufficient to relieve the pressure.

In carrying out this idea a variety of forms of arresters can be developed, one of which is to use a modified horn gap including a series of spark gaps through which the potential is discharged through resistance, the setting of the gap determining the excess of pressure required to cause the discharge and the resistance in the circuit of the gap determining its discharge capacity. Thus the short gap with high resistance in series is adjusted to break down first, the next gap breaks down after this and so on throughout the series.

However, to counteract the tendency to break down and discharge which occurs in the gap adjacent to the one which is discharging, there is provided a powerful blowout arrangement. This is made in two forms, in each of which the arc is compelled to move out and break itself regardless of the rate of discharge at the point of formation. At the same time that the arc moves the current constituting it is caused to decrease.

The manner in which this combined action is produced is by sectionalizing one or both of the electrodes and inserting resistance between the sections; also by depending upon the lengthening of the arc itself between the electrodes. Consequently the arrester has the property of preventing formation of an excess discharge and also of breaking any discharge which does form. It can, therefore, be set at a relatively low value.

A simple form of this arrester which discloses this principle is shown in the accompanying illustration. The outer electrode *1* is funnel-shaped at the top and cylindrical at the bottom. Mounted within it is the grounded electrode *2*, which is of conical form at the top and sectionalized below. Between the sections are inserted resistances of graded value. In other forms of this arrester the lower portion is closed and the upper portion is given various shapes. The blowout arrangement in this case is due to the explosive action of the heated air which drives the arc upward. In the case of the open type, such as shown in Fig. 1, the blowout action is due to powerful convection currents in the chimney-like arrangement of the lower portion of the device. Another advantage of this form of arrester is that it is protected from wind and weather disturbances so that its action is much more reliable and uniform than in the case of the ordinary horn gap commonly used.

These arresters are being developed by the firm of Schweitzer & Conrad, Incorporated, 1770 Berteau Avenue, Chicago, Ill.

Small, Light Fan for Travelers.

For a commercial or professional man that is called upon to travel a great deal, one of the most disagreeable features is to be compelled to put up at a hotel with stuffy rooms. Traveling men need good, sound sleep as much as anyone else, and a compact, light-weight electric fan that can be readily packed in a grip and carried along on the trip promotes such sleep. To meet the need the Fulton-Bell Company, 105 West Fortieth Street, New York City, has developed and marketed a special fan known as the "Little Giant," on account of its power in comparison to its size and weight. Complete with cord and plug it weighs 2.5 pounds. Its blades are 4.5 inches in diameter. It has a universal motor suitable for connection on any lighting circuit of from 110 to 130 volts. The fan is nicely finished and well built. It has speed adjustment, giving ready control of the breeze. Although designed especially for traveling use, it also serves admirably in small confined inclosures, or in providing just enough breeze for one person.

Electric Radiators for Use in Electric Vehicles.

One of the strong points which has made the electric vehicle popular, particularly with lady motorists, is the great comfort attainable in the usually well furnished closed body of the car. While this is itself a protection against the inclemency of the weather, there are times in winter when additional warmth is desirable. A type of electric radiator to meet this requirement has therefore been placed on the market by the Lee Electric Radiator Company, 629 Peoples Gas Building, Chicago. This radiator is of the same general type as the one described in the Electrical Review and Western Electrician November 27, 1915. From external appearance it looks as if it might be a hot-water or steam radiator, but in fact its two coils are filled with an insulating liquid and in the lower portion of the coils the heating element is mounted. This latter is an open coil which, when operating from the 80-volt battery circuit usually provided for electric vehicles, takes about 3.9 amperes and very quickly gives the radiator a temperature of about 190 degrees Fahrenheit.

The radiator is made of cast-iron sections 15 inches high and has three square feet of radiating surface. It is attached to a base plate which can be secured to the floor of the car to insure stability. This outfit is compact and takes up very little room.

Electric Radiator Keeps Pleasure Car Comfortable.

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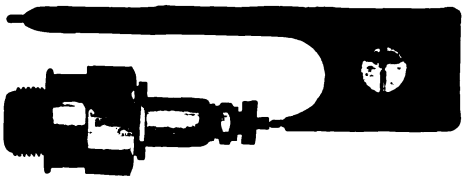
A New Spark-Plug Tester.

A simple and convenient tester for spark plugs on automobiles, motorboats, motorcycles, etc., is being put out by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa., under the name of the Royal tester.

It consists of a crotch containing the spark gap and two legs containing the terminals. One leg is three inches longer than the other so as to permit of handy contact.

When the plug is good, the tester shows the regular spark. If it is short-circuited, it will show no spark. If the porcelain is defective, the tester will show an irregular



Royal Tester for Spark Plugs.

spark. If the motor has no power, the tester will show a clear spark, indicating that the trouble is in the mixture. When there is a knock in the motor, the tester will magnify the knocking noise and thus locate it.

The tester is made of hard rubber with rounded corners. It is light in weight and only five inches long.

Orr & Lockett Drilhammer.

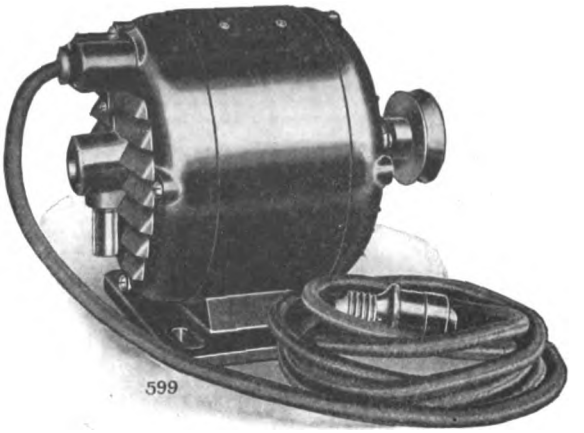
With the renewed activity in electrical construction work throughout the country, the Orr & Lockett Hardware Company, 14 West Randolph Street, Chicago, reports considerable activity in the sales of its Drilhammer, a tool especially designed for electrical contractors for drilling holes in any material except wood and metal. The Drilhammer, which is made in two sizes, is said to effect considerable saving in time over other methods. An extended description of this tool appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 17, 1914. It has a one-piece malleable handle which when revolved transmits centrifugal force to two hammer elements which deliver upwards of 975 blows per minute upon the drill.

Skeleton View of Drilhammer, Showing Internal Construction.

Washing-Machine Motor Has New Feature.

A new line of motors of special design has been developed by the Robbins & Myers Company, Springfield, O., for washing-machine service.

The end heads of this motor are cast in a form which serves to exclude from the interior any water that may splash on the motor. At the same time a free circulation of air is permitted through the motor, ventilation being assisted by a fan on the motor shaft. The base, which is provided with four holes for fastening the motor to the machine, is cast separately and attached to the motor frame



New Type of Robbins & Myers Washing-Machine Motor.

by four screws. It may be attached to the top of the motor, permitting of overhead mounting without making it necessary to turn the motor over. The motor terminals are protected by an iron box and the reinforced cord enters through a rubber bushing. A grooved pulley is provided. The bearings are made of phosphor bronze and are lubricated by wick oilers, the lubricating system being constructed to prevent any leakage and resultant soiling of clothes.

The motor is manufactured for direct-current lines of standard voltage and for alternating-current lines of standard voltages and frequencies. The rated speed is 1,750 revolutions per minute for the direct-current and 60-cycle alternating-current motors.

Haag Twin Washing Machine.

The use of electric power for driving washing machines relieves the housewife or laundress of the strenuous work involved in washing clothes, thus leaving her free either to engage in other duties, or to do the washing in a more

Haag Twin-Tub Electric Washer.

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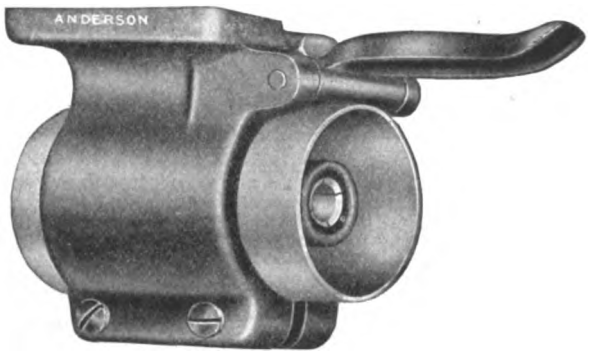
intensive manner. To develop the latter idea the Haag Brothers Company, of Peoria, Ill., has brought out a new form of washing machine called the Haag twin washer, because it uses two tubs in either or both of which washing may be carried on while clothes are being rinsed, blued and wrung dry.

The two tubs are made of heavy white cedar and are mounted side by side on a strong steel framework with a folding extension rack for holding a clothes basket and rinsing or bluing tub. Each of the twin tubs can be drained through hose connection. Each tub has a separate control connection with the motor drive so that it can be operated independently or with the other. The covers are also so arranged that, if desired, closing of either cover starts the washing operation in the corresponding tub. The wringer is separately controlled and easily reversed, it can be swung into any desired position and locked in place. A one-fourth-horsepower Robbins & Myers motor supplies all the power. It is mounted under the machine so that it is well protected from injury.

This washer is substantially built in every particular and is designed primarily for heavy service. Its use doubly facilitates handling a large batch of clothes.

Anderson Charging Receptacle and Plugs for Electric Garages.

Some time ago it was realized by the electric-vehicle interests that in order to increase the facility of charging the



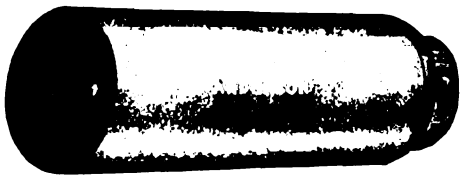
Anderson Charging Receptacle for Electric Vehicles.

batteries of electric pleasure and commercial cars it would be necessary to standardize a form of charging receptacle and plug so that a vehicle could run into any garage provided with charging facilities and secure either a complete or boosting charge. Standard specification governing the dimensions of such receptacles and plugs was therefore drawn up by a committee of the Electric Vehicle Association of America and the Electric Vehicle Committee of Great Britain also adopted these specifications.

The standard specifications chosen were those employed in the type of charging receptacle and plug manufactured by the Albert & J. M. Anderson Manufacturing Company, Boston, Mass. The wisdom of this selection has been borne out by the uniformly satisfactory results obtained from the use of these plugs and receptacles. Their design meets both the mechanical and electrical requirements for a device of this kind, which must withstand severe service on the part of truck and garage attendants. The form of receptacles provided on vehicles is shown in Fig. 1, wherein there is an iron clamp, by means of which the device is mounted on the body of the car. A spring lid, shown open in the cut, is mounted on front to protect the terminal contacts from moisture, dust and dirt. The shell of the receptacle is a seamless drawn-steel housing, which thoroughly protects the current-carrying parts, which are securely mounted within it and carefully insulated by means of a compound possessing special heat-resisting properties. The shell forms a bearing for the correponding steel shell of the plug, Fig. 2, and thereby relieves all contact parts of mechanical strain. Special terminal lugs provide connection with the connecting cable. A unique feature of these receptacles and plugs is that they are positively polarized so that it is impossible to connect the vehicle battery in the wrong direction.

The connecting cable used between the vehicle and the garage or other charging outlet is provided with a plug at each end. This fits into the vehicle receptacle, Fig. 1, at one end, and at the other end into the permanent receptacle forming the charging-circuit outlet. This latter receptacle is of similar standard design, at least as far as the contacts are concerned, but is arranged to be mounted in several different ways. One of these is by means of a ball-and-socket joint, which permits not only more convenient arrangement of the cable without excessive bending, but has another advantage in that it permits automatic instant disconnection of the connecting cable from the charging receptacle without damage to any part in case the vehicle should be started up without first disconnecting the cable. Another form of the garage receptacle is arranged for mounting on the ceiling. In this case a ball-and-socket arrangement is also used. These receptacles are also made for switchboard mounting or for mounting outdoors.

These battery-charging receptacles are being used very extensively in all the most up-to-date electric garages. A noteworthy installation thereof recently completed is in the electric truck garage of the Stroh Brewery Company, Detroit, Mich., which was described and illustrated in our issue of January 1, 1916.



Plug at End of Charging Cable.

Star Electric Fans.

A line of pressed-steel direct-current fans is now being marketed by the Fullerton Electric Company, 109-115 West Twenty-sixth Street, New York City. These are known as the Star fans, and are made in 12 and 16-inch desk and bracket types, both non-oscillating and oscillating. The voltage is 110 to 115 or 200 to 240. A ready change of angle and manner of mounting is obtained by the swivel and trunnion adjustments. The oscillators have a carefully designed oscillating gear mechanism provided with safeguards to prevent overturning the outfit or burning out the motor in case obstructions are met with. The oscillation is readily adjustable.

Vesta Centrifugal Electric Power Transmission for Automobiles.

The announcement by the Vesta Accumulator Company, 2100 Indiana Avenue, Chicago, of its centrifugal electric power transmission comes at a very opportune time, as it is generally admitted by automobile engineers that the electric transmission will supplant the old methods in the future cars. This firm has been working for a number of years in developing a transmission system which has been designed by William Morrison. A number of cars have been equipped with this transmission, one of which has been used for nearly four years. The main difference in the Vesta transmission as compared with other electric transmissions

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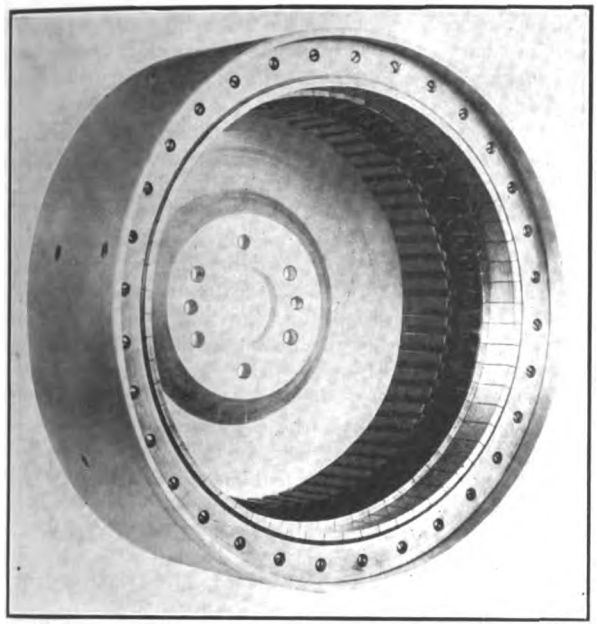
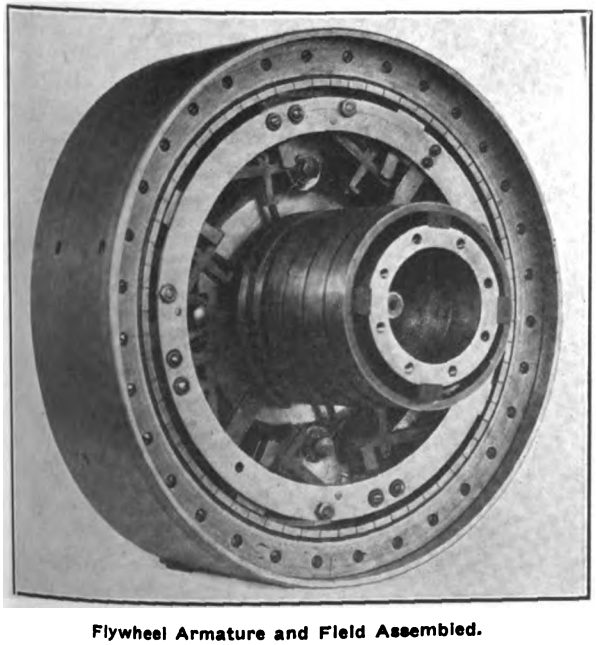


Flywheel Armature of Vesta Electric Power Transmission for Automobiles.

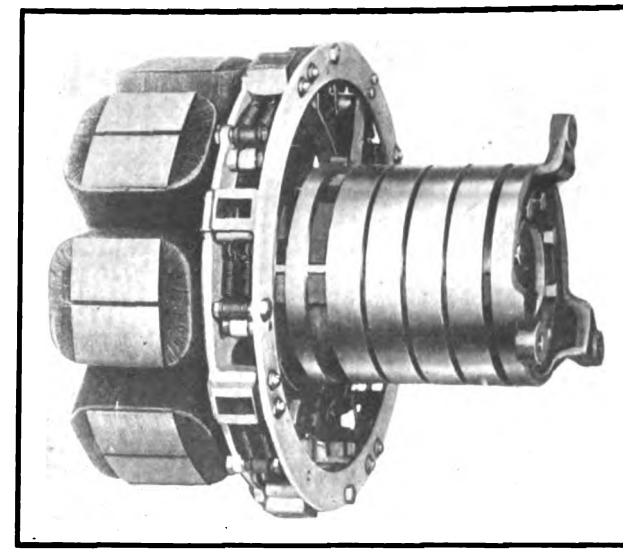
is that it does not transfer its energy with the exception of the small amount used for cranking the engine and lighting the lamps.

Centrifugal force is the important factor depended on for efficiency and economy in operation, as well as acting as an automatic regulator for the generator system. It is claimed that it totally prevents any danger of burning out the armature or fields regardless of the length of time in operation, even under the most adverse road conditions. It is also said to act as a perfect regulator for the battery system, preventing injury to the battery under the most adverse conditions.

The equipment consists of two main parts, the armature and the fields. Unlike the average motor or dynamo, the fields are on the inside and the armature on the outside. The armature is the flywheel itself and is bolted direct to the flange on the crank shaft of the engine. The flywheel armature is in the shape of a drum in which are mounted the armature laminations and form windings. There is used an internal commutator which is fastened to the outer edge of the armature drum. The fields are fastened to the propellor shaft and are mounted inside the armature on



Flywheel Armature and Field Assembled.

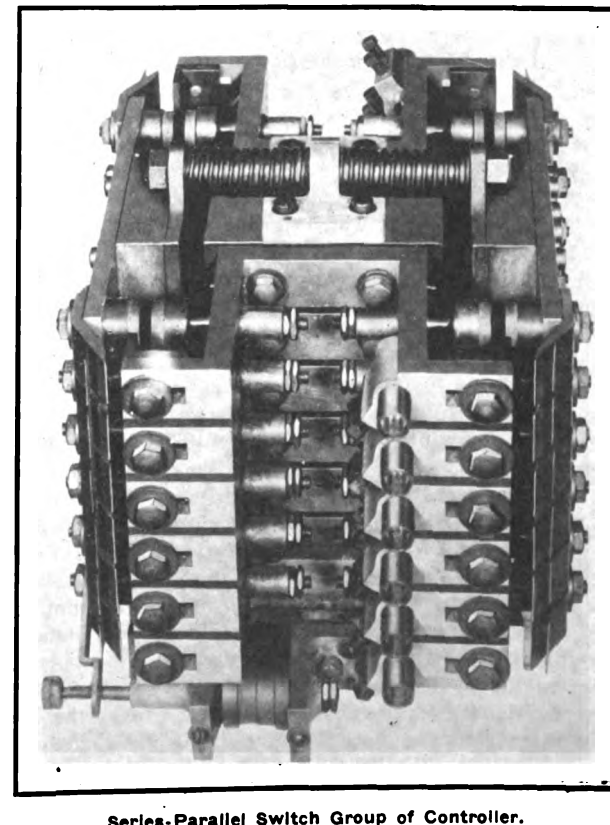


Revolving Field and Centrifugal Brush Which Fits Inside of Armature and Commutator.

the crank-shaft extension, and rotate freely on roller bearings.

The brushes, which are a part of the field unit, press outwardly against the face of the internal commutator. When the car is running, these brushes exert pressure against the commutator, due to centrifugal force so that when the car has reached a speed of 15 miles or more, driving on a level roadway, the force is sufficiently great to prevent any slip between the fields and armature. This centrifugal force can be governed by weighting the brushes themselves to the desired amount.

With this construction, one can readily see that great flexibility can be obtained in starting the car or on the pick-ups, and as the car increases in speed, the greater the centrifugal force the less the chance of slip. The slip that occurs in starting is not wasted but is used to generate electricity to charge the battery, keeping it in a fully



Series-Parallel Switch Group of Controller.

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charged condition at all times. The battery in this system actually floats on the line, there being no danger of injury by overcharging.

An excellent demonstration of the centrifugal-force factor was shown in demonstrating this system. When a speed of 20 miles an hour was reached, the driver disconnected all electric circuits, and at will maintained or increased the speed of the car from that point on.

The operation of the car is extremely simple. The car starts in high, goes through all ranges of speed, from nothing to the highest speed of the car by simply feeding it gasoline, the electrical and centrifugal action being entirely automatic with the fuel feed.

The pushing of the starter button connects the battery, fields and armature. The fields are held stationary by an automatic locking arrangement and the flywheel armature is revolved around them. This automatic locking arrangement does not make it necessary to apply the brakes to hold the field stationary in the starting operation.

The operation of the "gas" lever or accelerator makes an electrical connection automatically between the battery, fields and armature so that when the throttle is advanced, the internal fields immediately try to catch up with the revolving armature, through magnetic pull, assisted by the increasing centrifugal force.

Owing to the extreme flexibility of this device, it is impossible to stall the motor. When the gas throttle is fully retarded, all electric connections are broken and the car coasts until it stops by itself unless the brakes are applied.

The controller is a simple parallel and series switch mechanism operated electrically and is entirely automatic with the gas feed. The pushing of the starter button operates the series side of the controller, causing the batteries to be thrown in series to a 24-volt, 50-ampere-hour connection. the operation of the gas throttle or accelerator, automatically causes the other, or multiple side of the controller to regroup the batteries to a parallel or 6-volt, 200-ampere-hour connection. The construction of the controller makes it impossible to close both series and parallel circuits at the same time. The starting of the car, as well as the speed, is entirely regulated by the feeding of the gasoline, the electric connection being entirely automatic.

The use of electric motors has demonstrated the wonderful life of this kind of machinery. In tests made on this system, the brushes, which are 2.5 inches long, showed three sixty-fourths-inch wear on a car that had traveled 12,000 miles.

For reversing the car, as well as in emergency cases, such as pulling out of a ditch, etc., an ingenious electric compound system is used, which is operated electrically by push buttons on the steering wheel column. This is done absolutely without shifting any gears, and any amount of torque desired can be given.

As over 95 per cent of all running, as well as starting of the car, is done in direct drive, the Vesta engineers feel that only one low speed is necessary. They also show a car equipped with a direct speed and two selective speeds, all of which compound one on another. This compounding allows many times the torque that is possible to attain with the selective system of gears.

These low speeds can be selected and compounded on the reverse, which of course gives as many speeds backward as forward. In demonstrating the car it was shown that by simply touching a button one can go from low speed to high, as well as from high to low speed, instantly and without any jar, noise or vibration.

Due to the flexible connection between the engine and the rear axle, the jerks caused by traveling over the road are not transmitted to the engine itself as is the case where a rigid clutch is used. This feature prolongs the life of the engine itself.

The explosions in the cylinders coming against flexible connection are not transmitted with so severe a shock as in ordinary construction. This results in longer life to the wearing parts of the entire mechanism of the whole car, including the tires.

It is the belief of the Vesta engineers that, weight for weight and running over a given roadway, greater mileage will be obtained per gallon of gasoline than with any other system known. It has also been noted that on a car that has been driven 6,000 miles, equipped with Silvertown cord tires, there was no appreciable difference in the wear of the front and rear tires, as indicated by the small grooves in the tires, the tires themselves showing practically no wear.

It is also interesting to know that in weight, this system supplants the parts eliminated thereby, adding no additional weight to the car, and that its cost just about offsets the parts that it supplants in the old construction.

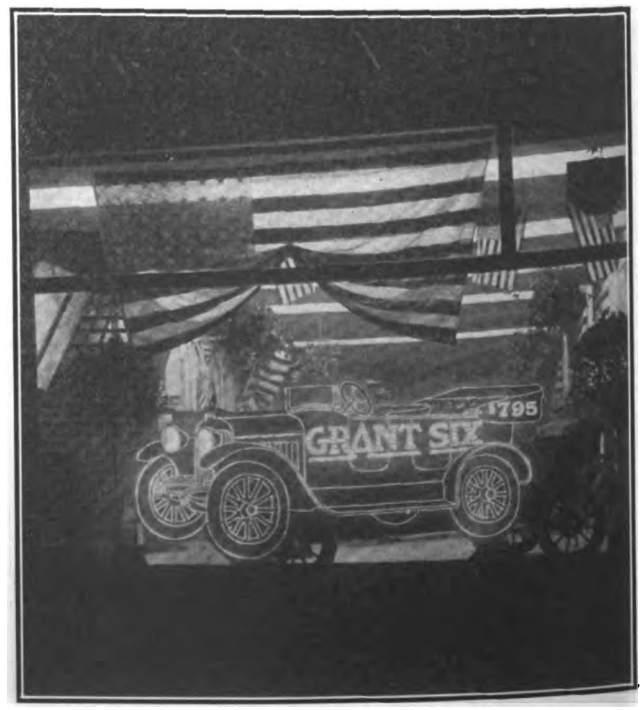
The intention of the Vesta Accumulator Company is to furnish this system to the entire automobile industry, or license its use to such manufacturers who wish to adopt it. This system is fully protected by a series of United States and foreign patents.

New Electric Sign Makes Use of Illuminated Convex Reflectors.

The value of illumination as a medium for attracting attention, and the use of electricity for purposes of illumination, is now so well recognized that the spirit of the modern city has come to be gauged as much by the effectiveness of its lighting system as by the character of its buildings and streets.

One of the newest applications of electrical energy to advertising is that brought out by the Economy Electric Sign Company. This company is manufacturing a patented electric sign made up of illuminated convex reflectors. Designs are worked out in tin, and by means of punchings, which are made convex and retained in the sign as reflectors, any portion of the design may be brought out by illumination, electric lamps being so placed as to reflect the light from the reflectors in a direction vertical to the sign. Besides economy of operation, in large signs, it is claimed that small and intricate designs may be easily worked out and illuminated.

The Economy Electric Sign Company has established offices at 1725 Michigan Avenue, Chicago, Ill.



New Type of Electric Sign in Store Window.

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INDUSTRY ACTIVITIES

A. F. Daum, Pittsburgh, Pa., has issued Bulletin H-18, which is a price list of Daum Types "B" and "E," and midget fuses, fuse strips and refillable plug fuses.

Roller-Smith Company, New York, N. Y., has prepared a folder showing an oscillograph record of one of its 80-ampere circuit-breakers opening a 575-volt circuit at 3,310 amperes.

The Campbell Electric Company, manufacturer of electrical time switches and appliances, Lynn, Mass., has completed plans for a six-story addition, 110 by 50 feet, to its manufacturing plant.

Westinghouse, Church, Kerr & Company, engineers and constructors, New York, have issued a neat four-page booklet which illustrates some reinforced concrete work recently completed by that company.

The Emerson Electric Manufacturing Company, St. Louis, Mo., has issued the February number of *The Emerson Monthly*, which is devoted to descriptive matter about Emerson fans and motor applications.

Dossert & Company, New York, N. Y., announce that the Delta Star Electric Company, Chicago, has ceased to act as its representative and for the present the former company will not establish an agency in that city.

The Century Electric Company, St. Louis, Mo., has prepared a four-page folder illustrating the installation of its line of single-phase motors for duty where a minimum of attention is paid to the machines, being either controlled automatically or from a distance.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is distributing a four-page folder telling of the increases in lifting capacities of its high-duty magnets and illustrating some of the applications of industrial motor control apparatus manufactured by the company.

The Robbins & Myers Company, Springfield, O., is sending out a folder giving information on its line of dealer fan-selling helps. A striking window display cut-out is illustrated. The company has also issued illustrated price lists in booklet form for its lines of fans with drawn-steel frames and with cast-iron frames.

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the opening of a new office in the Mills Building, El Paso, Tex., with F. B. Hitchings as local manager. This new office is under the supervision of O. H. Davidson, district manager of the Wagner company, whose headquarters are in Denver, Colo.

Utility Company Gives Employees Life Insurance.—The Arkansas Light & Power Company, of Arkadelphia, which operates lighting and water systems in eleven Arkansas towns, presented every employee, from office boy up, with a life insurance policy in a leading company, with a face value of $1,000. There are 78 on the payroll, all of them receiving policies.

General Insulate Company, 1008 Atlantic Avenue, Brooklyn, N. Y., manufacturers of "Insulate" and "Hi-Heat" specialties for electrical, automobile and other purposes, report the year just closed has been, in volume of sales and net results, one of the best in the company's history. Present business indicates to the company's officials that 1916 will be a still better year.

The Snyder Electric Furnace Company, 53 West Jackson Boulevard, Chicago, Ill., which established a European agency at Old Bank Chambers, Bradford, Yorkshire, England, G. J. Stock in charge, reports that the first year of the foreign office has been a successful one. Contracts have been closed for a large number of Snyder furnaces for steel works and for special smelting work.

The Bearing Company of America.—John W. Hertzler, for several years western representative of the Bearing Company of America, has been appointed assistant manager and is now located at the company's factory in Lancaster, Pa. Mr. Hertzler has been succeeded at the Detroit office by William C. Little, who has represented the Buda Company and Brandenburg & Company in the Detroit territory for some years.

The Franklin Electric Manufacturing Company, Hartford, Conn., has revived Benjamin Franklin's famous publication and is issuing what is called *Poor Richard's New Almanack*. It is an eight-page booklet printed on old-time paper and illustrated with woodcut pictures characteristic of Franklin's time. The sayings of Poor Richard are interesting and quaint in their humor. The *Almanack* will be distributed monthly among customers and prospects of the Franklin company.

Westinghouse Electric & Manufacturing Company.—The Veteran Employees' Association at a banquet held January 29 in the Fort Pitt Hotel, Pittsburgh, presented to the company a handsome bronze memorial tablet of the late George Westinghouse, founder of the numerous industries bearing his name. The tablet is 4 feet by 3 feet, and shows a bas-relief likeness of Mr. Westinghouse, under which is the inscription, "George Westinghouse, Master Workman, Inventor, Founder, Organizer, 1846-1914." It will be placed in the reception room of the East Pittsburgh works of the company.

Coking and Electric Power Generation to be Combined.—A project has been under consideration in Pennsylvania by which a company was to be formed to establish a coking plant in a new location, selling its by-product of gas to another company that would generate electric power from it, this concern to distribute the current through a certain part of Pennsylvania and to enter into particular contractual arrangements with an important railway that would thus obtain power for a contemplated mountain electrification much more cheaply than it could itself generate, at the same time saving the cost of capital necessary for its own power houses.

The Sprague Electric Works of General Electric Company, New York City, is making no radical changes in its extensive line of direct-current fans which have been manufactured for some 24 years. There is being added, however, a complete assortment of nine-inch fans which therefore makes the line more complete than ever and provides a suitable type of fan for practically every requirement. A number of refinements in design and construction have been incorporated in the 1916 line. This company's well known Sprague-Lundell fan motor still retains its distinctive feature of the single field coil which energizes both poles and thereby obtains exceptional simplicity. The oscillating mechanism of fans of this type is detachable and can be added to all 12-inch and 16-inch non-oscillating fans that have been manufactured by this company since 1908. To add this mechanism requires only about five minutes' work and the use of only a screw driver.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ARMORED CABLE AND CORD.—Trumbull Electric Manufacturing Company, Plainville, Conn.

Marking: Trade-mark (Circle T), stamped every 2.5 inches on exterior of armor.

Listed December 20, 1915.

AUTO STARTERS.—Crocker-Wheeler Company, Ampere, N. J.

Oil-immersed switch and air-cooled transformer mounted as a unit in metal case, with no-voltage-release coils and with or without overload release devices. Two and three-phase starters; capacity 200 horsepower or less, 600 volts or less; types CX, DX, EX, FX.

Oil-immersed switch mounted in metal case, with no-voltage-release coils and with or without overload release devices. Three-phase star-delta starters whereby motor windings are star or delta-connected during starting and delta-connected when running; capacity 30 horsepower or less, 600 volts or less; type BX.

Both types are used as a means whereby potential impressed on alternating-current motor windings may be made less than full line voltage.

In off position motor and transformer windings, where used, are disconnected from line. Overload release is inoperative during process of starting motor, and other circuit-breakers or fuses are necessary in motor circuit.

Listed December 23, 1915.

FUSELESS ATTACHMENT PLUGS.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, "Spartan." 660 watts, 250 volts, catalog No. 700.

Listed December 30, 1915.

FUSES, Cartridge Enclosed.—Multi-Refillable Fuse Company, 723 Fulton Street, Chicago, Ill.

Multi non-refillable cartridge inclosed fuses. 0-600 amperes, 250 volts.

Listed December 29, 1915.

GROUND CLAMPS.—The Ohio Electric & Manufacturing Company, 5016 Woodlawn Avenue, Cleveland, O.

Ground clamp for use with No. 10 B. & S. gauge ground wire. A single-piece clamp of tinned copper, provided with suitably spaced holes and with copper-plated bolt, nut and washer for clamping to rigid conduit. Adjustable for use with conduit up to and including one-inch in size. One end of clamp is channeled to form equivalent of a lug for soldering to ground wire.

Listed December 6, 1915.

HEATERS, Electric.—Rathbone Manufacturing Company, Grand Rapids, Mich.

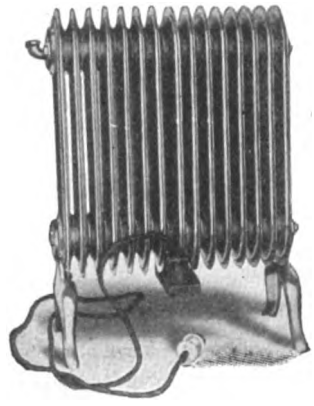
Electric air-circulating radiator. This device consists of cylindrical heating element, supported horizontally and inclosed in bottom of sheet-metal radiator made up of series of vertical radiating members, 660 watts, 110 volts.

Electric hot-water-circulating radiator. This device consists of two cylindrical heating elements supported vertically in center radiating member and inclosed in watertight tube, 660 watts, 110 volts.

Listed December 23, 1915.

INDIVIDUAL VEHICLE BATTERY-CHARGING EQUIPMENT.—Fort Wayne Electric Works of General Electric Company, Fort Wayne, Ind.

An individual vehicle battery charger consisting of a motor-generator and a special control panel permitting starting of set from battery before connecting A. C. motor to line. For use on 110, 220, 440, or 550 volts A. C.



Electric Hot-Water Radiator.—Rathbone Manufacturing Company.

Listed January 12, 1916.

MOTOR - OPERATED APPLIANCES.—The Hertner Electric & Manufacturing Company, Cleveland, Ohio.

A vertical battery charger and operating panel consisting of a vertical motor-generator and a cabinet inclosing a panel with switch, cartridge inclosed fuses and base, and a field control rheostat.

Listed December 30, 1915.

OUTLET BUSHING AND FITTING.—Cap-Swivel-Let Company, Warren, R. I.

Johnson's Cap-Swivel-Let conduit bushing consisting of porcelain cap with wire openings held in sheet-metal plate and secured to conduit by a cast swivel nut, formed with a lug for securing a ground wire. In sizes for standard ½, ¾, and 1-inch rigid, iron conduit.

Standard for use only at an exposed end of conduit (but not under fixture canopies) and only where conduit wires pass out through fitting without splice, joint or tap within fitting.

Listed December 1, 1915.

OUTLET BUSHINGS AND FITTINGS, Couplings, Elbows and Tees.—Thomas & Betts Company, 105 Hudson Street, New York, N. Y.

Brass floor couplings with threaded brass plugs; and malleable-iron bushed elbows and bulb tees, with bushed inlets for threaded conduit and threaded outlets at the top for brass floor couplings. No. T. & B. ¾-inch to 1¼-inch sizes.

Standard for use in concrete floors for coupling short lengths of exposed conduit to concealed conduit systems when so installed that floor couplings do not come below surface of floor in which they are embedded and subject to following restrictions: Bushed elbows to be used only where conduit wires pass through fitting without splice, joint or tap within fitting, and only where no more than one bushed elbow is used in any conduit run. Bulb tees to be used only where conductors are not drawn in until after the main conduit installation is complete. If splices, joints or taps are used in bulb tees, conductors must be so looped that upon removing exposed conduit at floor coupling, splices, joints or taps can readily be disconnected without interfering with other wiring within fitting.

Listed December 26, 1915.

OUTLET BUSHINGS. — Weber Manufacturing Company, 633 South Main Street, Wilkes-Barre, Pa.

Connector bushings of pressed steel for connecting armored cable or flexible conduits at outlets.

Listed December 1, 1915.

PHOTOGRAPHIC PRINTING MACHINE.—Burke & James, Inc., 240-258 East Ontario Street, Chicago, Ill.

Device for printing photographs by incandescent lamps. A wood light chamber supports a special printing frame and contains lamp receptacles and metal-inclosed control switch and wiring. Equipment includes portable cord with separable attachment plug for connection to supply circuit. Ingento 240 watts, 250 volts.

Listed January 5, 1916.

PICTURE MACHINES AND APPLIANCES.—Baird Motion Picture Machine Company, 31 Runyon Street, Newark, N. J.

Baird motion-picture machine. Two types; one for hand operation, the other driven by a special motor equipped with a mechanical speed controller and inclosed in a metal compartment.

Listed January 12, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. M. N. WEEKS, who has been manager of the Grand Rapids (Wis.) Electric Company for a number of years, has resigned to enter the construction business.

MR. F. W. LOVETT has succeeded MR. H. K. MUDD as editor of *Wire and Pipe*, the monthly publication of the Union Electric Light & Power Company, St. Louis, Mo.

MR. F. W. FRUEAUFF, of New York City, formerly vice-president of the City Light & Traction Company, Sedalia, Mo., has been elected president of that company succeeding MR. H. L. DOHERTY.

MR. ATTILLA NORMAN, general manager of the Oregon Power Company, has been appointed official delegate of the Eugene (Ore.) Commercial Club to the Chamber of Commerce of the United States.

MR. C. E. FAHRNEY, manager of the Ottumwa Railway & Light Company, has been appointed a member of the Commercial Association Committee which is arranging for an annual county fair in Ottumwa, Iowa.

DR. DAVID SNEDDEN, Commissioner of Education of Massachusetts and a member of the Board of State Examiners of Electricians, has resigned from office and will become a member of the faculty of Columbia University.

MR. CARL A. SYLVESTER, formerly general manager of the Middlesex & Boston Street Railway in Massachusetts and now general manager of the electric railway system of Rio Janeiro, Brazil, was married January 20 to Miss Lillian F. Harrington, of Newton, Mass., at Grace Episcopal Church in that city.

MR. FRANK S. KRUG, city engineer of Cincinnati, has been chosen administrative head of the proposed Cincinnati Rapid Transit & Interurban Railway project by the Rapid Transit Commission of that city. Mr. Krug will also be chief engineer of the commission and will have charge of the construction of the street-railway project if bonds for that purpose are issued.

DR. GEORGE D. SHEPARDSON, head of the Electrical Engineering Department, University of Minnesota, will be the guest of honor at a dinner given by his former students at the Hotel Radisson, Minneapolis, February 12. The dinner will be given to celebrate the closing of the twenty-fifth year of continuous service by Dr. Shepardson as head of the Electrical Engineering Department.

MR. GEORGE C. KNOTT, formerly manager of the Benjamin Electric Manufacturing Company of Canada, Toronto, has become associated with the Wirt Electric Specialty Company, Philadelphia, Pa. Under Mr. Knott's able management the business of the Benjamin company was greatly increased, and he will leave a host of friends on the Canadian side who wish him success in his new business undertaking.

MR. CHARLES H. GAUNT, general manager of the Pacific Division of the Western Union Telegraph Company, San Francisco, Cal., was tendered a farewell banquet at the Bohemian Club prior to his departure for Chicago, where he will assume the duties of general manager of the Western Division of the company.

MR. HARRY A. NICHOLL, who was awarded a silver replica of the Anthony N. Brady Memorial Medal at the annual meeting of the American Museum of Safety in New York City February 3, is general manager of the Union Traction Company, Anderson, Ind. The jury of awards presented the medal to the American electric railway company which for the year of the award shall have done most to conserve the safety and health of the public and of its employees. A replica in bronze was presented to MR. J. E. HANCOCK, a motorman of the Union Traction Company. The award is a pleasant expression of the appreciation of the efficient and careful methods employed by Mr. Nicholl in his capacity as general manager of the company.

Harry A. Nicholl.

MR. F. J. ALLEN, who has been connected with the Benjamin Electric Manufacturing Company for several years, has been appointed manager of the Canadian branch of the same company at Toronto. Mr. Allen's experience with the Benjamin company has placed him in close touch with the many phases of the company's business organization, and under his direction continued success for the Canadian branch is assured.

MR. EMERSON McMILLIN, chairman of the board of directors of the American Light & Traction Company, has founded two scholarships in the new school of engineering of the University of Detroit, the scholarships to be awarded by the faculty of the school. Mr. McMillin's interest in the school is stimulated by the fact that the industries controlled by his company are large employers of electrical, mechanical and civil engineers and his purpose is to promote opportunities for young men of Detroit and vicinity in that direction.

MR. WILLIAM H. BYARS, of the Ne Page-McKenny Company, Seattle, Wash., has been instrumental in forming an organization of the representatives of the various companies engaged in the electrical industry in Seattle. Questions concerning electrical development and appliances will be discussed at monthly meetings. MR. A. M. JONES, of J. A. Roebling's Sons, MR. ROY WORTH, of the Pacific States Electric Company and MR. H. J. GILLE, of the Puget Sound Traction, Light & Power Company, also assisted in forming the organization, for which a name has not yet been selected.

MR. CHARLES HAYDEN was recently elected president of the Nassau (N. Y.) Light & Power Company, the holdings of the company having been sold to the firm of Hayden, Stone & Company, New York, N. Y. The Nassau Light & Power Company does all the electric light and power business in that portion of Long Island which includes the principal residential districts of Roslyn, Westbury, Glen Cove, Oyster Bay and neighboring towns. A more progressive and aggressive policy of enlarging the facilities and developing the business the company is expected to be inaugurated under Mr. Hayden's supervision.

MR. H. M. BYLLESBY, of H. M. Byllesby & Company, Chicago, Ill., was guest of honor at a luncheon given by MR. LOUIS W. HILL, president of the Great Northern Railway, at the Minnesota Club, St. Paul, January 26. About 150 men prominent in business, professional and public life were present. In talks by Mr. Hill and others the construction work and progressive methods of the Byllesby organization were praised, and particularly complimentary remarks were made in reference to the efforts of MR. P. T. GLIDDEN, St. Paul manager of the Byllesby properties, which were cited as an example of what modern management should be to be permanently successful.

OBITUARY.

DR. JOHN O. REED, a prominent member of the University of Michigan faculty from 1892 to 1914, died in Cleveland, O., January 22, aged 60 years. He was the author of many well known text books on physics.

MR. CLARENCE A. HENLEY, who had been connected with the McGraw Publishing Company, Inc., New York City, for several years as a member of the business staff of the *Electric Railway Journal*, died February 1 as a result of injuries received in an automobile accident on January 29. Mr. Henley was 24 years old.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

MIDDLEBURY, VT.—The Public Service Commission will hold a hearing here February 24 on a petition to acquire the water rights in Addison County for generating energy for power, heat and light. The incorporators of the company, to be known as the Central Power Corporation of Vermont, seeking the rights are C. H. Thompson, H. J. M. Jones, B. A. Summer and D. J. Lillie, all of Montpelier, Vt.; F. H. Stuart and A. T. Stuart, Newton, Mass., and Alexander Gordon, Barre, Vt. The company wishes to acquire water rights on Middlebury River and its branches in the towns of Middlebury and Ripton; construct and operate power plants, pipe lines, auxiliary steam plants and stations in Barre, and construct the necessary transmission lines to distribute electricity in the following towns: Middlebury, Ripton, Lincoln, Hancock and Granville, in Addison County; Warren, Roxbury, Northfield, Berlin, Barre, and Montpelier, in Washington County, and Williamstown in Orange County. The proposed office of the corporation is Middlebury and the capital stock $1,000,000.

LAWRENCE, MASS.—Mayor Hurley has been petitioned by interested citizens to make plans for a white way on Broadway, Essex Street and other parts of the city. It is planned to have the system completed in July.

SALEM, MASS.—The Street Lighting Committee is considering improvements in lighting, both on the streets and in the interior of the public buildings of this city. A white way system is being planned.

TAUNTON, MASS.—Improvements in the municipal generating station and the reconstruction of lines in the city are contemplated.

TORRINGTON, CONN.—The American Brass Company is contemplating the erection of a large power plant in connection with the factory of the Coe Brass branch here.

ALBANY, N. Y.—The Public Service Commission has authorized the issue of $546,000 of 6-per-cent three-year gold notes, dated February 1, 1916, by the Salmon River Power Company with which the company will complete the financing of its 30,000-horsepower hydroelectric plant on the Salmon River, Oswego County, from which it proposes to supply current to the Solvay substation of the Niagara-Lockport Ontario Power Company.

BINGHAMTON, N. Y.—Plans have been approved by the Western Union Telegraph Company to place underground all of its wires and cables extending from Liberty Street on the east to Front Street on the west along the railroad tracks, and from this territory to the local office at State and Henry Streets. H. F. Horton is manager.

PARISHVILLE, N. Y.—The electric light plant here was destroyed by fire recently. The plant will be rebuilt.

CAMDEN, N. J.—In order to secure a white way the mayor has been authorized to make a supplementary contract with the Public Service Electric Company for the installation of 50 arc lamps on Broadway, wiring to be placed in underground conduit.

HACKETTSTOWN, N. J.—The Hackettstown Electric Light Company is seeking a 50-year franchise giving the company the right to construct power lines from the city to Belvidere, through the villages of Vienna and Great Meadows, to furnish energy for light and power to private customers and for lighting the streets in Vienna and Great Meadows.

MILLVILLE, N. J.—As a result of the refusal of the City Commission to grant the Millville Electric Light Company an extension of time in which to complete the street lighting system, a resolution was adopted to submit a referendum to the voters on the question of a municipal electric light plant.

NEW CASTLE, PA.—A high tension power line will be constructed in this industrial district by the Mahoning & Shenango Valley Railway & Light Company, the line to connect the company's million-dollar plant at Lowellville, O., with the plant at Ellwood City. Steel pyramid towers, 60 feet in height, and erected at intervals of 500 feet, will be constructed over the entire right of way, which has recently been secured. The towns and industrial centers between Ellwood and Lowellville, including New Castle and the large manufacturing plants here, will be supplied from the new line when it is placed in operation. These places are now supplied by the corporation which will erect the new transmission line.

NEW HAMILTON, PA.—A municipal light plant and trolley line between this city and the works of the Aetna Explosive Company was assured at a public meeting here when the first $1,000 was subscribed toward the capital necessary for the improvements. J. W. White, superintendent of the Aetna Works, pledged his company to take up one-half of the capital stock issued to build and equip the trolley line.

GRANITE FALLS, N. C.—The Ivey Power Company, E. C. Ivey, manager, Lenoir, N. C., will build a hydroelectric plant on Gunpowder Creek, near Granite Falls.

HILLSBORO, N. C.—The Hillsboro Power & Light Company has been incorporated with a capital of $7,500 by S. M. Gattis and others.

IVA, S. C.—The city contemplates the construction of an electric light system. H. A. Orr, manager of the local branch of the Southern Public Utilities Company, will submit a proposition to furnish electrical energy for such a purpose.

SALUDA, S. C.—F. A. Hugh, of Atlanta, Ga., has secured a 20-year franchise to build an electric light and power plant to cost $6,000.

ACWORTH, GA.—The Council is planning to install a $7,000 electric light system. P. O. McLain is city clerk.

ATLANTA, GA.—Application has been made for a franchise in Atlanta for a suburban electric railway, to be constructed between Atlanta and Creighton, Ga., a distance of 60 miles. The franchise is asked by the Federal Construction Company.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company is planning to triple the present capacity of its power plant at the Gorge. Additions to the plant will be made with a view of taking care of the company's increase of business for several years to come.

CANTON, O.—A boulevard lighting system for the center of the city is desired by the authorities, who are investigating various types of lights. The Canton Electric Company and other local light concerns will assist in the investigations by showing samples of lights in actual service.

CINCINNATI, O.—The Cincinnati Gas & Electric Company and the Union Gas & Electric Company at a conference held last week arrived at an agreement regarding the financing of the new power station to be constructed on the river front at Cincinnati. The cost of the plant will be covered by $4,000,000 of a proposed issue of $15,000,000 of bonds of the Cincinnati Gas & Electric Company and the Union Gas & Electric Company will guarantee the payment of interest on the bonds issued for that purpose. The plant is to have a capacity of not less than 50,000 kilowatts, and additional units will be provided for if necessary. It is the intention of the companies to provide sufficient current for the use of all of the electric and traction companies in and around Cincinnati for years to come.

CLEVELAND, O.—Improvements costing $2,000,000 will be made during 1916 by the Cleveland Electric Illuminating Company, according to a statement by Samuel Scovil, president of the company.

DAYTON, O.—A new two-story factory building of steel and concrete, equipped with electric elevators, machine motors and other electrical devices, will be constructed by the Miami Brass Foundry Company, of which B. Semmelman is president.

DAYTON, O.—The Dayton Power & Light Company, of which O. H. Hutchings is superintendent, has plans and is taking bids on building a two-story brick and reinforced concrete building, together with radial brick stacks, steel towers, etc., the cost of which is to be $1,000,000.

DELPHOS, O.—Contracts have been signed by the Northwestern Ohio Light Company for the electrification of the entire plant of the Delphos Manufacturing Company. The necessary equipment will cost about $30,000.

EAST LIVERPOOL, O.—An ordinance has been passed extending to the East Liverpool Traction & Light Company the right to build a new Grandview car line and complete other contemplated improvements to the company's holdings in this city.

HICKSVILLE, O.—The Hicksville Electric Light Company, which now furnishes energy for lighting ten neighboring towns, will also supply the town of Ney. C. M. Lott, the owner of the company, is adding new equipment to plant to carry the increased load. There is some prospect that this city will replace its arc light system with lighting standards of the cluster or one-light type. The City Council and the lighting company are working out the details for the addition of this improvement, which has the support of Hicksville citizens.

MARION, O.—Steps are being taken preliminary to the construction of an electric trolley line connecting this city with Mt. Gilead. The proposed line will cut down the traveling distance between these two points.

OSNABURG, O.—The business men of Osnaburg and residents of the road between Canton and Osnaburg are planning to organize for the purpose of securing franchises and eventually operating either a trackless trolley system or an electric interurban line between the two terminals. C. H. Firestone, R. C. Flack and Otto Stettler are interested.

PORT CLINTON, O.—The Mathews Boat Company has been reorganized under the name of the Mathews Company, and will build new plants for the manufacture of automatic electric lighting plants and other electrical equipment. The capital stock of the new company is $820,000, and the incorporators are S. J. Mathews, Willard Reed, M. C. Cosgray, F. H. Dewitt and G. A. True.

SPRINGFIELD, O.—Arrangements are being made by the Springfield Light, Heat & Power Company for the installation of new equipment next month. A 5,000-horsepower turbine has been ordered, and facilities to greatly enlarge the company's service will be added.

ZANESVILLE, O.—An electric elevator, dumb waiters, lighting fixtures and other equipment will be purchased by the trustees of Bethesda hospital to complete the new building.

MISHAWAKA, IND.—A. G. Barone, of Wilmington, Ill., is interested in a plan to build an electric line from Mishawaka to Indianapolis, the line to pass through Rochester, Logansport and other towns north and south of Rochester. The line, if built, will be of the gas-electric type and will make connections with steam roads along its intended route.

PERU, IND.—The city of Peru will again be owner of the city lighting plant, which has been in possession of G. Conradt for the past six years.

SEYMOUR, IND.—The City Council has granted a franchise to the Commercial

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Electric & Power Company, of Seymour, containing several novel features. Under certain conditions the city may buy the plant at any time.

ALBANY, ILL.—K. D. Slocum has petitioned for a franchise to furnish energy for power and lighting purposes.

GALENA, ILL.—The Interstate Light & Power Company is making plans to furnish power to the United States Steel Company for its mine near Schulesburg, and additional power to the Cleveland Mining Company at its mine near Galena. It is estimated that during the next year an additional load of 3,000 horsepower will be added to the company's lines. To serve these additional requirements it will be necessary to further enlarge the generating capacity of the Galena station, for which arrangements are now being made.

MARION, ILL.—The Ohio Valley Electric Company is planning for a large increase in business, and has issued $100,000 in bonds to finance improvements and extensions. The company is now operating a power plant at Norris City and has been very successful. Propositions have been received by the company which will require power plants of larger capacity and equipment to handle this business will be installed at an early date. F. W. Richard, Carterville, is president, and F. H. Wyckes, Marion, is secretary.

MATTOON, ILL.—At an election in April citizens will vote on a proposition to issue $25,000 bonds for a municipal electric lighting plant, to be run in connection with the waterworks.

SPRINGFIELD, ILL.—An ornamental lighting system on Washington and Monroe Streets, from First to Tenth Streets, is under discussion by the City Commission and officials of the Springfield Gas & Electric Company. A plan to put all wires of the city and company underground on these streets also is being discussed.

ALLEN, MICH.—The Allen Electric Lighting & Power Company has been organized here with a capital of $2,000.

EDMORE, MICH.—Plans for development of a hydroelectric power company, to furnish this town with light and power are being made by W. C. Clark, of Pontiac, who has just purchased the lighting plant owned by J. H. Gibbs. Mr. Clark has purchased the water power rights at Riverdale and Sumner, ten miles east on Pine River, and the service will be brought here from those points.

FENTON, MICH.—The Council will place lights on Roberts and Caroline Streets.

IONIA, MICH.—The Ypsilanti Reed Furniture Company is having plans prepared by Wernette, Bradfield & Mead, architects, Grand Rapids, for a 1,000-horsepower plant. The cost will be about $20,000.

MARKESAN, WIS.—Application for a franchise has been applied for by the Markesan Electric Company to furnish energy for light, power and heat in the village of Markesan. The company is incorporated with a capital of $15,000. In the event of the franchise being granted the current will be furnished by the Ripon Light & Water Company from its Ripon plant.

BALATON, MINN.—A franchise has been granted whereby this village and Garvin, Minn., will be furnished with energy for power and lights by the plant at Tracy, Minn.

ST. NICHOLAS, MINN.—The Public Service and Union Power Company of St. Cloud has been granted a franchise to extend their electric lights and power lines into and through this village.

ALBIA, IOWA.—Guy J. Walker, of New York City, has purchased the property of the Southern Light & Railroad Company, which was sold at auction here. He paid $75,000 for the property. The company is now furnishing light to Albia and surrounding villages, and is operating two interurban lines.

ARCHER, IOWA.—Ways and means are being considered for the establishment of an electric light plant here.

CLARKSVILLE, IOWA.—A. D. Van Meter, of the local electric light company, is planning an installation of electroliers on several streets here.

DAVENPORT, IOWA.—Lights on the viaduct spanning LeClaire from Fourth to Federal Streets, are being considered by the City Council.

DELMAR, IOWA.—The City Council will make arrangements to purchase energy for street lighting from the Maquoketa Light & Power Company.

ODEBOLT, IOWA.—The Town Council has decided to light the city with electroliers which will be put in early in the spring.

PERRY, IOWA.—S. D. Henry, owner of the Coon Rapids electric light plant, closed a deal with the Iowa Railway & Light Company and the property in the neighboring town will be taken over by the Cedar Rapids corporation within a short time. The people of Coon Rapids will doubtless be served from the Perry plant when the new building and equipment is installed next summer.

STANHOPE, IOWA.—A petition is being circulated asking for the submission of the question of granting a franchise to the Henderson Light & Power Company, of Jewell.

WAUKON, IOWA.—Mayor P. C. Jones has under consideration the building of a $7,000 electric light plant.

AURORA, MO.—The Lawrence County Water, Light & Cold Storage Company will construct 6,600-volt, 3-phase, 25-cycle transmission line to the substation of the Ozark Power & Water Company.

MT. VERNON, MO.—An election will be held in February to decide the question of issuing $8,500 in bonds to rebuild the electric light plant here.

ST. JOSEPH, MO.—W. E. Winner has obtained a franchise in Clay County for the building of an electric trolley line from North Kansas City to Campbellton. Mr. Winner has organized a company to operate a trolley line from Kansas City to St. Joseph.

WARRENTOWN, MO.—The Warrentown Electric Light, Ice & Power Company contemplates the construction of a 6,600-volt, three-phase transmission line to Wright City.

CUBA, KAN.—E. C. Preble has submitted a proposition to the City Council asking for a franchise to put in an electric light plant here.

GREAT BEND, KAN.—A. E. Fitkin, of the Interstate Electrical Corporation, New York City, owners of the Great Bend Water & Electric Company, recently inspected the work being done on the new plant here, and will recommend the purchase by his company of the power plants at Sterling and Lyons. If the purchase is made the three plants will be tied together.

BLOOMFIELD, NEB.—W. H. Mowrer has sold the local gas and electric company and the new owners have taken charge. F. L. Bates, of Memphis, Tenn., is president of the company, and is here now to oversee the remodeling and repairing of the plant.

SPRINGFIELD, S. D.—The Artesian Light Company is planning on the installation of a larger plant in the spring. J. L. Turner is president.

WALLACE, S. D.—The Town Board has been authorized to grant a franchise to the Bradley Electric Company to extend its lines to this place and furnish energy for light and power. The company, of which R. L. Nordness is secretary, will probably furnish the street lighting system.

HAMPDEN, N. D.—An electric light plant will be installed here.

LINTON, N. D.—The question of issuing bonds for a municipal lighting plant will be submitted to a vote February 19.

DATES AHEAD.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 14-16. Secretary, E. A. Thiele, Roswell, N. M.

Electrical Supply Jobbers' Association. Quarterly meeting, Hotel Statler, Detroit, Mich., February 15-17. Secretary, F. Overbagh, 411 South Clinton Street, Chicago, Ill.

Illinois State Electric Association. Annual convention, Champaign, Ill., February 23-24. Secretary, H. E. Chubbuck, Peoria, Ill.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfiister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

CAMPBELLSBURG, KY.—This city has advertised a light, heat and power franchise for sale. Louis Coblin is in charge of the project.

CRAB ORCHARD, KY.—A lighting franchise will be sold here on March 7. It has been drafted by K. S. Alcorn, of Stanford, Ky., and the project is being engineered by H. G. Skiles and Morris Perkings, of Crab Orchard.

LAGRANGE, KY.—Owing to the refusal of Mayor French to sign an order for payment of the local lighting concern, owned by S. R. Schaff, of Louisville, the town is in darkness. The company declines to provide service until a ninety-day bill, past due, is paid. Negotiations for a new franchise are on.

LONE OAK, KY.—S. M. Ware & Son announce that they will install a generating equipment to supply this village of 200 people with power and light. The cost will be about $2,000.

LOUISVILLE, KY.—The Gas & Electric Company has been incorporated here with a capital of $30,000, by Fred Letz, R. A. McDowell and others.

LOUISVILLE, KY.—Operations have been begun in construction of the new plant of the Louisville Gas & Electric Company to be an addition to the present plant. The excavation contract has been let, and work has commenced, considerable blasting being required to dislodge the old concrete foundations of buildings formerly on the site. The contract to the General Electric Company amounts to $125,000. The permit for construction of the new intake and outlet tubes has been obtained, and these will be built in the late summer when the river is low. Instead of tunneling, as formerly when the first intake was constructed, the work will be handled by an open trench, to be covered thereafter.

MT. STERLING, KY.—Members of the General Council heard a discussion on the subject of the projected municipal lighting plant from Edward B. Kay, civil engineer, of Tuscaloosa, Ala. He stated that the city could build and operate its own plant on the $385 per month it is now paying for service.

WHITESBURG, KY.—J. J. Bell, of Lexington, Ky., has been here to interest this city in electric lights, waterworks and other modern utilities.

OXFORD, MISS.—The city is planning to install a 150-kilowatt generator and engine, direct connected. J. H. Lawshire is receiving proposals.

KNOXVILLE, TENN.—According to Mayor J. E. McMillan a municipal lighting plant here is being considered by the City Commission. It is believed an adequate plant could be built for $300,000.

ARDMORE, OKLA.—The Southwestern Public Service Company has been incorporated with a capital of $50,000 by J. L. Hamon, of Ardmore; W. F. Kerr, of Oklahoma City, and others.

RINGLING, OKLA.—Mayor Frank L. Ketch has called an election for February 25 at which will be submitted the question of whether a franchise shall be granted to the Southwestern Public Service Company to install an electric light plant here.

STRATFORD, OKLA.—The Council is planning ways and means to provide electric lighting.

TULSA, OKLA.—Besides making various extensions, the Sand Springs Electric Railway will double track its road between Sand Springs and this city.

BALLINGER, TEXAS.—The Interstate Electric Corporation of New York has purchased the local electric light and power plant from the Ballinger Cotton Oil Company. The plant will be enlarged and a

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system of power transmission lines built to other towns in this section.

COLUMBUS, TEXAS.—The Texas Airline Interurban Company is being organized for the purpose of constructing an interurban electric railway between Columbus and Gonzales and between Austin and Port Lavaca. Part of the right of way has been obtained and construction work will be started in a short time, according to Ben B. Hunt, of Columbus, who is promoting the project.

TROUP, TEXAS.—The Troup Light & Power Company will install a 50-horsepower oil engine and a 40-kilowatt generator.

WESTERN STATES.

HELENA, MONT.—Announcement has been made here by F. M. Kerr, of Butte, general manager of the Montana Power Company, that as soon as the present cold snap moderates a preliminary survey will be made looking to the construction of the Holter power plant, 30 miles northwest of Helena, on the Missouri River, and three miles from Wolf Creek. Work on the project was begun in 1908 by the Missouri River Power Company and suspended in 1910, when financial difficulties overcame the concern. The original plans called for a plant generating 60,000 horsepower, with a dam across the Missouri River 1,400 feet long at the highest elevation and of an average height of 130 feet. Its construction will require 300,000 yards of masonry and 1,500 tons of steel. Seven main hydraulic units, three exciter units and an auxiliary unit are provided for in the original plans. The dam and power plant will cost from $3,000,000 to $3,500,000 and will take from two to two years and a half to build. The building of the dam will create an immense lake, 25 miles in length, the waters being backed up through Picnic Canyon.

HINSDALE, MONT.—The electric power plant here was completely destroyed by fire recently. Arrangements to rebuild are now being made.

MISSOULA, MONT.—Bids will be received February 16 for furnishing and maintaining for one to three years, 46 arc lights along Higgins Avenue, in special lighting district No. 1. L. E. Harris, City Clerk, will furnish information in regard to the bids.

PUEBLO, COLO.—The Arkansas Valley Railway, Light & Power Company will furnish additional power to the Rocky Ford, Colo., water plant, where new pumps are being installed.

KINGMAN, ARIZ.—A power line is to be extended to the Big Jim mining property by the Desert Water & Power Company. A transformer house will be constructed and power furnished for driving machine drills, hoist and compressor.

PHOENIX, ARIZ.—Burns & McDonnell, consulting engineers, Inter-State Building, Kansas City, Mo., are preparing plans for a new municipal electric lighting and gas plant, to cost approximately $750,000. George W. Barrows is chairman of the committee in charge of the project.

WALLACE, IDA.—A snow slide carried away part of the Thompson Falls power line, which furnishes power to the Hercules, Tamarack and other mines. Repairs will be made immediately.

EVERETT, WASH.—The City Council has instructed the City Clerk to make application to the United States Forestry Department for a preliminary power permit in Sultan Canyon. This step will be the first to be taken to secure municipal power and lighting facilities for the city. Investigations made by the City Engineering Department in Sultan Canyon for power sites have shown the project to be feasible.

SEATTLE, WASH.—A bill instructing City Engineer Dimock to ascertain the possibilities of the development of the Sauk-Suiattle power site has been introduced in the City Council, and another bill is before the Council declaring the intention of the city of Seattle to proceed with the development of the site. According to reports, the American Nitrogen Company, recently organized to manufacture compounds from atmospheric nitrogen, desires this site, and C. J. Buck, Acting District Forester, has notified the city that the Nitrogen Company will file on the Sauk-Suiattle site unless the city takes advantage of its prior rights. City Engineer Dimock and other city officials are in favor of the city acquiring and developing this site, which is considered extremely valuable.

SPOKANE, WASH.—The City Engineer has been instructed to proceed with plans for the lighting of Sprague Avenue.

TACOMA, WASH.—In a report to the City Council, B. W. Collins, Superintendent of Electric Works, stated the cost of extending lighting service of the municipal lighting plant to Day Island, to serve residents in that district, will be $1,264.79. It is understood the municipal plant will make the extension.

WALLA WALLA, WASH.—Announcement has been made that improvements will be made in the power plant of the Pacific Light & Power Company so that continuous service will be furnished in the future.

DREWSEY, ORE.—The installation of the electric lighting system is being planned for this city by George L. Baker and Charles Miller. It is understood the installation will be made as soon as weather conditions permit and materials can be placed on the ground.

PORTLAND, ORE.—The City Council has granted permission to business men and property owners on First Street, between Morrisson and Yamhill Streets, to install a cluster lighting system in that section of the city.

LOS ANGELES, CAL.—The Department of Public Service will receive bids up to February 15 for electric meters.

LOS ANGELES, CAL.—The Board of Supervisors has called for bids for maintaining the street lighting system in the Bairdstown Lighting District.

RED BLUFF, CAL.—The Board of Trustees has adopted plans and specifications for a street lighting system for Main Street from Elm to Hickory. The cost is estimated at $2,700.

REDLANDS, CAL.—New arc-lights are to be installed here by the Southern California Edison Company.

SAN FRANCISCO, CAL.—Two large submarine cables have just been laid across San Francisco Bay by the Pacific Gas & Electric Company. The cables extend from the Exposition grounds across the bay to Marin County.

MARTINEZ, CAL.—Construction of the electric railroad between Martinez and Concord, giving connection with both the Oakland, Antioch & Eastern and the Santa Fe railroads, will start within 30 days, according to a statement made by Clifford McClellan to the Martinez Development Board. The line and its equipment will cost $150,000.

YREKA, CAL.—The California-Oregon Power Company, which supplies 34 communities in Northern California and Southern Oregon with electric light and power, is building an additional plant on the Klamath River to generate 53,000 horsepower.

CANADA.

QUEBEC, QUE.—Details of the project of the new Vercheres, Chambly & La Prairie Tramways Company, which proposes to capitalize at $500,000 and operate an electric railway system between South Shore towns and Montreal, were presented in a bill to the Legislature. J. W. Domville, Rosemere; Alfred Colas, Longueil; D. W. Ogilvie, Ernest Pitt and Edmond Ducharme, Montreal, are named as provisional directors of the company.

RIGAUD, QUE. — Extensive improvements are to be made in the lighting system here by the North Shore Electric Company.

MEXICO.

BOQUILLA, CHIHUAHUA.—The Mexican Northern Power Company will soon resume work on their large power project here. The big dam across the Conchos River came through the revolutions unscathed and the hydroelectric plant and power transmission line will be built as rapidly as possible.

Financial Notes

The Columbus Railway Power & Light Company has called at 101 and interest on August 1, 1916, the $182,000 6-per-cent first-mortgage bonds of the Columbus Public Service Company, due February 1, 1924.

Kings County Electric Light & Power Company, Brooklyn, N. Y., at a meeting of the Board of Directors, declared a regular quarterly dividend of 2 per cent on the amount of the capital stock outstanding, payable on March 1, 1916, to stockholders of record at 3 p. m. on February 10, 1916.

Detroit United Railway Company has sold to William A. Read & Company, New York City, the $3,500,000 three-year-and-two-months 5-per-cent trust notes recently approved by the Michigan Railroad Commission. Of the proceeds of the notes $2,000,000 will be used to take up the $2,000,000 two-year 6-per-cent notes due February 5, 1916, and $1,000,000 to retire the $1,000,000 Detroit Electric Consolidated 20-year 5-per-cent bonds due June 1, 1916, leaving $500,000 available for improvements and extensions to property of the company. It is understood that the entire issue of the notes has been sold to investors by the purchasing house.

Net profits equal to 11.7 per cent on its $27,000,000 capital stock are reported by the Chicago Telephone Company for the year ended December 31 last, compared with 9.5 per cent in 1914. The income account compares as follows:

	1915	1914
Operating revenues	$17,559,533	$16,229,368
Operating expenses	12,425,604	11,841,477
Net operating revenue	5,133,929	4,387,890
Net income	3,163,047	2,570,596
Div'd approp'n of inc.	2,160,000	2,160,000
Other approp'ns of inc.	206,000	4,375
Surplus	797,047	406,221

On Dec. 31, 1915, the company had a total of 504,124 telephones in service.

Dividends.

	Term	Rate	Payable
Boston Elevated	Q	1.5 %	Feb. 15
Detroit United Ry	Q	1.5 %	Mar. 1
Elec. Co. of Am	—	25c	Feb. 17
Kings Co. Elec. Lt. & Pw.	Q	2 %	Mar. 1
*Marconi Wireless Teleg.	—	7 %	.....
†Marconi Wireless Teleg.	—	5 %	.....

*Dividend on cumulative participating preference shares for 1915, payable on and after February 1. †An interim dividend for 1915 on the ordinary shares, payable on and after February 1.

Reports of Earnings.

PACIFIC GAS & ELECTRIC.

	1915	1914
December gross	$1,622,941	$1,549,457
Net after taxes	696,892	659,648
Total income	755,305	676,484
Surplus after charges	434,112	402,931
Balance after bond discount and expense	420,383	359,957
12 months' gross	18,530,301	16,912,688
Net after taxes	7,944,708	6,998,766
Total income	8,358,587	7,306,582
Bond interest	3,982,419	3,890,341
Interest on notes and floating debt	2,992	301,060
Discount and expenses	160,410	469,515
Surplus	4,212,766	2,645,666
Dividends first preferred	400,717	14,983
Dividends original preferred	600,000	600,000
Balance	3,212,050	2,030,682

Included in gross for December is $33,869 in dispute on account of rate litigation as compared with $34,866 in December, 1914, while for the 12 months there is included in

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 7	Jan. 31
American Tel. & Tel. (New York)	126⅞	127
Commonwealth Edison (Chicago)	144¾	144½
Edison Electric Illuminating (Boston)	244	242
Electric Storage Battery common (Philadelphia)	63	63
Electric Storage Battery preferred (Philadelphia)	63	63
General Electric (New York)	170½	170½
Kings County Electric (New York)	128	128
Massachusetts Electric common (Boston)	6	6
Massachusetts Electric preferred (Boston)	36¼	35¾
National Carbon common (Chicago)	179	179
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	135¾	132
Philadelphia Electric (Philadelphia)	28	28
Postal Telegraph and Cables common (New York)	81½	79
Postal Telegraph and Cables preferred (New York)	66	65½
Western Union (New York)	87⅞	88¾
Westinghouse common (New York)	66	65½
Westinghouse preferred (New York)	76	75

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gross $398,288 in dispute as compared with $554,362 in the preceding 12 months.

Operating expenses for December in addition to maintenance charges of $73,926 include depreciation charges of $130,000, while for the 12 months in addition to maintenance of $970,886 charged operating costs there was also charged $1,380,000 for depreciation.

DETROIT EDISON.

	1915	1914
December gross	$881,856	$714,422
Net	410,553	322,466
Surplus after charges	310,391	240,718
Twelve months' gross	7,759,932	6,495,815
Net	2,948,713	2,301,064
Surplus after charges	1,848,658	1,418,751

SOUTHERN CALIFORNIA EDISON.

	1915	1914
December gross	$ 412,912	$ 397,314
Net after taxes	221,301	204,320
Total income	239,793	217,676
Surplus after charges	163,641	175,035
Balance after depreciation	83,641	95,035
Twelve months' gross	4,808,606	4,755,632
Net after taxes	2,589,989	2,424,468
Total income	2,714,498	2,522,976
Surplus after charges	1,711,317	1,630,966
Balance after depreciation	1,011,317	930,966

MONTANA POWER.

Montana Power Company reports earnings for three months and twelve months ended December 31, 1915, as follows:

	1915	1914
Three months' gross	$1,375,212	$ 921,256
Net after taxes	1,046,224	626,986
Surplus after charges	710,253	379,344
Twelve months' gross	4,359,407	3,778,286
Net after taxes	3,167,505	2,639,239
Interest charges	1,189,162	1,063,614
Preferred dividends	677,026	677,026
Depreciation	300,000	.....
Surplus	*1,001,316	898,599

*Equivalent to 3.72 per cent on the common stock as compared with 3.34 per cent in 1914.

DAYTON POWER & LIGHT.

Dayton Power & Light Co. reports for December, 1915, and the fiscal year ended December 31, 1915, as follows:

	1915	1914
December gross	$ 131,580	$ 96,944
Net after taxes	62,183	44,623
Surplus after charges	44,361	27,649
Balance after preferred dividends	32,177	17,402
Twelve months' gross	1,098,065	943,321
Expenses and taxes	579,582	528,151
Net earnings	518,483	415,170
Other income	12,987	11,842
Total income	531,471	427,012
Interest charges	198,765	192,647
Sinking fund charges	19,167	15,000
Surplus	313,539	219,365
Preferred dividends	128,347	116,219
Balance	*185,192	103,145

*Equivalent to 6.06 per cent on $3,053,000 common stock as compared with 3.37 per cent in 1914.

Proposals

GENERATOR.—Sealed proposals will be received March 1 for a new engine and generator in the United States postoffice and courthouse at Philadelphia, Pa. Address James A. Wetmore, Acting Supervising Architect, Washington, D. C.

ELECTRICAL WORK.—Sealed proposals will be received February 15 at Room 406, City Hall, Chicago, Ill., for furnishing all labor and material, and for doing all the electrical work required in the construction of additions to the Washington Heights Swimming Pool, located at Vincennes Road and 104th Street, according to plans and specifications on file in the office of the Department of Public Works, W. R. Moorhouse, Commissioner.

ELECTRIC PASSENGER ELEVATOR.—Sealed proposals will be received at office of the Supervising Architect, Treasury Department, Washington, D. C., until February 29, for the installation, complete, of an electric passenger elevator in the United States postoffice and courthouse at Martinsburg, W. Va. Copies of drawings and specifications may be obtained on application to the custodian of the site at Martinsburg, or at the Supervising Architect's Office, Washington.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing supplies at naval stations: Schedules 9282 and 9283—Mare Island, Cal., 5,000 feet telephone cable, 1 15-horsepower induction motor and 5 transformers. Schedule 9279—Brooklyn, N. Y., 1,000 Leyden jars and 1,000 feet single-wire conductor: Philadelphia, Pa., 1,500 plugs and 800 sockets. Schedule 9274—Brooklyn, N. Y., 25,000 feet telephone wire. Bidders desiring to submit proposals should make application for schedules to the Bureau or any Navy Purchasing Office.

New Incorporations

FRANKLIN SPRINGS, N. Y.—Progressive Electric Light Company. Capital, $6,000. Incorporators: J. B. Coleman, C. B. Van Slyke and others.

NEW YORK, N. Y.—D. & D. Electric Company. Capital $10,000. Electrical machinery. Incorporators: D. Strulson, A. Chazick and others.

BOSTON, MASS.—Legalite Corporation. Capital, $5,000. Manufacture electrical automobile appliances. Incorporators: R. H. Holman, F. D. Shenk and others.

BAKERSFIELD, CAL.—The Pacific Light & Power Corporation. Capital, $40,000,000. Incorporators: W. G. Kerchoff, Charles Forman, Kaspare Cohn, W. N. Kemp, G. S. Patten and H. E. Huntington.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,913. LAMP SOCKETS.—A commercial agent of the bureau transmits an inquiry from a firm in Switzerland which desires to purchase electric-lamp sockets, both with and without key. Samples, catalog and full information should be sent.

NO. 19,926. ELECTRIC LAMPS, BULBS, AND ACCESSORIES.—A commercial agent of the bureau transmits an inquiry from a firm in the Netherlands which desires to receive samples, prices and full information from American manufacturers of tungsten metal filament electric lights, bulbs for electric lights and accessories for same.

NO. 20004. ELECTRICAL APPARATUS.—An American consular officer in Switzerland reports that a firm in his district desires to receive catalogs, price lists and full information from American manufacturers of electrical apparatus for motor-car lights, including cranking, lighting, and ignition device.

NO. 20022. WIRELESS APPARATUS.—An American consular officer in Central America desires to receive quotations, f. o. b. steamer New Orleans, on a 3 to 5 kilowatt, 500-cycle wireless transmitter, with complete modern receiving set. The transmitter should be equipped with either quenched or synchronous rotary spark gap and capable of transmitting a distance of 250 miles. The power is to be furnished by a mining power plant. A 200-foot mast or tower will be furnished by the purchaser. Cost of installation should be included in quotations.

New Publications

TRANSMISSION LINES.—"The Exact Calculation of Electric Transmission Lines with Distributed Dielectric Admittance and the Complex Hyperbolic Method," by A. E. Salazer, of the University of Chili, which was presented at the Second Pan-American Scientific Congress, has been published in pamphlet form by the author in Spanish, accompanied by an English abstract.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has issued publication No. 19 entitled "Results of Observations Made at the Magnetic Observatory at Cheltenham, Md., 1913 and 1914," by Daniel L. Hazard. Detailed observations, with monthly and annual means, are given of the three components of the earth's magnetic field. There are also records of earthquakes and magnetic storms.

Electrical Patents Issued February 1, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,169,788. Secondary or Storage Battery. B. Ford, Philadelphia, Pa. Jar cover made tight.

1,169,798. Lug. R. A. Goeller, New York, N. Y. For soldering to cable end; detachable exterior shell is finished.

1,169,799 and 1,169,800. Machine-Switching Telephone-Exchange System. C. L. Goodrun, assignor to Western Electric Co., New York, N. Y. First patent: Arrangement of relays and magnets for operating selector switch. Second patent: Same for finder switch.

1,169,817. Method of Carrying Out Gas Reactions in an Electric Furnace. A. Helfenstein, Vienna, Austria-Hungary. Manner of producing reactions at high temperatures in electric low-tension furnaces.

1,169,819. Process of Preparing Metallic Filaments. R. H. Henderson, assignor to Westinghouse Lamp Co., E. Pittsburgh, Pa. Preparing structures containing metal with high fusing point.

1,169,824. Apparatus for Electrically Treating Air. W. T. Hoofnagle, assignor to Electro-Chemical Products Co., New York, N. Y. Automatically controlled current, passed through closed reaction chamber containing the air or gas.

1,169,825. Method and Apparatus for Making Ozone. W. T. Hoofnagle, assignor to Electro-Chemical Products Co. Air, rapidly checked and released in flow to produce surging in reaction chamber where current is passed through it.

1,169,827. Electrical Stove. G. A. Hughes, assignor to Hughes Electric Heating Co., Chicago, Ill. Structure of oven, etc., and arrangement of resistor.

1,169,851. Gas Lighter and Extinguisher. H. G. Mead, Shrewsbury Park, Mo., assignor of one-half to J. J. Hartley, St. Louis, Mo. Electromagnetically operated valve and spark lighter.

1,169,853. Adjustable Shade. S. R. Menssen, Platte Center, Neb. For securing to socket; has adjustable wings.

1,169,865. Contact Shoe for Third-Rail Electric Cars. C. F. Raydure, West Philadelphia, Pa. Structural details.

1,169,866. System for Supplying Electricity. I. J. Reuter, assignor to Remy Electric Co., Anderson, Ind. Generator supplies constant potential for automobile lighting; potential increases with speed for ignition.

1,169,885. Vehicle Signal. J. F. Sullivan, New York, N. Y. Shutter of automobile light controlled conjunctively with brake pedal.

1,169,890. Selector Switch. L. V. Nagy, assignor to Western Electric Co., New York, N. Y. Structural details of contacts and operating means.

1,169,893. Apparatus for Use in Producing Synthetic and Chemical Substances. J. R. Watson, Baltimore, Md. Electrically-heated rotary retort.

1,169,894. Automatic Telephone System. H. G. Webster, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of contacts and magnets for operating selective switch.

1,169,932. Electric Fixture Attachment. S. E. Cressey, San Pedro, Cal. Detachable clamp with conductors supports lamp.

1,169,937. Electrical Device for Changing the Direction of Rotation of Shafts. M. J. Dikeman, Detroit, Mich. Electromagnetically controlled differential gears.

1,169,942. Arc Light Electrode. E. Egly, assignor to Gebrueder, Siemens & Co., Lichtenberg, Germany. Has illuminating ingredient comprising cerium peroxid, calcium oxid and a fluorid.

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1,169,943. Colloidal-Manganese-Dioxid Depolarizer. C. Ellis, Montclair, N. J. For Leclanche batteries; comprises higher oxid of manganese cemented to carbon particles by colloidal manganese dioxid.

1,169,949. Cable Construction. B. W. Gates, Washington, D. C. Paper-filled, multiple-conductor cable.

1,169,953. Glass-Shaping Apparatus. A. F. Gumpp and W. J. Johnson, Smithport, Pa. Electromagnetically operated forming apparatus.

1,169,954. Clothes-Drying Machine. M. B. Haliday, Wallkill, N. Y. Motor and gearing enclosed in base.

1,169,957. Circuit Controller. W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. Details of rock-lever switch.

1,169,960. Device for Mounting Electric Wires. G. P. Jacobson, Lanse, Pa. Insulated clamp structure.

1,169,991. Electric Signaling System. W. C. Neahr, assignor to Protective Signal Mfg. Co., Denver, Colo. Railway signal controlled by normally closed circuit having switch operated by passing vehicle.

1,169,992. Circuit-Controlling Instrument. W. C. Neahr, assignor to Protective Signal Mfg. Co. Car-wheel-operated switch related to above.

1,169,993. Book Fumigator. R. Oldham, Salt Lake City, Utah. Has alarm circuit for indicating when treatment of book in closed chamber is completed.

1,170,000. Insulating Enamel. F. A. Robinson, assignor to D. W. Armistead, Aurora, N. Y. Elastic, flexible material consisting of hardened preparation of residuum of oil from a pinnipedic or cetaceous animal.

1,170,012. Portable Electric Searchlight. R. L. Smith, Everett, Mass. Stand, carrying reflector, lamp and handle, is mounted on storage battery.

1,170,017. Fault-Locator for Electric Cables. H. M. Stoller, assignor to Western Electric Co. Device for exploring the field of electric cable conductors.

1,170,032. Lock for the Gates of Elevator Shafts. W. A. Williams, Barton, O. Latch controls circuit of signal and indicator.

1,170,033. Circuit Controller. M. Wuerpel, assignor to General Railway Signal Co. Controller drum built up of interlocking sections.

1,170,034. Electrical Connector. W. H. Adams, Kenyon, R. I. Special structure providing flexible connection between stationary cable and movable contact apparatus.

1,170,048. Distributing System. J. T. Cowley, assignor to Lamson Co., Boston, Mass. Parcel delivery system.

1,170,063. Circuit-Closer. H. J. Heeney, assignor to Holtzer-Cabot Electric Co., Brookline, Mass. Details of tubular, push-button switch.

1,170,091. Mail-Distributing Machine. B. S. Molyneux, assignor to C. H. Bierbaum, Buffalo, N. Y. Electrically operated.

1,170,112. Service and Meter Testing and Connection Block. J. Sachs, Hartford, Conn. Special arrangement of contacts and connectors for connecting in testing apparatus.

1,170,113. Electric-Meter-Testing Switch. J. Sachs. Multiple connectors operated separately or together to produce desired testing connections.

1,170,132. Welded Rail Bond and Fish Plate. J. M. Yount, San Francisco, Cal., assignor of one-half to T. Finigan, San Francisco, Cal. Special structure and arrangement of welded fin-plates.

1,170,143. Railway Signaling System. A. Dulac, Gardiner, Me. Combination of home and distant-signaling stations with clock mechanism for indicating and recording time of arrival of cars at stations.

1,170,153. Metal-Rolling Machinery. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Driving motor automatically controlled by material passing through rolls.

1,170,153. Mechanically Actuated Horn or Alarm. M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Has motor-operated diaphragm vibrator. (See cut.)

1,170,165 and 1,170,166. Electrical Heating Unit. F. Kuhn, assignor to American Electrical Heater Co., Detroit, Mich. First patent: For sad irons. Second patent: Flat resistor has lateral heat distributing wings.

1,170,167. Terminal Contact-Plug. F. Kuhn, Detroit, Mich. Armored with resilient conductor guard.

1,170,168. Connector for Electrically Heated Instruments. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. For sad irons.

1,170,169. Electrical Food-Warmer. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. Electric heater arranged in base of cup.

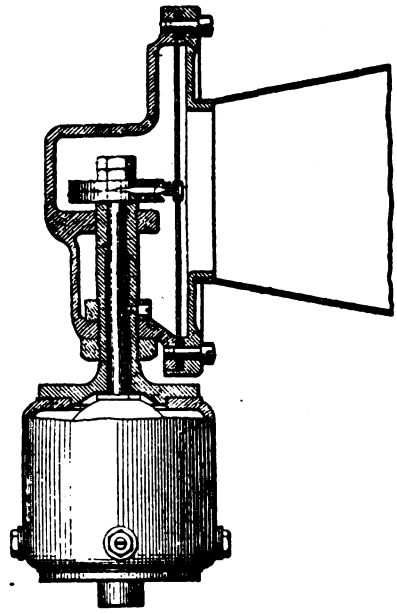
1,170,170. Electrically Heated Glue Pot. F. Kuhn and F. E. Shailor, assignors to American Electrical Heater Co. Connections, etc., for resistor on bottom of pot spaced from enclosing casing.

1,170,184. Separation of Liquid Suspensions. F. W. Peek, Jr., assignor to General Electric Co., Schenectady, N. Y. Suspended water removed from oil by passing through alternating electrostatic field varying in intensity at different points.

1,170,190. Electric Switch. F. J. Ravlin, Chicago, Ill. Plug-switch receptacle member.

1,170,192. Cooling Dynamos. R. Rudenberg and A. Zehrung, assignors to Siemens-Schuckertwerke G. M. B. H., Berlin, Germany. Air passed through hollow stator conductors in opposite directions.

1,170,196. Controlling Mechanism for Automobile Starting Motors and Lighting Generators. G. E. Stevens, assignor to General Electric Co. Switch in circuit of dynamo-electric machine connected to engine shaft, interlocked with transmission.

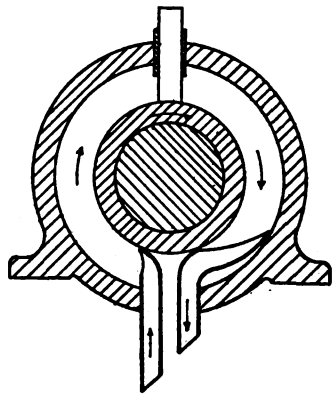


No. 1,170,158.—Motor-Driven Horn.

1,170,201. Transformer. J. M. Weed, assignor to General Electric Co. Details of core structure.

1,170,203. Air Pump for Vacuum Cleaners. T. Wiedemann and J. H. Templin, assignors to Santo Mfg. Co., Philadelphia, Pa. Mounting and connection of motors.

1,170,211. Split-Phase System. E. F. W. Alexanderson, assignor to General Electric Co. Combination of transformer secondary sections and phase converter.



No. 1,170,444.—Cooling Device for Dynamos.

1,170,235. Adjustable Lamp Support. F. A. Fox, Philadelphia, Pa. For dentists' chairs and the like.

1,170,247. Anticathode for Röntgen Ray Tubes. M. Gundelach, Gehlberg, Germany. Of metallic uranium.

1,170,260. Lightning Rod. A. G. Hoovens, Goshen Ind. Structure of vertical point tube.

1,170,275. Ignition System. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, Ohio. Ignition circuit operated from two sources of high and low potential, respectively.

1,170,287. Method of Making Insulators. J. S. Lapp, assignor to Locke Insulator Mfg. Co., Victor, N. Y. Metallic and vitreous sections united by hydraulic cement set at high temperature.

1,170,313. Process of Burning Carbon Electrodes. F. Nagelschnitz, assignor to the firm of Georg Mendhein, Munich, Germany. Electrode material with tar binder heater and expelled gases collected and ignited.

1,170,323. Telephone-Signal-Operating Device. F. E. Phillips, Wells, Me. Signal lamp is lighted when instrument is in use.

1,170,347. Means for Operating Switch Mechanisms. R. A. Schoenberg, assignor to I. S. Rosenheim, New York, N. Y. For sockets; operated by longitudinal movement of plug.

1,170,352. Electric Lamp and Its Fittings. H. E. Sheward, Winchmore Hill, England. Socket, plug and bracket details.

1,170,356. Telephonic Apparatus. H. Smith, assignor to G. Kiorboe, Copenhagen, Denmark. Structure and arrangement of granule chambers in microphone.

1,170,359. Electrically Operated Pump. M. E. Swortzel, Waynesboro, Va. Piston operated by motor solenoids.

1,170,360. Holding Device. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. For railway signals; comprises stator with single-phase winding and squirrel-cage rotor having same number rods as stator has poles.

1,170,361 and 1,170,362. Railway Signal. J. D. Taylor, assignor to Union Switch & Signal Co. First patent: transformer device for moving and holding signal. Second patent: modification.

1,170,388. Electrical Contact. H. A. Kaempfe, Meumuhlen, near Kiel, Germany. Contact improved between a pin and its bearing by mercury secured by capillary attraction.

1,170,407. Testing Device for Spark Plugs. W. Brown, Oglesby, Ill. Comprises contacts and sight spark gap for application to plugs.

1,170,421. Receiver-Holding Attachment for Telephones. W. A. Delano, New York, N. Y., and E. R. Belmont, Hempsted, N. Y. Receiver-holding clip clamped to transmitter.

1,170,444. Cooling Device for Dynamos. W. Gscheidlen, assignor to Siemens-Schuckertwerke G. M. B. H., Berlin, Germany. For sliding contacts in dynamo-electric machines; has cooling space, intake and exhaust nozzles bent in opposite directions. (See cut.)

1,170,480. Cash Register. J. J. Duffie, San Francisco, Cal. Has series of lamps and circuits operated on actuation of register to produce a given character.

1,170,483. Track System for Controlling Trains. A. Gollos, Chicago, Ill., assignor to Gollos Railway Signal Co. Arrangement of sections in block system.

PATENTS EXPIRED.

The following United States electrical patents expired on February 7, 1916:

618,837. Conduit for Wire or Cables. E. H. Calloway, New York, N. Y.

618,848. Electric Arc Lamp. W. E. Dennis, New York, N. Y.

618,853. Brush Holder for Dynamo-Electric Machines. G. S. Dunn, East Orange, N. J.

618,864. Apparatus for Operating Electric Brakes. H. S. Graber, St. Louis, Mo.

618,876. Circuit-Breaker and Closer. A. T. Hill, Detroit, Mich.

618,911. Trolley Connection for Canal Boats. F. J. Shewring, Toronto, Can.

618,935. Rotating Electric Motor. W. P. Freeman, New York, N. Y.

618,950. Lightning Arrester. E. C. Parham, Johnstown, Pa.

618,992. Cleaner for Commutators. J. T. Morrow, Great Falls, Mont.

618,993. Electrical Battery. L. Paget, New York, N. Y.

619,014. Electric Arc Lamp. T. E. Drohan, Chicago, Ill.

619,023. Torpedo-Controlling Device. W. D. Litchfield, Somerville, Mass.

619,028. Electrochronograph. C. W. Thomson, LaCrosse, Wis.

619,038. Automatic Electric Signal for Railway Crossings. U. J. Fry, Milwaukee, Wis.

619,090. Electric Arc Lamp. A. Schweitzer, Allegheny, Pa.

619,091. Automatic Magnetic Circuit-Breaker. W. M. Scott, Philadelphia, Pa.

619,100. Electric Crane. W. R. Thomas and J. Thomas, Catasauqua, Pa.

619,157. Composite Signaling and Transmission System. S. D. Field, Stockbridge, Mass.

619,187. Prepayment Mechanism for Electric Meters. J. C. Kinney, San Antonio, Tex.

619,217. Electric Motor. O. H. Pieper and A. F. Pieper, Rochester, N. Y.

619,240. Toll Counter for Telephonic Circuits. G. K. Thompson, Malden, Mass.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

SPREADING KNOWLEDGE OF ELECTRICAL REQUIREMENTS.

In the early days of the electrical industry when no one knew very much about electrical matters, the little knowledge that was possessed, being mostly acquired from experience, was jealously guarded for fear that it might aid competitors. As the industry developed and there grew up in it societies like the American Institute of Electrical Engineers and the National Electric Light Association, interchange of ideas and discussions of electrical matters became more common and these greatly stimulated the extraordinary electrical developments of the last quarter century.

In recent years most branches of the industry have shown a tendency to practice co-operation, at least to the extent of minimizing the evil effects of competition in business. We now have two strong national electrical organizations, the Jovian Order and the Society for Electrical Development, which are carrying out active propaganda for co-operation. The national house-wiring campaign about to be inaugurated by the latter society is an instance in point.

Another case is the compiling of a condensed and yet complete analysis of the changes in the National Electrical Code that are incorporated in the recently issued 1915 edition. This analysis is published on other pages in this issue. For it the industry is indebted to Mr. Washington Devereux and his corps of electrical inspectors. It would seem that such an analysis of changes could be easily compiled by the Electrical Committee which has charge of the biennial revision of the Code and published either as an appendix or as a separate supplement to the revised edition of the Code procurable for the small cost of publication. It would be still better to publish a larger pamphlet giving an authoritative and less condensed explanation of each of the changes, so that the electrical contractor and inspector could have readily available promptly and in easily understood language the significance of each change. This would promote not only a better and more up-to-date knowledge of the National Electrical Code but would eliminate the numerous unintentional violations of it caused by failure to grasp its meaning.

To show the importance and value of this matter to the electrical construction industry and the co-operative spirit shown in at least one city to keep the industry informed, it may be stated that Mr. Devereux is planning to distribute the information referred to in a new edition of his "Electrical Key," which is supplied to all electrical contractors, electricians and electrical mechanics in Philadelphia. Surely the "City of Brotherly Love" is setting a splendid example in this matter and one that might be copied with profit.

TEN YEARS OF ILLUMINATING ENGINEERING.

The midwinter convention of the Illuminating Engineering Society, held last week in New York City, marked the tenth anniversary of the formation of that society. When the founders of the society gathered together in 1906 to form an organization, illuminating engineering as an applied science and an art was in its infancy. Lighting installations were put in without much study of the situation and were considered satisfactory if they supplied enough illumination to accomplish the primary purpose of seeing.

Ten years have witnessed great advances in illuminating engineering, and with many of these the Illuminating Engineering Society has been identified. The society has stimulated study and research in the problems of illumination, and has furnished a medium for bringing the results to those who are in a position to utilize them in practical lighting work. It has furnished the forum where engineers and commercial representatives could come together to discuss their problems. It has brought to the attention of scientists problems requiring extended research for solution, and many of these have been taken up in the laboratories where alone the facilities for their solution are available. Under the successive presidencies of L. B. Marks, Clayton H. Sharp, Louis Bell, W. H. Gartley, Edward P. Hyde, Arthur E. Kennelly, V. R. Lansingh, Preston S. Millar, C. O. Bond and A. S. McAllister, it has held a series of annual conventions whose transactions represent the developing thought and knowledge of the subject. In conjunction with Johns Hopkins University, it arranged a course of lectures in 1910 which served to collect and render available such information as could then be gathered together on the subject. Under the presidency of Dr. Charles P. Steinmetz, it is proposed to arrange a similar course of lectures in connection with the convention to be held this year in Philadelphia, and with Dr. Hyde heading the committee in charge, it may be confidently expected that this will be as completely successful as the previous effort of the same kind.

The society had a large part in bringing about the adoption of the international candle as a unit of luminous intensity. By its publication of a lighting primer it has helped to bring to public attention some fundamental facts connected with the proper use and the misuse of light. Its various committees have advanced the situation with respect to glare from paper, lighting of school houses, lighting legislation, etc. The society has already accomplished much in the vigor of youth with an undeveloped field before it, and may look forward hopefully to valuable work in the future.

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In signalizing the tenth anniversary of its birth, the society could have selected no one more appropriate as the recipient of honorary membership than Thomas A. Edison. His work has contributed more than that of any other man to the progress of electric lighting, and the application of electric illuminants is almost synonymous with modern illuminating engineering. Mr. Edison not only invented the first commercial electric incandescent lamp, but developed many of the elements necessary for a complete multiple system of lighting. Since the dinner at which the presentation of honorary membership took place was continued until after midnight, it became also a birthday party for Mr. Edison, who, in spite of his continued activities, was credited with 69 years of life on February 11. As the foremost inventor of the world, Mr. Edison takes a deserved position as honorary member of the society.

SECURING EFFECTIVENESS IN ILLUMINATION.

An element was injected into the midwinter convention of the Society which has been too often lacking and which is decidedly needed to balance the usual number of laboratory and commercial papers, which ordinarily make up the bulk of the program. The papers by Prof. Morgan Brooks and Mr. Bassett Jones represented studies to determine how to best make use of the facilities available to the engineer to obtain effective results, and to so illuminate the object of his work, whether it be persons or building interiors, or indeed exterior areas and structures, as to give pleasing results and to attain the end for which it is to be made visible. This touches upon the artistic side and requires the artist's eye and the artist's imagination for its proper consummation, but it is nevertheless an appropriate field for the illuminating engineer.

The paper by Mr. Jones dealt with stage lighting and showed how big a field exists for the application of sound engineering to this work. Just as the architect has often left the lighting of his creations to be carried out by a routine giving no consideration to what he would wish to have brought out, so the playwright and the stage manager have left their productions to the mercy of the stage electrician, whose principal efforts have been devoted to producing volume of light and wealth of color. To give the proper proportion of illumination to the different portions of the stage, to the properties and actors, to throw the shadows in the right direction, to emphasize the essentials, to display facial expression, to give an atmosphere in sympathy with the words and actions of the play, requires both art and engineering; and these have been generally lacking in both the planning and the execution.

The paper of Professor Brooks dealt with architectural interiors in much the same way, pointing out the needs and the neglected possibilities—for we must admit that they *are* generally neglected. Here again an appropriate atmosphere is necessary for effectiveness, emphasis must be put in the right place, intensities must be properly graded, and shadows must be controlled. The varied apparatus of the stage is not available, yet much can be done by a proper selection and arrangement of lighting units and illumination intensities. The apparent dimensions of a room may be altered, pleasing contrasts brought about, coziness suggested, etc. Two methods suggested by Professor Brooks for changing the distribution of light are novel. One is to groove the ceiling, an effect which could be easily secured if found worth while for indirect lighting. The other is the use of direct or semi-direct glassware of elliptical or unsymmetrical rather than circular section. This would probably prove expensive to manufacture, and the desired results could usually be secured in other ways. The need exists, however, for unsymmetrical distribution of light in certain cases, and departures from the stereotyped symmetry of the typical installation would be welcomed by the artistic eye.

NATIONAL RECOGNITION FOR ENGINEERS.

There has been much talk among engineers of the lack of recognition by the public of the important place which the engineer occupies in the complex activities of modern life. Nearly every convenience enjoyed by the individual in the city, and nearly every industrial operation is dependent upon the work of the engineer. Yet in choosing legislative and administrative government officials, in organizing big transportation or industrial corporations, and in filling other posts of importance and responsibility, little attention is given to the engineer. He is seldom a leader of public opinion. Only when it comes time to actually begin work which only he can do is he called in to perform it.

The real dependence of the nation upon the engineer, and the need of his counsel and mental resources in high places has been keenly felt in England since the outbreak of war, and is being realized in this country in taking steps for preparedness. The Naval Consulting Board was the first evidence of this, its membership calling for engineers, chemists and other inventors. We now find the President of the United States again calling upon the engineers of the country for assistance in organizing industrial plants so that they shall be ready upon call to begin the manufacture of munitions without delay. As before, the national engineering societies constitute the medium through which the appeal is made. For the American Institute of Electrical Engineers, President Carty lost no time in responding, and a representative will be appointed in each state to cooperate with others representing other engineering and chemical interests. These groups will then proceed to organize their respective territories.

That this call should come to the engineers is an evidence that their genius for accomplishing things is not unappreciated in Washington. It is at once an honor, a duty, and a recognition that is put upon the shoulders of the organized engineers of the country and we have no doubt as to how they will meet the emergency. It was Mr. Carty who once said that engineers

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can accomplish any material feat if some one stands ready to foot the bill! The requirements of this work will not even tax their abilities.

THE MEASUREMENT OF MAXIMUM VOLTAGE.

One of the sessions of the recent midwinter convention of the American Institute of Electrical Engineers was devoted to the measurement of alternating voltage. For a high voltage the classical method of measurement has been to use a spark gap, whose indication gives the maximum or crest value of the voltage wave. If the wave form be known it is also a measure of the effective or root-mean-square value. In many cases of high-voltage work, such as the testing of insulation, the crest value is the important element of the voltage, and the measurement by spark gap provides directly the desired quantity. There are, however, disadvantages inherent in this method. It gives no indication except at the moment of breakdown, and this breakdown may itself alter conditions in the circuit and set up objectionable oscillations. The gap must be set for each reading, and the convenient features of an indicating instrument are all lacking. Corrections are necessary for barometric pressure, etc.

Of recent years numerous attempts have been made to devise methods for directly indicating the crest value of an alternating voltage, and several of these have proven satisfactory in practice. One early scheme was to use an impulse transformer, whose secondary current was inappreciable except at the maximum of the primary wave, to supply one coil of an electrodynamometer. A more practical method was the adaptation, by Messrs. Middleton and Dawes, of the oscillograph to measure the maximum value instead of describing the curve to represent the entire wave. Mr. Dawes has lately applied this principle to an electrostatic oscillograph, thus obviating the necessity for the comparatively large current required by the oscillograph of the Duddell type. Messrs. Sharp and Farmer some years ago described a method in which an instantaneous contact apparatus driven by a synchronous motor made connection to an electrostatic voltmeter at the instant of maximum voltage. Messrs. Chubb and Fortescue made connection during a half cycle to an ammeter connected in series with a condenser. The charging current was then a measure of the maximum voltage. Professor Whitehead used a mercury rectifier with this arrangement.

The phenomenon of corona, after the necessary constants are known, offers a means of measuring voltages above a certain range. With a direct-current discharge, the air pressure due to ionization serves as a measure of steady voltage, but with alternating voltages dependence must be placed upon the observation of corona itself.

Since the minimum voltage at which corona will take place depends on the diameter of the discharging wire, the air pressure, etc., there is a certain range in which corona may be made a measure of voltage. Prof. H. J. Ryan uses a rod of conical form. Detection of the corona may be made by electroscope, galvanometer, telephone or mere visual observation.

Two new modifications of old methods were brought forward for consideration at the Institute meeting, and both make use of the kenotron, or vacuum tube with a hot cathode, as a valve, to permit current to flow into an instrument in one direction only. Messrs. Sharp and Doyle connect in series with this valve an electrostatic voltmeter, which thus becomes charged to the maximum voltage of the wave, which is indicated by its reading. Mr. Chubb connects the valve in series with a condenser and a direct-current ammeter, and again the charging current is a measure of the crest voltage. In this case the current will depend upon the frequency, which must be known and allowed for. By using as his condenser the bushing of a high-voltage terminal, Mr. Chubb is unlimited in the value of voltage to which his method may be applied. However, where any of the methods require a low voltage, high voltages can be measured by the use of a transformer or of a test coil suitably located in the transformer which produces the high voltage.

The method of Messrs. Sharp and Doyle seems to present possibilities of application to a single wave or surge, and if so it will prove doubly valuable, as other means for such measurements are not satisfactory.

A NEW RECORD IN ELECTRICAL EXPORTS.

The peculiar condition of international commerce brought about by the European war has formed the subject of much discussion in commercial circles and a variety of opinions, or rather conjectures, have been expressed on the probable status of foreign trade after the conclusion of peace. Nearly all of the leading neutral nations have experienced a decided stimulus in their foreign commerce and whether this is to be permanent or temporary no one can say. The extraordinary increase in American exports since the war began, starting with heavy shipments of food stuffs, is being reflected in an ever widening group of our products, of which the electrical exports are now experiencing their share.

As given on another page of this issue, the latest official monthly report shows that the electrical shipments for last November broke all previous monthly records, exceeding the high value of May, 1913, by over seven per cent. As compared with November of 1914, there was an increase of nearly 67 per cent. The chief contributors to this increase are batteries, wire, lamps and the miscellaneous, or "all other," class; the latter mysterious group was about double in value. The total value of the electrical shipments for the first eleven months of 1915 indicate that the aggregate for the year will not quite reach the high total established in 1913, but will come a close second thereto.

Such achievements in view of the troublesome conditions abroad should prove encouraging to the electrical industry. That much greater achievements in foreign electrical trade could be attained, however, is evident when one considers with what apathy the subject of export trade is still looked upon by some.

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Happenings in the Industry

Electrical Exports Reach High Mark in November—Important Electric-Range Topics Considered by Committee of Commercial Section—Edison Made Honorary Member of Illuminating Engineering Society at New York Convention—Important Utility Merger in Massachusetts—Dr. Louis Duncan Dies in New York

Electrical Exports for November Break All Previous Records.

From the monthly summary of the foreign commerce of the United States just issued for last November by the Bureau of Foreign and Domestic Commerce, Washington, D. C., it is evident that the total value of the electrical exports for that month broke all previous monthly records. The November total exceeded that of a year ago by nearly 67 per cent. For the four electrical classes for which quantities shipped are given in the government reports, there were exported last November the following: Electric fans, 3,943; arc lamps, 114; carbon-filament lamps, 121,672; metal-filament lamps, 658,005.

The classified electrical figures for the month and for the corresponding period of a year ago are reported as follows:

Articles.	Nov., 1915.	Nov., 1914.
Batteries	$ 184,903	$ 44,136
Dynamos or generators	58,850	112,784
Fans	55,849	3,825
Insulated wires and cables	302,089	78,652
Interior wiring supplies, etc. (including fixtures)	79,580	53,189
Lamps—		
Arc	2,115	860
Carbon-filament	13,186	5,408
Metal-filament	98,703	22,379
Meters and other measuring instruments	85,113	32,061
Motors	293,540	337,792
Telegraph instruments (including wireless apparatus)	12,154	3,350
Telephones	30,308	143,777
Transformers	170,632	115,955
All other	1,357,825	690,555
Total	$2,744,847	$1,644,723

Meeting of the Range Committee of the Commercial Section at Salt Lake City.

Pursuant to a call by the chairman, W. R. Putnam, sales manager of the Utah Power & Light Company, the Electric Range Committee of the Commercial Section of the N. E. L. A. convened at Salt Lake City, February 7, for a three-day session. The following members of the committee were in attendance: S. M. Kennedy, general agent of the Southern California Edison Company, Los Angeles; M. C. Osborn, commercial agent, Washington Water Power Company, Spokane; S. V. Walton, commercial manager, Pacific Gas & Electric Company, San Francisco; A. C. MacMicken, commercial manager, Portland Railroad, Light & Power Company, Portland, Oregon.

The purpose of the meeting was to receive a report of progress from the various sub-committees, to decide upon the further investigations to be made and to lay out in a preliminary way, the report of the committee to be presented at the coming convention.

Extended conferences of the committee were held with the manufacturers' representatives at which the various features of development of the range business were discussed and lines of procedure agreed upon. The various chairmen had secured information from practically all of the important central stations in the western section of the country and it was the consensus of opinion of the committee that the central stations of the country are well prepared now to develop the range business, both as to merchandising and rates, and that this condition is not alone confined to the Western States, but is quite general throughout the country. It was felt that with these conditions obtaining the rapidity with which the range business would develop would depend to quite a large extent on the co-operation which could be effected in a nation-wide educational campaign as to the advantages of electric cooking. It was the opinion of the committee that in such a campaign, comparative costs should be avoided as far as possible, and the educational efforts be concentrated on the advantages of electric cooking. It was pointed out by various members of the committee that this situation presented an unusual opportunity to the Society for Electrical Development, to take the leadership in this educational propaganda. Housekeeping magazines, farm journals, newspapers and magazines of general circulation are fully awake to the fact that electric cooking is a live subject, and that their readers are anxious to obtain information on it. A large amount of publicity can be secured if the local advertising of the central station can be supplemented by a nation-wide advertising campaign by the manufacturers. At the convention of the Northwest Section, the Range Committee stated that in its judgment, 5,000 ranges could be sold in that territory. More optimistic members of the committee which included Chairman Putman, predicted, however, that the number would probably exceed 10,000 ranges. It developed at this meeting that the range sales for 1915 had exceeded that number, and the prediction for 1916 ranged from 20,000 to 30,000 ranges, depending, as previously stated, upon the extent to which the public can be educated to the advantages of electric cooking by the educational campaign, which it is hoped by the committee, can be organized and effected.

It is the intention of the committee to make its report at the coming convention a compendium of information on electric cooking available today. The committee's report at the Portland convention of the Northwest Section was so comprehensive that it will not be practicable to submit a report along entirely new lines. The important features of this report will be summarized and the additional information and development since this report given so that any central-station man unfamiliar with the subject will be able to get as complete review of the subject as is possible in a committee report.

Philadelphia Electric Company Section Activities.

The first meeting of the year of Philadelphia Electric Company Section, N. E. L. A., was held in Lulu Temple January 17, and the speaker of the evening was Edward James Cattell, city statistician. He chose as his theme "The Way to Happiness."

A splendid vaudeville program followed Mr. Cattell's address. The floor was then cleared and dancing followed.

The meeting of the Meter Department Branch on January 7 was addressed by Samuel J. Cooper, Jr., and Herbert S. Bauman. Mr. Cooper spoke on motors and motor troubles and demonstrated the effects of various troubles, such as running on one phase, incorrect starting taps, etc., by reproducing these conditions. Mr. Bauman gave a résumé of the types and characteristics of modern graphic instruments and sketched their application to the electrical industry.

The Commercial Branch held a combination dinner and meeting at the Arcadia Cafe on Monday evening, January 24. The speakers were Philip Moore, W. M. Stevens and S. S. Neff.

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EDISON MADE HONORARY MEMBER OF ILLUMINATING ENGINEERING SOCIETY.

Midwinter Convention Held in New York.

Conferring honorary membership upon Thomas Alva Edison was the feature of the midwinter convention of the Illuminating Engineering Society, held in New York City on February 10 and 11 to celebrate the tenth anniversary of the founding of the Society. This ceremony took place at a banquet at the Hotel Biltmore on Thursday evening, February 10, in the presence of over 400 guests, and the presentation was made by John W. Lieb after reading an address recounting Mr. Edison's achievements. This was preceded by an address by President Charles P. Steinmetz and followed by another by T. C. Martin. William H. Meadowcroft responded on behalf of Mr. Edison.

Others seated at the speakers' table were Arthur Williams, William Williams, E. H. Johnson, Hugo Münsterberg, F. Park Lewis, A. E. Kennelly, M. R. Hutchison, William E. McKay, D. S. Jacobus, Farley Osgood, Haley Fisk and Charles R. Lamb.

Among those present at the banquet were: Louis Bell, Charles O. Bond, H. H. Cudmore, S. E. Doane, Mrs. Edison, H. M. Edwards and Mrs. Edwards, Louis A. Ferguson and Mrs. Ferguson, Frank H. Gale, S. B. Gorge, A. S. McAllister, Ray Palmer, E. W. Rice, Jr., W. D' A. Ryan, Edward Schildhauer and Mrs. Schildhauer, Frank W. Smith and Mrs. Smith, Theodore Stave, Calvert Townley, J. M. Wakeman and Mrs. Wakeman, W. R. Whitney, L. Zelander and Mrs. Zelander, of Amsterdam.

The sessions of the convention were held in the Engineering Societies Building. At the opening session on Thursday morning Arthur Williams presided and an address of welcome was made by Mayor John P. Mitchel. A. E. Kennelly responded to this and was followed by Charles P. Steinmetz, whose presidental address was on the topic "Illuminating Engineering."

L. B. Marks, one of the founders of the Society and now its treasurer, spoke on the subject "The Tenth Anniversary of the Society," and pointed out what had been accomplished by it, and what had been the concurrent development of the art of lighting.

Other addresses were made by Hugo Münsterberg, psychologist; Charles Rowland Lamb, architect; and F. Park Lewis, physiologist. Professor Münsterberg told of researches being conducted to determine the effect of colored light upon mental processes. Many problems in lighting, such as safety in street illumination, can be settled better by psychological studies than upon the basis of physics or common sense.

Three other sessions were devoted to the presentation of technical papers. President Steinmetz presided at the session on Thursday afternoon. The first paper was by Bassett Jones and was entitled "The Possibilities of Stage Lighting Together With an Account of Several Recent Productions." The author showed the need of applying both engineering and artistic principles to get the best stage effects. This paper was discussed by Messrs. Luckiesh and Irwin.

A paper by Morgan Brooks, entitled "The Relation of Lighting to Architectural Interiors," was read by A. L. Powell, and discussed by J. R. Cravath, S. E. Doane, Norman Macbeth and Felmer Moon.

W. E. Hodge presented a paper on "Simple Methods of Computing Light Flux and Horizontal Illumination," by himself and R. W. Chadbourne. The method uses the vertical distribution curve and unit dimensions. Special curves are drawn for horizontal illumination. This paper was discussed by F. A. Benford.

At the session on Friday morning a paper by Thomas Scofield and Clarence L. Law entitled "Lighting of the General Offices of The Consolidated Gas and The New York Edison Companies, Consolidated Gas Building, New York City," was presented by Mr. Scofield. This building is lighted by semi-direct fixtures, and a description was given, with measurements of the resulting intensities of illumination. The paper was discussed by J. D. Israel, George A. Hoadley, R. F. Pierce, R. B. Ely, T. J. Litle, Jr., J. R. Cravath, Ward Harrison, D. McFarlan Moore, Preston S. Millar, F. M. Steadman, W. R. Moulton and H. R. Summerhayes. The discussion turned largely upon the question of whether a lighting company should install in its own offices a variety of lighting systems to demonstrate the possibilities of different systems, and opinion was divided upon this point. In closing Mr. Scofield stated that the rooms were lighted for use rather than display, and separate display rooms are equipped for showing fixtures and illustrating different types of lighting.

James D. Lee, Jr., read a paper entitled "Gas Lighting in a Cathedral," which described the installation in the cathedral of Saints Peter and Paul, Philadelphia. It was discussed by R. F. Pierce, R. B. Ely, G. B. Nichols, J. R. Cravath, T. J. Litle, Jr., D. McFarlan Moore, J. D. Israel and W. R. Moulton.

Ralph C. Robinson read a paper entitled "Candlepower Measurements of Series Gas-Filled Incandescent Lamps." He showed that for filaments of different shapes at the same temperature the mean spherical candlepower per watt is the same, but the mean horizontal candlepower varies enormously and consequently the reduction factor has widely different values. In discussing this paper, Henry Schroeder said that although the lamps are still rated in terms of horizontal candlepower, the manufacturers aim to supply a definite number of lumens. For any one type of filament the variations between individual lamps are very slight. G. M. J. Mackay, George H. Stickney, J. R. Cravath and E. C. Crittenden also discussed the paper.

The session on Friday afternoon was devoted to papers on heterochromatic photometry and integrating photometers. Four papers were presented: "An Interlaboratory Photometric Comparison of Glass Screens and of Tungsten Lamps Involving Color Differences," by G. W. Middlekauff and J. F. Skogland, presented by Dr. Middlekauff; "An Average Eye for Heterochromatic Photometry, and a Comparison of a Flicker and an Equality-of-Brightness Photometer," by E. C. Crittenden and F. K. Richtmyer, presented by Dr. Crittenden; "The Integrating Sphere, Its Construction and Use," by E. B. Rosa and A. H. Taylor, presented by Dr. Taylor; "A Box Photometer," by L. O. Grondahl.

The first two papers were discussed by Clayton H. Sharp, G. M. J. Mackay, E. C. Crittenden, G. W. Middlekauff, Preston S. Millar, Herbert E. Ives, A. S. McAllister and L. C. Porter. The papers on integrating photometers were discussed by E. C. Crittenden, D. McFarlan Moore, W. F. Little, S. L. E. Rose, E. L. Clark, N. K. Chaney, R. B. Chillas, Jr., L. M. Morse and A. B. Herrick.

In the evening W. D'Arcy Ryan gave an illustrated lecture on "The Lighting of the Panama-Pacific Exposition."

Municipal Plant Shows Marked Business Gains.

The annual report of the municipal light department of Westfield, Mass., indicates remarkable increases in output and in income. There are now 1,404 meters on the lines, a gain of 285 over 1914. The department has more than 1,000 horsepower of motors connected, and the demand for both light and power is increasing rapidly. The income from the electric department for 1915 was $52,637 and the operating expenses were $42,721, the former being about $11,000, and the latter $6,500 greater, than during the year of 1914.

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Banquet of Illuminating Engineering Society in New York on February 10 at Which Thomas A. Edison Was Made Honorary Member of Society.

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Important Utility Merger Projected in Massachusetts.

The Connecticut River Transmission Company and the New England Power Company, both of them Massachusetts corporations, have petitioned the Board of Gas and Electric Light Commissioners for its approval of the consolidation of the Power Company with the Transmission Company, and its approval of the terms therefor.

It is proposed that the capital stock of the consolidated company shall consist of the present 25,000 shares of preferred stock of the Power Company and the present 25,000 shares of its common stock, and the present 11,950 shares of the Transmission Company, all of $100 par value, making the aggregate capital stock of the consolidated company $6,195,000 par value.

The consolidated company under the terms of the agreement shall issue not exceeding $3,219,000 of additional securities to pay obligations incurred for new lines, extensions, improvements and additions to lines and substations of the Transmission Company, now in course or contemplated for 1916, a hydroelectric plant at Readsboro, Vt., and additions to the four hydroelectric plants of the Power Company. Such additional securities to consist of not exceeding 7,190 additional shares of preferred stock and not exceeding $2,500,000, face value, of mortgage bonds, whereby the capital stock of the consolidated company will be increased from $6,195,000 to about $6,914,000, and the bonded indebtedness from $3,500,000 to $6,000,000; the proceeds of the additional issues to pay for costs of the following:

New lines, about	$2,200,000
Extensions and additions to lines, substations, etc., now in course of construction	170,000
Extensions, etc., contemplated during 1916	220,000
Readsboro hydroelectric plant	405,000
Enlargements and additions to four hydroelectric plants of Power Company	214,000

The petition points out that the lines of the Transmission Company are actually connected with the hydroelectric plants of the Power Company, these lines consisting of so-called "old lines" extending from the Massachusetts-New Hampshire line at Warwick southeasterly to Gardner, Fitchburg, Clinton and Worcester, together with substations and branch lines, for the acquisition of which $1,195,000 capital stock has been issued by the Transmission Company; and the "new lines," consisting of a line from Shelburne Falls to Ware, Millbury, Uxbridge and the Rhode Island line, and a line from Millbury to West Boylston, there connecting with the "old lines"; also a line from Ware to Monson, one from Shelburne Falls to Leyden and from Shelburne Falls to Adams and to Bennington, Vt., which together with substations, etc., cost about $2,200,000, for which the Transmission Company has issued no stock nor bonds.

The hydroelectric and storage reservoir properties of the Power Company consist of four hydroelectric plants on the Deerfield, a storage reservoir in Windham County, Vt., and other undeveloped hydroelectric properties on the Deerfield River in Massachusetts and Vermont.

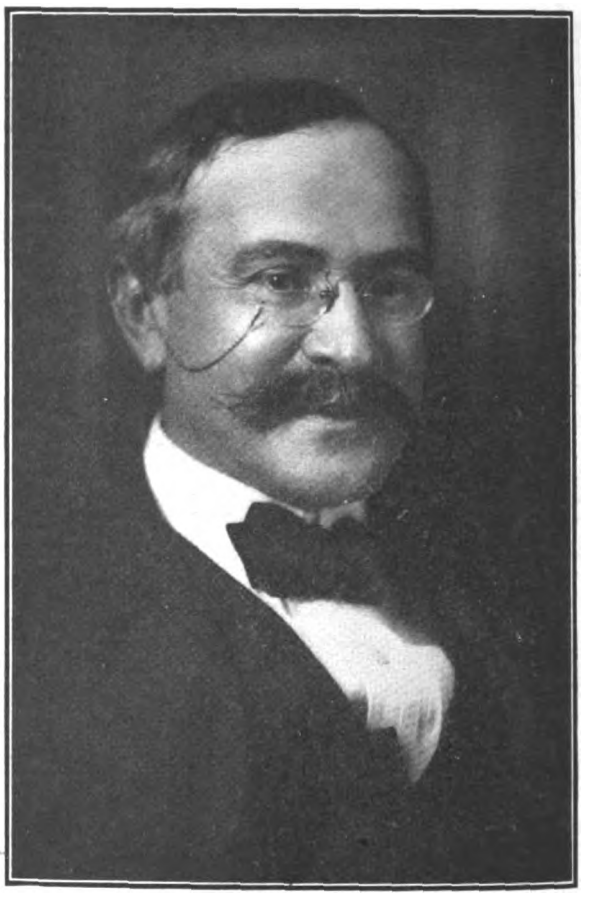
Public Policy Conference of National Electric Light Association.

A conference of a number of the leading men in the electric lighting industry was held Wednesday and Thursday, February 16 and 17, in New York, presided over by W. W. Freeman, chairman of the public policy committee of the National Electric Light Association. The attendance was large and quite representative of all sections of the United States. It included President Lloyd and other officials of the Association and matters of present-day importance to operators and owners of electric lighting companies were discussed in executive session.

Dr. Louis Duncan Dead.

Louis Duncan, a member of the firm of Duncan, Young & Company, New York City, died at his home, 998 Prospect Avenue, Pelham Manor, N. Y., in his fifty-fourth year. He was best known as an electrical traction expert and was consulting engineer of the Rapid Transit Commission during the electrification of the transit systems of New York.

Dr. Duncan was born in Washington, D. C., March 25, 1862, and was graduated from the Naval Academy in 1880, being appointed an ensign three years later. In the same year he was sent to Johns Hopkins University by the Government to take a graduate course in physics and electricity, and during his course there determined the unit of electrical resistance. Dr. Duncan served as chairman of the Board of Judges of the International Electrical Exhibition at Philadelphia in 1884. In 1887 he received his degree of Doctor of Philosophy at Johns Hopkins University and



Louis Duncan.

then became a professor there, resigning from the Navy to accept the appointment.

During the Spanish-American War, President McKinley appointed Dr. Duncan an aid in forming a battalion of engineers, and he became major of the First Volunteer Engineers. After the war, he again entered business and in 1902 became head of the Department of Electrical Engineering at the Massachusetts Institute of Technology.

Dr. Duncan was president of the American Institute of Electrical Engineers from 1895 to 1897. He was an honorary member of the Franklin Institute, and was a member of the Mathematical Society of France, the Physical Society of France, the American Electrochemical Society, the Automobile Club of America, the Maryland Club of Baltimore, and was a fellow of the American Philosophical Society. In addition, he was a member of the University and Engineers' Clubs. His wife, a son and three daughters survive him.

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Miscellaneous NEWS NOTES

To Test Concentric Wiring.—It is reported that the Rochester (N. Y.) Railway & Light Company will make test installations of concentric wiring with a view to its adoption if the tests are satisfactory.

Statistics of Holyoke (Mass.) Municipal Plant.—Power generated by the municipal plant during 1915 amounted to 14,264,700 kilowatt-hours, as compared with 14,088,000 kilowatt-hours during 1914. Receipts totaled $339,146, a slight decrease from the year before. The total number of electric meters set is 6,474, 629 having been added during 1915.

Rail Bonds Are Stolen.—About 170 copper rail bonds were removed from the tracks of the Lowell & Fitchburg (Mass.) Street Railway Company recently, being removed with a chisel and sledgehammer. As the bonds are worth about $1.75 each, the loss to the railway company is considerable when the cost of replacing them, together with the hindrance to traffic operation, is taken into account.

Report of Power Company Shows Large Increase in Business.—The annual report of the Kings County Electric Light & Power Company, Brooklyn, N. Y., shows the total number of contracts signed at the close of the year 1915 to be 32,581, an increase of 5,000 over the preceding year. The power output for 1915 was 143,997,941 kilowatt-hours, an increase of 31,720,515 kilowatt-hours over 1914. The increase in the company's business has made additional equipment necessary, and a 30,000-kilowatt turbogenerator will be installed during the coming summer.

Circuit Court Renders Decision in Montgomery (Ala.) Power Case.—The United States Circuit Court of Appeals has handed down a decision holding that the contract of the Montgomery Light & Water Company to furnish current for power to the Montgomery Light & Traction Company is valid and rendering judgment against the latter for full amount claimed. Under the contract about $200,000 is now due Montgomery Light & Water Company. The contract has three years yet to run. The traction company refused payment on the ground that the contract was invalid.

Printing Telegraph Introduced at Boston.—The Associated Press, Western Union and Postal Telegraph companies have installed the Morkrum automatic printing telegraph in their Boston offices. The apparatus consists of a universal keyboard operating a perforator which prepares a tape. The latter is fed through the transmitter, driven by a one-thirtieth horsepower motor. At the receiving end the signals are picked up through relays, and by means of selective apparatus the various signals are registered on a printing typewriter. Successful tests have been made with the apparatus between New York and San Francisco, with six repeaters in circuit, a speed of 58 words per minute being achieved. The average working speed for normal service is between 60 and 70 words per minute.

Dinner a la Electricity.—One of the first dinners prepared entirely by electrical means to be served in Oakland, Cal., was given by the Great Western Power Company in that city February 8. Covers were laid for 30 prominent men in the electrical industry, W. M. Briggs acting as toastmaster. Addresses were made by B. C. Hill, representing the city of Oakland: Lee Gilpen, representing the California Electrical Contractors' Association, and by Messrs. Mittick, Norling, Trogo, Clark, Ellis, Mellman and Woodward. Mr. Briggs gave an interesting talk on the company's pioneer work in promoting domestic cooking with the electric range. Assisting in the evening's festivities were F. H. Woodward, the company's Oakland manager, and W. B. Sedgley, recently appointed by the Great Western Power Company as agent at Martinez, Cal.

President's Visit Stimulates Lighting.—The visit of President Wilson to Kansas City recently caused the officials of the Union Station to order the full illumination of the waiting room, where heretofore only a small part of the equipment has been used. Hereafter the complete equipment will now be employed, the effect of the full lighting in the president's honor having been impressive and suggesting the advantage of continuance.

Hydroelectric Development in Oregon.—Rights for the development of 456,410 horsepower in the state have been initiated, according to claims filed with State Engineer Lewis for 1916. The claims total 219, and in many cases represent power which the claimants assert the right to develop, but which yet have not been actually developed.

Fined Under Provisions of Electrical Code.—Under the provisions of the Electrical Code of the city of New York, Michael Jacovone, 643 West Fiftieth Street, has been fined $50. Jacovone's offense consisted in a failure to correct serious electrical defects existing on his premises within the time fixed by an order of the Commissioner of Water Supply, Gas and Electricity. This is the first conviction under the new ordinance.

Louisville Jovians to Hold Rejuvenation.—Preparations for a rejuvenation on March 17 are being made by Jovians of Louisville, Ky., 26 applications already having been received. The local organization now numbers 126 and, after the campaign for new members, which will be launched shortly, it is expected that the membership will be increased to 175. The Louisville Jovian League will hold its annual election on February 22.

Joint Meeting of Engineers at Boston.—The Boston Section of the American Institute of Electrical Engineers, American Society of Mechanical Engineers and the Boston Society of Civil Engineers held their seventh annual joint banquet February 8 at the City Club, Boston, with about 500 in attendance. Charles L. Edgar, president of the Edison Electric Illuminating Company of Boston, presided as toastmaster, and the speakers were Governor McCall, Colonel W. E. Craighill, U. S. A., William Barclay Parsons of New York, John R. Freeman, of a recent Panama Commission, and Dr. John A. Brashear of Pittsburgh, Pa. Governor McCall said the science of engineering could be greatly expanded along social and economic lines, and that the profession is bound to have a larger part in the economic and efficient administration of government.

Recent Storm Damages Oregon Utilities.—Damage to power and light transmission lines on poles in the outlying districts of Portland during the recent storm which swept over the Pacific Norhwest, will amount to thousands of dollars, according to officials of the Portland Railway, Light & Power Company. After the storm had subsided, many wires snapped from the weight of ice, and for several days the company was busy repairing the numerous breaks. Power for its city lines and interurban roads, besides energy sold to the electric lines of the Southern Pacific, Oregon Electric and United Railways, and power for manufacturing plants in Portland, is generated by the Portland Railway, Light & Power Company. According to information made public, the 11,000-volt lines connecting the substations gave the most trouble during the storms. The power plants of the corporation were operated with but little difficulty, but when the two 60,000-volt lines from Cazdero fell, the two steam auxiliary plants were called into play. At this writing, it is reported lines have been repaired and conditions are again normal. At Milton, Ore., backwater from the tailrace flooded the power house of the municipal lighting plant there, putting the plant out of commission.

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Electricity in Automobile Manufacturing

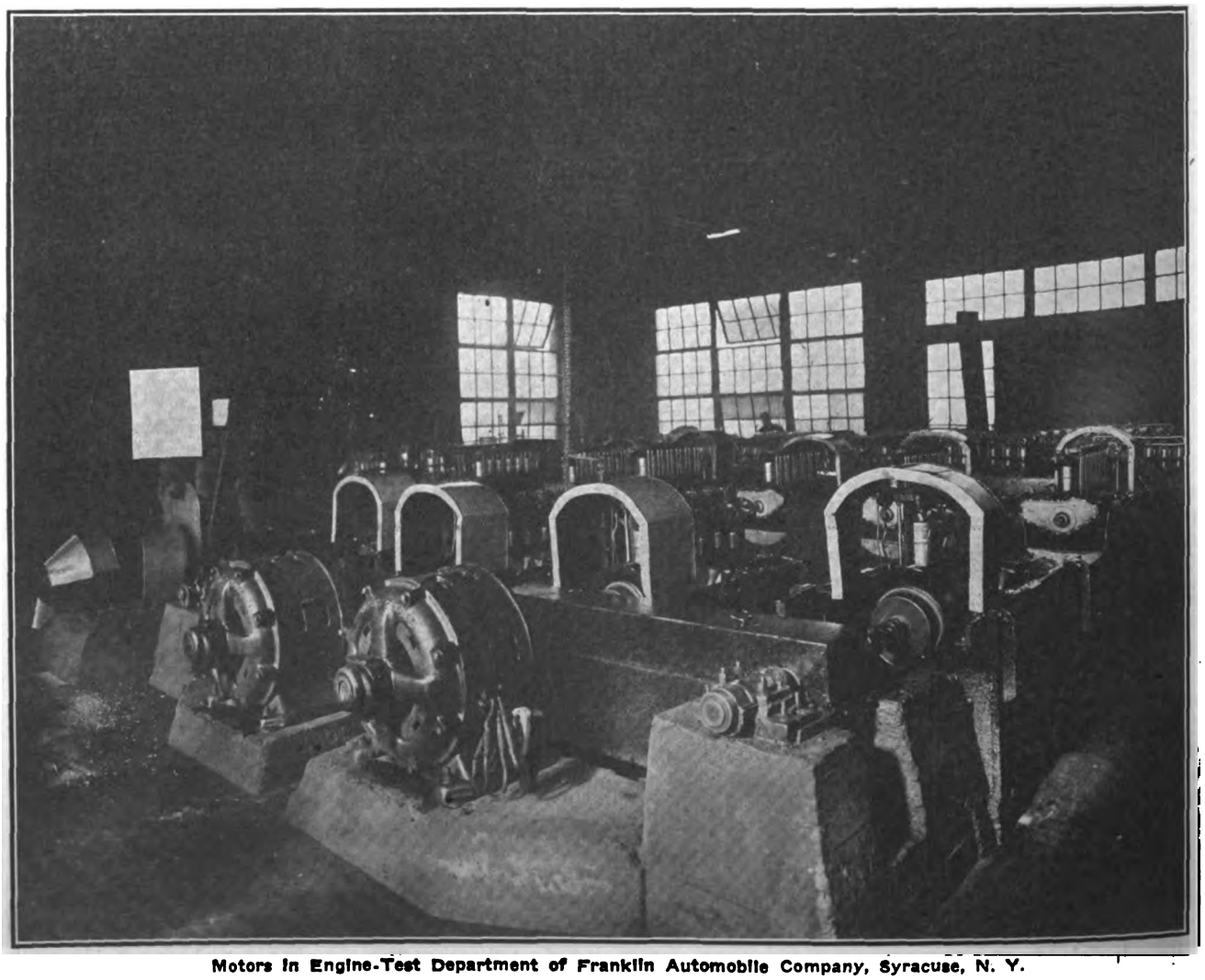
Details of Electrical Equipment in the Plant of the Franklin Automobile Company Which Secures Energy from the Local Central-Station Company

Industrial Power Series—Article No. 154.

There is probably no industry at the present time that has developed with greater rapidity than the manufacture of automobiles, and the subject of this article, the Franklin Automobile Company, Syracuse, N. Y., is an example of a modern industry. In 1898 the first four-cylinder automobile was built in this country which in 1902 took the form of the Franklin car. For fourteen years the growth of the company has been rapid and during the year 1915 the production of cars was 4,300 and the estimated production for 1916 is 8,500, or nearly double that of the previous year. The Franklin Company was numbered among the pioneers in the use of electric motor drive and at the present time is operating nearly 100 motors and is about to install 18 additional motors in a new building nearing completion.

For use in the cars 97 per cent of all material is made in the works which includes practically everything with the exception of the transmissions, differentials and aluminum bodies. Service is furnished by the Syracuse Lighting Company, at 2,300 volts, three-phase, to a substation in the Franklin buildings where the current is transformed to two-phase, 220 volts by means of transformers connected for three-phase, two-phase transformation. The transformer equipment includes four 150-kilowatt oil-insulated transformers and two 600-kilowatt units of the same type.

Scientific management and production receives especial attention and many innovations are in evidence in the production department. Every unit is made on part number and the lot sizes are determined for a theoretical minimum which is based on 22 variables. The quantity of production is determined by a specialist and production on one part is eased off when thought desirable to gain uniformity in quantity and parts are picked up which are dragging. An elaborate system of workmens' records is kept so that the qualifications of a man necessary to perform a particular part of the work can be found at once. A central department dispatches each job over each machine and no material is moved by the skilled workmen. A battery of storage-battery trucks is kept in operation and they transfer approximately 300,000 pounds of material weekly. As to the advantages of electric motor drive and central-station service in an automobile plant, in many respects they are quite similar to those outlined for other similar industries. The majority of the parts are small and the processes diversified.



Motors in Engine-Test Department of Franklin Automobile Company, Syracuse, N. Y.

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Electroplating Department Showing Dynamo in Background.

Group of Motor-Driven Machines in Small-Parts Department.

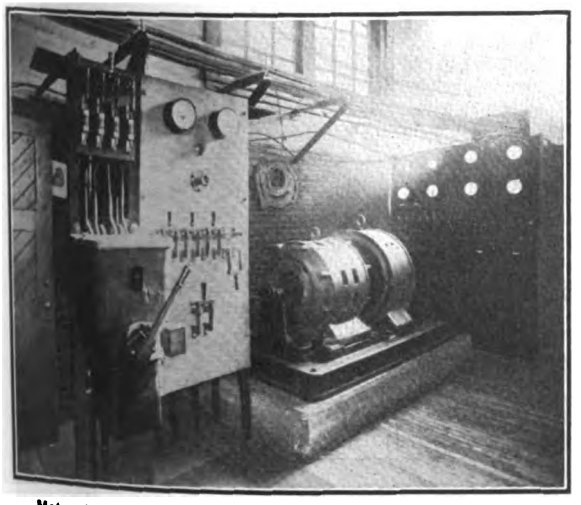
Process of Manufacture.

Before taking up some of the manufacturing details it may be in order to describe briefly the Franklin Company's product which includes a number of styles of pleasure vehicles. One of the principal features sought in the design of Franklin cars is a minimum weight with a maximum of sturdiness. It is claimed that by means of this light-weight construction that shocks created by inequalities in the road's surface are correspondingly reduced. The light weight is obtained largely through flexible construction.

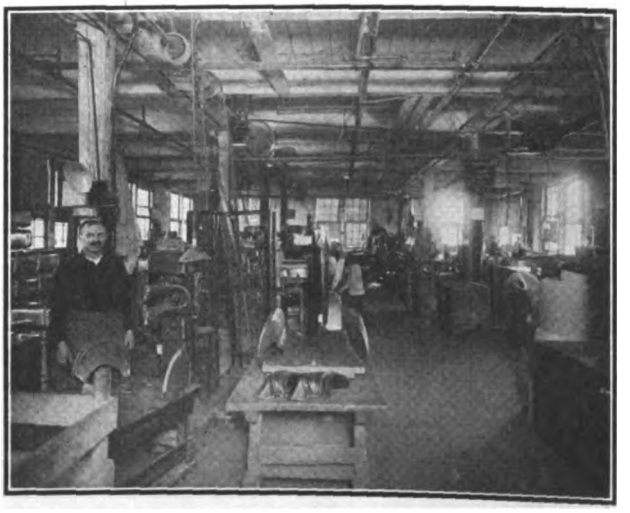
Another feature of the Franklin car is the air cooling of the engine. The object for cooling an automobile engine is to keep the temperature of the engine within the range of efficient operation. Not all of the heat that is generated by the combustion of the mixture goes into the power, a portion of it being transferred to the cylinder walls and must be carried away. There are two ways of accomplishing this cooling, one by the direct application of air currents to the cylinders, and the other by the direct application of air to the cylinders through the medium of water. The air cooling in this car depends upon the movement of the flywheel in which is incorporated a special fan which draws in over the cylinders 2,200 cubic feet of air per minute when the engine speed is 1,500 revolutions per minute. Flexibility is carried into the power application of the car, as the drive from the rear wheels is transmitted through the rear springs instead of torque tubes or radius rods. The car frame is made of second growth ash which is claimed to be lighter for frame construction than steel frames of equivalent strength.

The Dyneto electric starting and lighting system used on the Franklin cars is the single unit type that consists of a motor-generator that serves both to supply the current and start the engine. One of the interesting applications in connection with the electric drive is found in the engine test department where the engines are driven by electric motors for the preliminary test before being driven by their own power. The engines are run at various speeds corresponding to given road speeds of the car. There is an equipment of six 25-horsepower motors which drive two engines each, one engine being direct-coupled to the motor and the second engine is driven from the first engine by means of a chain belt. Twelve engines can thus be tested at one time. The motor speed is 685 revolutions per minute. The engines are handled by hand hoists and are bolted to a regulation crank case supported on iron legs. For high-speed tests there is an equipment of four test blocks with four 30-horsepower motors having provision for direct-coupling one motor to a single engine by means of flexible couplings. These motors operate at 1,745 revolutions per minute. The engines after receiving the motor-driven test are tested under their own power and then mounted on the chassis for the first road test. After the latter has been completed the bodies are placed on the chassis and a second road test is run. The cars are then subjected to a final inspection given a rub down are prepared for shipment.

All the woodwork of the cars is prepared in the woodworking department where there is an equipment of a sand-paper machine, wood planer, miscellaneous woodworking machine and an exhaust fan for removing the



Motor-Generator Set Supplying Direct-Current Motors.



Ten-Kilowatt Spot Welder and Motor-Driven Lathes.

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Motor Data Sheet.

Franklin Automobile Company, Syracuse, N. Y. Service from Syracuse Lighting Company's 2300-volt, three-phase distribution. Three-phase, two-phase transformation, 2300/220 volts. All motors 2-phase, 220-volt squirrel-cage machines unless otherwise noted. Standard pulleys.

No.	Horse-power.	Kind of Drive.	Speed, R. P. M.	Application.
1	7.5	Belt	1120	Sand-paper machine.
1	10	Belt	1120	Wood planer.
1	10	Group	1120	Turning machine, band saw, three drills.
1	30	Group	850	Sticker, shaper, circular saw.
1	15	Belt	850	Exhaust fan for removing shavings.
1	15	Belt	850	Machine for pressing rear axles.
1	10	Group	1120	Five drill presses, one engine lathe, two grinders.
1	15	Group	1120	Group small machine tools.
1	10	Group	1120	Two wood lathes, four engine lathes.
2	2	Direct	1800	Paint spraying machine.
4	2	Direct	1800	Four paint spraying machines.
1	2	Direct	1800	Machine for drying wheels.
1	2	Belt	1800	Air purifier.
1	2	Belt	1800	Enamel separator.
1	15	Belt	1120	Six gear shapers.
1	25	Group	1120	Eight grinders, two engine lathes, one drill press.
1	10	Belt	850	Machine for testing transmissions.
1	15	Group	1120	Group of engine lathes.
1	40	Group	1200	Twenty-six drill presses.
1	15	Group	1120	Ten milling machines.
6	25	Direct	685	Six engine test blocks—low speed.
4	30	Direct	1745	Four engine test blocks—high speed.
1	10	Group	1120	Group small machine tools, and group of engine lathes and drill presses.
1	5	Belt	1120	Air compressor.
1	7.5	Group	1120	Group small machine tools.
1	7.5	Belt	1120	Pratt & Whitney grinding machine.
1	15	Group	850	Group of lathes, milling machines and drill presses.
1	15	Direct	1140	Engine test block.
1	5	Group	1150	Engine lathe, emery wheel.
1	10	Group	850	Broaching press, drill press, three engine lathes, group small machine tools.
2	25	Group	1120	Eleven engine lathes, five grinders, one shaper, four milling machines, ten drill presses, three screw machines.
1	10	Group	850	Four tumblers, three hammers, forge blower.
1	10	Group	850	Group of small machine tools and blower.
1	10	Group	1120	Five emery grinders.
1	25	Group	1150	Three grinders, two radial drills.
1	20	Chain	1120	Fox multiple spindle drill.
1	30	Group	1120	Ten milling machines, radial drill, three drill presses, seven milling machines.
1	75	Group	850	Twenty-two grinders.
1	15	Group	1150	Eight drill presses, three engine lathes.
1	50	Group	850	Eleven Jones & Lamson screw machines, five automatic screw machines.
1	30	Group	1120	Group Jones & Lamson screw machines.
1	25	Group	1120	Group automatic screw machines.
1	10	Group	1120	Four drill presses, nine turret lathes.
1	1	Group	1700	Two small drill presses, two emery grinders.
1	5	Group	1120	Group of sewing machines.
1	10	Group	1150	Five drill presses, tool grinder, group small machine tools.
1	10	Belt	1120	Ten-kilowatt Toledo spot welder, 35-kilowatt Toledo spot welder, exhaust fan for removing dust from polishing wheels.
1	15	Group	1120	Twelve polishing wheels.
1	5	Belt	1120	2500-watt plating generator.
1	3	Belt	1150	Small cylinder press. } D. C. Motors 220 volts
2	1	Belt	1140	Two small job presses. } D. C. Motors 220 volts
1	0.5	Belt	....	Paper folding machine. } D. C. Motors 220 volts
1	2	Belt	1700	Paper cutter. } D. C. Motors 220 volts
1	0.16	Belt	1200	Stitching machine. Single-phase motor.
1	74.3	Belt	1170	50-kilowatt, 250-volt direct-current generator for supplying direct current to direct-current motors.
1	10	Belt	850	Freight elevator. } Cutler-Hammer control
1	20	Belt	1120	Freight elevator. } Cutler-Hammer control
1	25	Belt	850	Freight elevator. } Cutler-Hammer control
1	10	Direct	750	Freight elevator. } Cutler-Hammer control

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shavings. The first two machines and the fan are individually driven; the two groups of miscellaneous machines are driven by two motors. There are a great number of manufacturing processes which are carried on in miscellaneous machine tools in the various departments. The cylinders and boxes are ground to a fit on special grinding machines which are driven in groups by motors.

Motor Drive in Paint Shop.

The paint department is interesting on account of the manner in which the paint is applied. The various parts are placed in a paint spraying machine of which there are six and the paint sprayed on with a hose and nozzle. In connection with these machines there is a motor-driven fan for removing the gases and superfluous paint, the latter is deposited in a metal can and the gases excluded from the building. The machines are operated by two-horsepower motors. The wheels are dried on a special machine which revolves the wheels slowly. This machine is also driven by a two-horsepower motor. In addition the paint department contains an air purifier and an enamel separator each driven by a two-horsepower motor. The speed of all the motors in the paint department is 1,800 revolutions per minute. There are of course, experimental departments and numerous individual departments for the necessary upkeep of the plant and for repair work. In the metal-body department where the metal parts of the body are assembled there are two Toledo spot welders.

There is a complete printing department in connection with the Franklin plant where practically all of the company's printing is done. There is a cylinder press, two job presses, folding machine, paper cutter and a stitching machine. All of these machines are driven by direct-current motors, 220-volts, with the exception of the stitching machine which is driven by a single-phase motor. The direct current for these motors is supplied by a 50-kilowatt, direct-current, 250-volt generator direct-coupled to a 75-horsepower induction motor. There are four electric freight elevators driven by two 10, one 20, and one 25-horsepower motors. There is a complete electro-plating department which includes a 2,500-watt, direct-current plating generator belted to a five-horsepower induction motor operating at 1,120 revolutions per minute.

Correction.

A typographical error in the issue of February 12, concerning "Central-Station Costs in Massachusetts" (page 284), made it appear that the Boston Edison Company was referred to, when the Brockton company was the company under discussion. Its principal generating station is at East Bridgewater, Mass.

Central-Station Problems Discussed at Boston Luncheon.

About 150 attended the February 10 get-together luncheon at the American House, Boston. G. K. Dustin, of the Massachusetts Lighting Companies, Boston, presided, and the meeting was devoted to an informal discussion of central-station problems and practices. A poll of companies showed that 64 out of a total of 67 sell appliances at a profit, the usual per cent being 10, and the maximum about 30 per cent. Of 40 companies with elevators on their circuits, 15 use reverse-phase relays.

It was stated that insurance underwriters make no special ruling on the use of Type C lamps in show windows, but that an attempt is made to limit the temperature to 200 degrees Fahrenheit.

About half the central stations represented make a point of soliciting new enterprises for their territory.

Manhole and cable records of the Boston Edison Company were shown. Causes of over-registering of meters were considered.

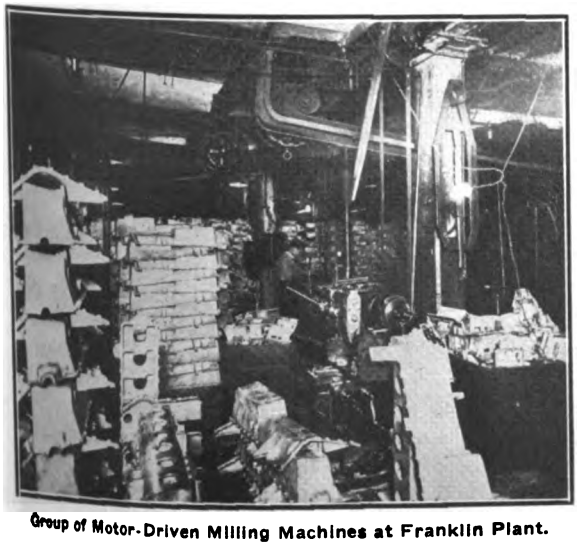
An interesting practice of the Worcester Electric Light Company is to leave a meter on discontinued service for a period of 30 days, with a tag attached stating that service is available at once on application. The company is discontinuing all inclosed arcs.

Residence Lighting Committee Active.

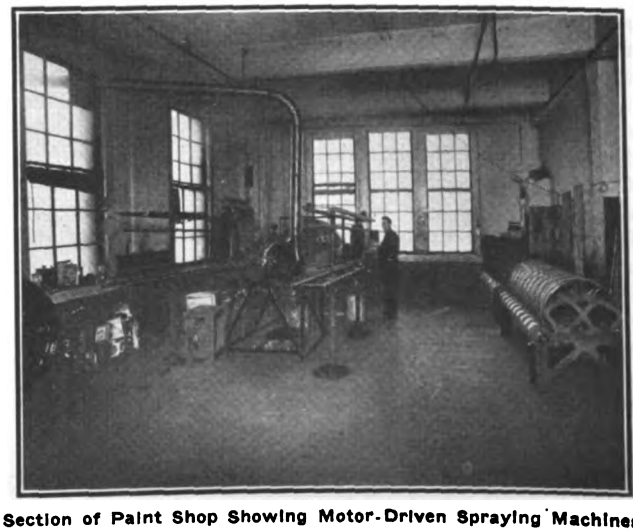
The committee on Residence Lighting, Lighting Sales Bureau, N. E. L. A., of which Fred H. Scheel, Public Service Company of Northern Illinois, Streator, Ill., is chairman, is actively engaged in the preparation of a report showing various methods of securing residence business and giving details of those proving most successful.

This report is part of the report of the Lighting Sales Bureau which is to be presented at the convention in Chicago this year and is being planned with the idea of giving assistance to the business-development departments of lighting companies. The report will be practical to such a degree that every lighting sales manager and lighting salesman interested in residence business will find it profitable.

In compiling the report of the committee, summaries on the subject of residence business were considered which were prepared by T. H. Kettle, Minneapolis General Electric Company; W. H. Wells, Edison Electric Illumination Company, Brooklyn; R. G. Gentry, Denver Gas & Electric Light Company; W. P. Lyon, Commonwealth Edison Company, Chicago; G. W. Rieger, Philadelphia Electric Company; Charles B. Yonts, Illinois Northern Utilities Company, and Earl E. Whitehorne.



Group of Motor-Driven Milling Machines at Franklin Plant.



Section of Paint Shop Showing Motor-Driven Spraying Machines.

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

SERVICE TO LIGHTING CUSTOMERS.

Philadelphia Electric Company Has Well Organized Department for Giving Service to all Customers and Prospects.

By G. B. Regar.

The work of the Lighting Service Department of the Philadelphia Electric Company presents no new, radical or startling development in its central-station practice, but has for its object a more thorough and systematic handling of the ever increasing details and importance of service.

In this enlightened, progressive age, we find in all commercial pursuits, and especially in public service corporations, a demand for something more than the mere physical exchanging of a commodity for a compensation. A concrete example of the transaction of delivering to one's home a spool of thread at an acknowledged financial loss, presents itself, but has for its compensation the fact that a high grade service has been rendered, which had it not been the case would no doubt have precluded further business transaction with the customer. We read the stupendous reports of passengers carried each year by the railroads with a constant decreasing loss of life. This has been made possible by the careful study of service conditions, in the nature of exacting employees, of perfected methods of signaling, and accident prevention, steel cars and many other details which go to make up their vast systems. Many demand an extra service in the nature of parlor and chair cars, even at an added expense.

It is true that the public demands this service, and is willing to pay for it. But efficient business methods enable the larger corporations to give this service at no additional compensation from the public.

It is well recognized that an electric lighting company must sell something else besides electricity, viz.: Service. It is also a fact that the completeness of that service and the manner in which it is rendered are reflected in the success of the company and in its relations with the consumers. The consumer purchases electricity for illumination, power or heating to fulfill his requirements of a business or personal nature. It is desired to accomplish certain results in the best possible manner, at the lowest cost and without delay or friction in his business dealings with the lighting company. Therefore it is evident that each detail of the central station's business in the supplying of the current and collection of the bills must harmoniously dovetail perfect and satisfactory service from the company to its consumers.

The far-reaching importance of the lighting phase of our work can best be described by quoting the opinion of Joseph B. McCall in his presidential address to the National Electric Light Association: "It is gratifying to find that increasingly greater attention is being given by all concerned in all parts of the world, and particularly in this country, to the proper working out of our artificial illumination problems, particularly with relation to its effect upon the health and happiness of our citizens.

"It is not too much to say that this renaissance in lighting methods has been brought about primarily, by the development of electricity as an illuminant.

"The infinite possibilities in the way of bettering artificial illumination created a new type of engineer. The scientific study of illuminating problems and the importance to general public health in the matter of conserving vision have led us to the point where not only must efficiency and economy not be neglected, but the problem of health for the masses must be accorded its proper importance.

"The situation imposes upon us in the central-station industry, certain duties and responsibilities. We must work for the betterment of conditions in order to meet fully and satisfactorily the increasing requirements of the age, bearing in mind the essential necessity of conserving the health and energy of the human race so that the faculties, mental and physical of all of us, may be devoted to the highest type of progress in the world's work."

Functions of Lighting Service Department.

The lighting load of a central station is a very desirable one. The public is being educated on the subject of efficient lighting through the daily papers, magazines, advertising by the manufacturers of lighting units, central-station engineers and the actual installations of improved lighting. Electric illumination is cheaper today than it was a few years ago, due primarily to the increased efficiency of lamps and the prominence of illuminating engineering in central-station practice.

The Philadelphia Electric Company has always been an exponent of the best and most efficient lamps procurable for its customers. Its knowledge of matters pertaining to the industry and of usefulness to its consumers has always been placed at their disposal. It early grasped the importance of illuminating engineering and educated its salesmen along these lines, realizing that a general knowledge of the subject by the selling force would be reflected by the installation. It organized an Illuminating Engineering Department consisting of men well versed in the more scientific applications of illumination, and able to cope with the new and varied conditions and placed this department at the services of its consumers without cost to them, through the agencies of newspaper, street-car and sign advertising, and general advertising matter and also the verbal offering of this service by the salesman and other representatives.

An analysis of our records shows many lamps other than Mazda connected to our lines. It is further evident that with the commercial activity in lighting units, the advent of the type "C" Mazda lamp, and last but far from least, the many instances of an utter disregard for efficiency in the matter of installation of lighting units, leaves much work to be done by the lighting specialists of our company.

Exemplifying the statement in the opening paragraph that no new departure has been made in the formation of the Lighting Service Department, it is only just to say that it was organized to extend its plan of service more systematically, having 100 per cent for its goal. The predominant factor of this work is that this service seeks out the customer instead of waiting for him to take the initial step. Its fundamental principles are to co-operate with the sales force in laying out proposed lighting installations and compiling the necessary engineering and commercial data per-

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taining thereto, for the enlightenment of the proposed consumer. It co-operates with the district managers in holding the business connected to the lines, by pointing out to the consumer the faults of his installation and the necessary changes to make a well balanced and efficient installation.

The department consists at the present time of seven men with the necessary complement of clerks and stenographers. Its headquarters are at the main office, where three of its men are located, the remaining four being assigned to other districts and making headquarters there. The district men report by telephone to headquarters morning, noon and night, to keep in close touch and to follow cases needing immediate attention. All requests for information or complaints are called on within 24 hours and fully 75 per cent within six hours.

Lighting Specialist Visits Installations.

On receipt of a request for information or a complaint from a consumer, either by personal call, telephone or letter, the person receiving such request fills out a blank form known as "Office Notice to Service Department." This blank is in triplicate. The original is immediately forwarded to headquarters, the duplicate to the Lighting Service representative of the district and the triplicate retained for office files. If the case to be called on is in other than the district receiving the call the information is given over the telephone to the proper districts and the blank forms follow in the company mail.

The same procedure is carried out by salesmen in requesting the aid of this department in preparing lighting plans for new or proposed installations or for changes in existing installations. Practically all cases of this character are handled by the lighting specialists stationed at headquarters, it being considered inexpedient to permit the district men to devote a considerable period of time—some time extending into several hours or even days on any one case, in which event they would often fail to give service to some consumer desiring immediate attention. They are, however, fully capable of handling the lighting problems coming before them, and care for all, except as stated, the large and extended ones.

The personnel of the department consists of men who have been connected with the company for extended periods and who have had technical training in the higher schools and colleges, or who have worked their way through the technical and engineering departments of the company. They must possess a thorough knowledge of the details of the company, and be well versed in the commercial phases. It is needless to say that men, assigned to this department must possess a courteous and diplomatic personality.

There is no limitation placed upon the character of work. The consumer requesting an inspection of his house lighting for the purpose of seeing that his lamps are in good condition, is accorded the same prompt and careful attention as the proposed lighting of a large factory, necessitating written specifications and plans.

Night Inspections of Installations.

Each district representative is in a measure held responsible for the lighting of the installations in his district, at least as far as his endeavoring to convert the consumer as to the errors of the installation. It is part of his duty to inspect at night the commercial lighting installations—at least one inspection per week must be made. These are reported to headquarters in a blank form in duplicate. The original is forwarded to the district office, who issues instructions on the triplicate form, as previously explained, and the consumer is called upon.

These cases especially demand a diplomatic treatment, the manner of approach being an important factor in the results obtained. Many of the consumers of the smaller business class look with suspicion on the first visit, and it can readliy be seen that the salient point is to gain the consumer's confidence and assure him that the call is for his benefit. To immediately launch into the fact that a Mazda lamp will cost him so much money, without first absolutely convincing him that it only consumes about half the current, would offset the results expected.

Type C Lamps Recommended.

In all cases of lamp renewals where other than Mazda lamps are placed a pamphlet describing the efficiency of Mazda lamps is mailed; these bring many requests for inspection and information. It is now contemplated to make a personal call on every such consumer for the purpose of explaining the advantages of this lamp.

When the 60-watt Mazda lamp was changed from a unit base to a standard base, the company changed, without cost, the type "H" holder to type "O." This rule has now been made general, and, in fact, any type holder whatever is taken in even exchange for the correct form. A casual observance of lighting installations in the smaller stores shows that the plain three-screw flat-type holder is universally used—first, no doubt, because it is the cheapest, and, second, because the electricians and fixture manufacturers do not investigate the type of lamp to be used.

Another very distracting fact is the replacing of a number of lamps with fewer lamps. A notable example is in deck windows with cone reflectors. Many consumers will remove perhaps 16 40-watt Mazda lamps and install four 100-watt type "C" Mazda lamps. The horrible resulting glare is very evident. This same result occurs in the cases of hundreds of fixtures. There are many instances of a fixture with three 60-watt Mazda lamps not giving the results desired. The consumer replaces these three with one 200-watt type "C" lamp, with the result that the fixture is unbalanced, the lamp extends below the shade, and the whole result is poor.

These results are also stimulating the use of the single unit, and we are getting more uniformly good results with it because of the impossibility of it becoming unbalanced by lamp changes.

Electric Radiators Heat Office Building While Being Moved.

The Boston Elevated Railway Company, owners of a brick office building occupied by the Bay State Street Railway Company as headquarters of its electric freight business, recently moved the building about 150 feet to a new location, on Atlantic Avenue, Boston. During the process of moving, heating for the offices, which continued to be occupied without interruption, was provided by means of about 50 electric radiators, which were connected to the Elevated Company's circuits by means of temporary wiring. As the moving took place during midwinter, the need of artificial heat presented a problem which was successfully met by the electric heating installation.

Maine Power Company Holds Incubator Sale.

The Central Maine Power Company, Augusta, Me., has been conducting a special display and sale of the Lo-Glo poultry outfit, at all its appliance stores. The complete outfit, consisting of one 120-chick electric incubator, one 100-chick electric hover, one 100-chick run, one Lo-Glo egg tester, a 3-compartment hopper, drinking fount, chick feed and dry-mash trays, were offered for $38.75.

The company pointed out that the electric apparatus is free from the fire hazard attending oil-burning incubators and called attention to the fact that hatching the chickens is only part of the process, the perfectly even temperature of the hover being necessary to obtain best results.

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Large Sign Installed in Hartford.

The Travelers Insurance Company has erected on its Home Office Building in Hartford, Conn., what is said to be the largest electric sign employed by any insurance company in the world.

This sign extends across the front of the building a distance of 120 feet and has letters 9 feet high. The body of each letter is 18 inches wide, is painted white, and has a collar to give the edge of the letter definition. Two hundred and fifty electric bulbs are used to light the sign, and experiments have shown that it will be readily legible at a distance of three miles or more.

The Travelers building, which is a ten-story structure on the Main Street of Hartford, is located in such a position that the sign can be easily seen from the trains of the New York, New Haven & Hartford Railroad as they enter and leave the city. The sign will be kept burning all night.

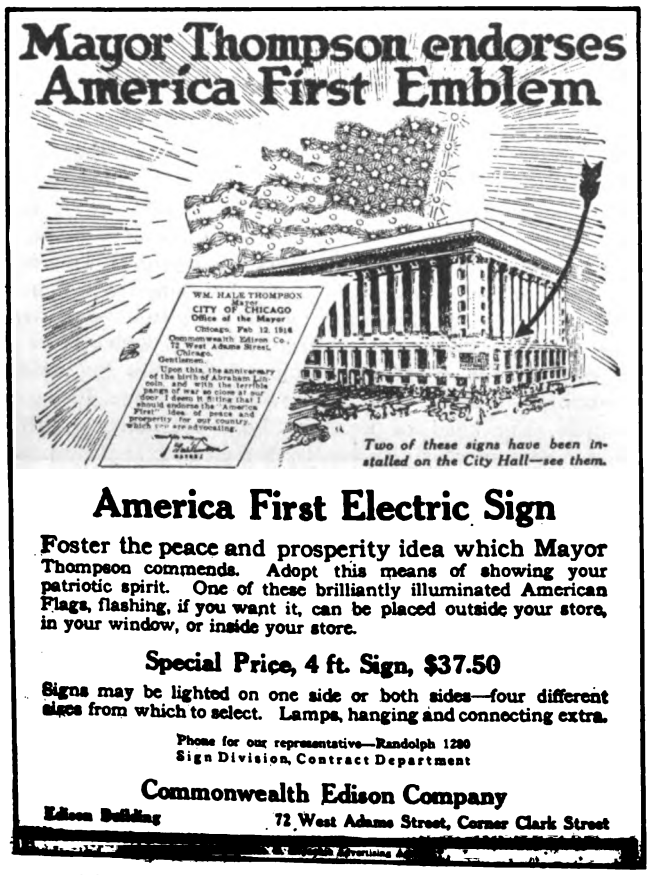
Flag Sign Campaign Inaugurated in Chicago.

In furtherance of the nation-wide movement to popularize the electrically lighted flag sign, the Commonwealth Edison Company, Chicago, Ill., has inaugurated a sign campaign and is offering special prices on a standard four-foot flag sign. Before actively starting the campaign the company succeeded in selling two of the signs to the city and these are now installed over the two main entrances of the City Hall. Two similar signs have also been installed at the entrances of the Edison Building.

The accompanying illustration shows the initial advertisement used in the campaign and embodies a letter from Mayor Thompson endorsing the movement.

Edison Company Advertises Building Equipped With Electric Ranges.

As a feature of its campaign to increase the use of electric cooking, the Boston Edison Company is advertising in the "For Rent" columns of the daily papers, apartments



Advertisement of Commonwealth Edison Company.

Boston Edison Company Advertisement in "For Rent" Section of Daily Papers.

in which electric ranges have been installed. The accompanying illustration shows a typical advertisement. In addition to the publicity which is directed to the apartment so featured, it is stated that many owners and agents of other buildings are being favorably impressed with the co-operation of the Edison company and with the advertising possibilities of a building equipped with electric ranges.

Unique Features of Range Campaign on Coast.

A unique and interesting selling campaign on electric ranges is about to be put on in California, the progress and success of which will be watched with keen interest by the men identified with this industry.

The Federal Sign System (Electric) of San Francisco, representatives of the Globe Stove & Range Company, Kokomo, Ind., is making arrangements with the Pacific Coast power companies to demonstrate Globe electric ranges to customers on a plan, the main features of which are as follows:

A Globe range will be mounted on a motor truck carrying meters graduated in "cents" and "cents per hour" for the easy understanding of the trial by the customer.

The truck will move from house to house in a given town giving complete cooking demonstrations on the back porch of each prospect.

The range will be connected to the company lines outside of the household meter so that the trial costs the customer absolutely nothing.

The companies which have adopted this plan are confident that it will produce most gratifying results.

Large Increase in Sale of Power to Steel Industries in Ohio.

Four subsidiaries of Cities Service Company in comparatively small cities in Ohio—the Alliance Gas & Power Company, the Trumbull Public Service Company, of Warren; the Massillon Electric & Gas Company, and the Elyria and Lorain electric properties—report sales of power to steel and allied industries, expressed in gross revenue in 1913, of $119,778; 1914, $181,809, and 1915, $306,136.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ELECTRICITY IN SMALL INDUSTRIES.

Central-Station Service Effects Marked Economies in Several Small Plants in Auburn, N. Y.

In a recent article in this department, the general advantages of electric drive and central-station service for small manufacturers were discussed. The present article takes up the details of several small manufacturing plants now using central-station service and motor drive. One of these plants formerly used water power and another a gas engine. In both of these latter cases remarkable saving in power costs and increased production has been the result. Therefore, before taking up specific details, it may be well to draw some comparisons between the relative advantages of electric, water and gas power.

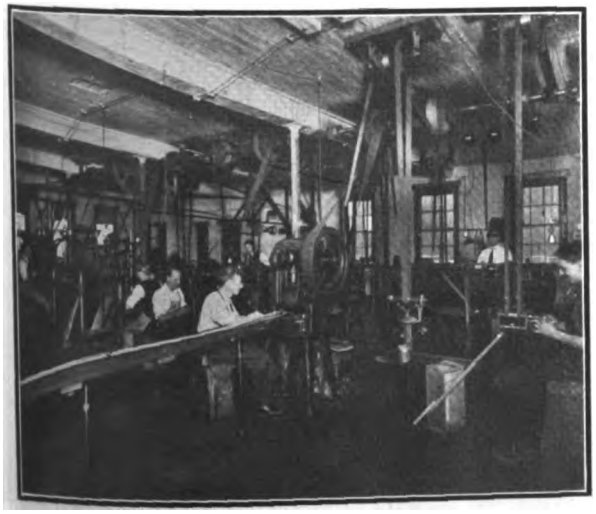
One of the greatest limitations of the gas engine and the water wheel is that they cannot be appreciably overloaded, and the former operates economically only at or near full load. When a water wheel is overloaded there is a wide fluctuation of speed with fluctuations of load which impairs the product manufactured and decreases output. The efficiency and power of a water wheel is seriously impaired by low water in either the head or the tail race and foreign matter and ice are a constant source of trouble. The electric motor is noted for its overload capacity which is limited only by the heat that it can radiate, and therefore for short periods it can carry excessive overloads.

In many localities, where water power is used, it requires the services of a man continually at the intake screen to clear obstructions, and if the wheel is stopped for any reason, production ceases and the overhead charges still continue. From one standpoint the gas engine and the water wheel are alike in objectionable features, that is, the power must be transmitted mechanically from a central point, necessitating friction losses and cost of upkeep of large shafts and belts. The gas engine as frequently erected is noisy, bulky and subject to continuous vibration, and requires an especially built foundation. The electric motor is practically noiseless, occupies small space, requires no foundation, can be placed on the floor, mounted on the wall or suspended from the ceiling, wherever it is most convenient for the work. To start a water wheel it is necessary to manipulate cumbersome gates and unless a complicated and expensive governor is installed a man must be stationed at the gates to manipulate them with reference to the load.

The gas engine must be turned over by hand, unless compressed air or other external power is at hand which can be applied, while the electric motor will start with full load by simply throwing in a simple starting device. It is frequently claimed that internal-combustion engines operate at a very low cost per unit of energy produced. These figures, however, apply only when the engine is operating under most favorable conditions as regard load, quality of fuel, adjustment of the mixture, the ignition, etc. When operating under unfavorable conditions the cost of operation per unit of energy may be nearly twice the figures claimed. Taking this into consideration, and also the fact that the first cost of the internal combustion engine is nearly double that of an electric motor of equal rating, it is seen that even on the basis of cost of energy, the electric motor under operating conditions gives more favorable results than the internal-combustion engine. The data given in connection with the following installations will illustrate the arguments set forth in the preceding paragraphs.

National Rug Company.

This small industry is devoted to the manufacture of rugs of all sizes and qualities from old carpets. Although there are a number of such industries in the country, the process is comparatively new and offers an excellent opportunity for the use of electric drive and central-station power. Owing to the nature of the work hand looms are used, but machines for fraying the edges of the strips of carpet used in the manufacture of the rugs are power driven. The general process of manufacture is as follows: The old pieces of carpet as received are first thoroughly cleaned and cut into strips approximately three-fourths of



Motor-Driven Machine Tools, Jewell Manufacturing Company.

Motor Drive in Leather-Goods Plant.

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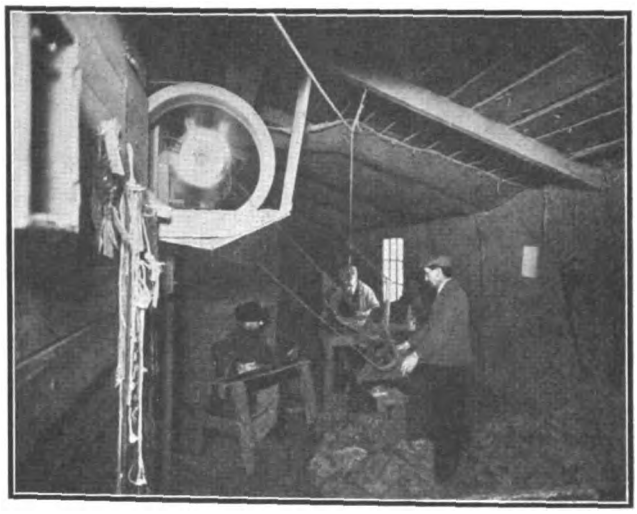


Motor-Driven Rug Machines.

an inch in diameter. The brussels strips are run through the fraying machines which consist of two wheels, slightly separated with serrated peripheries, which bear on a steel roller. The strips are passed through the machine as the wheels revolve, which frays or ravels out the edges of the strips. After fraying, the strips are twisted into spirals by hand and used in the looms as the yarn is used in the original manufacture of the carpet. Ingrain and other qualities of carpet fray when cut into strips and do not need to be passed through the machines. The finished rug presents a handsome appearance, being alike on both sides.

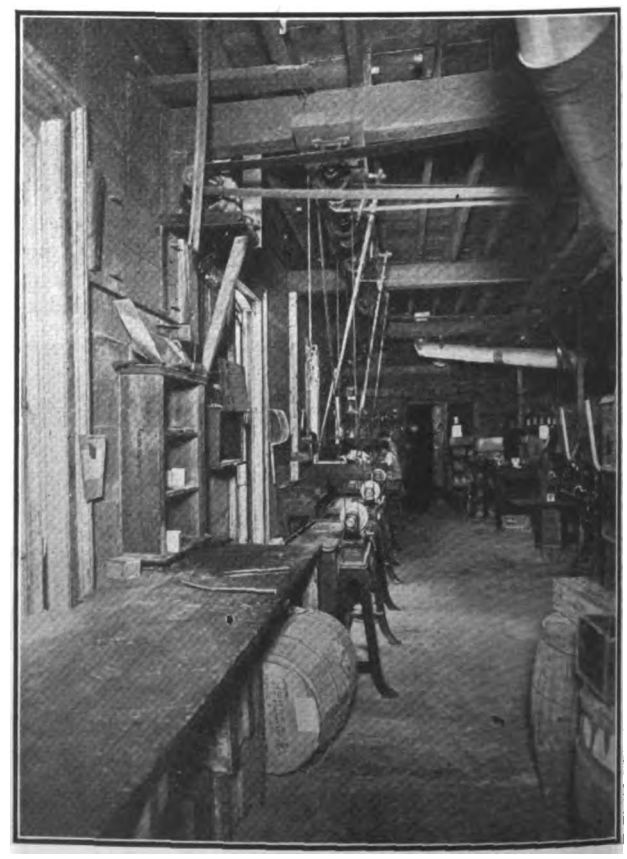
In the National rug plant there are two fraying machines group driven by a five-horsepower induction motor operating at 1,800 revolutions per minute and equipped with a four-inch pulley. There are five hand looms, respectively 3 feet and 8 feet wide, three of the former and two of the latter. The plant has a capacity of 250 square yards of rugs a day under normal working conditions. The average consumption of energy is 161 kilowatt-hours monthly. Formerly a gas engine was employed using illuminating gas from the city mains and from careful tests it has been shown that there is a saving of 25 per cent in power costs by the use of electric power over the old method of drive, aside from the other advantages.

Auburn Leather Goods Company.

This concern manufactures automobile parts of leather, fiber, paper, asbestos, and felt, including gaskets, shims, friction disks, tire valves, washers, etc. In addition plumbers and hydraulic supplies are made as well as leather advertising novelties. There was formerly a department for the manufacture of infants' shoes but this has been abandoned and will be devoted to advertising novelties. Water power was used until about 1.5 years ago, but owing to the many disadvantages it was abandoned and electric drive substituted. Although the water rights cost very little an official of the company stated that electric power has cost much less than water power. The company under the old power paid a man from $10 to $12 a week to do nothing but keep refuse and ice away from the intake screens and there was considerable trouble from stoppage of the wheel by sticks working through the screens endwise and clogging the wheel. It is interesting to note that this wheel was rated at 25 horsepower and that the load is now carried by a 7.5 and a 5-horsepower motor with excellent results. The use of the leather punches would appreciably affect the speed of the water wheel which was the cause of ruining a large amount of product going through the various machines. It is still further interesting to note that from an actual test during excessive production the motors were operating at a 100 per cent overload without appreciable damage or variation of speed. There is a 7.5-horsepower and a 5-horsepower motor as previously stated, both operating at 1,800 revolutions per minute and equipped with five-inch pulleys. The smaller motor is not used at present but will be as soon as proper machinery is placed in the old shoe department. For finishing the leather gaskets there are nine cup machines, two hand operated and seven pneumatically operated. These machines are similar in appearance to a small lathe. The ordinary chuck is replaced by the female die and the male die is placed in the tail stock. The blanks are punched by hand and consist of leather disks with a hole in the center. The disk is placed over the point of the male die and by hand pressure or pneumatic pressure is forced into the female die which revolves at a high rate of speed. There is a small knife on a swing lever which is used to trim the edge of the gasket. Each of these machines has a capacity of about 8,000 gaskets daily. The leather before punching is run through splitters of which there are four. These trim the material to a uniform thickness. There is also in this department several machine tools for making dies and a surface planer for finishing the surfaces of the cutting blocks on which the hand dies are used. There is also a machine which cuts thick felt into strips and some miscellaneous machines which are enumerated in the accompanying table.

Jewell Manufacturing Company.

The product of this company is thermostats for the control of steam, hot-water and hot-air systems. The thermostat consists of a compound metal strip known as the blade which is platinum tipped and extends between two platinum-pointed screws. When expansion caused by increased heat occurs, contact is made with one of the screws which releases the motor and the drafts are closed to check the heater. When the room cools, contact is made with the other screw and the drafts are opened. The motor, or that part of the mechanism which operates the



Electric Drive in Ignition Plant.

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dampers or valves is made in four models: Gravity motor for use with all types of coal burning heaters; spring motor for use with quick opening gas or steam valves; 110-volt motor and battery motor. There is a clock attachment for the thermostat so that night and day temperatures can automatically be obtained. In such instruments there are a large number of small parts requiring small machinery and delicate workmanship. The machine tools as listed in the accompanying table are group-driven by a five-horsepower motor running at 1,800 revolutions per minute, with an eight-inch pulley. It will be noted that there are a number of multiple-spindle drills. These are of especial value for small manufacturing as a number of holes can be bored in a part at one time, effecting a considerable saving.

To show the extent to which individual motor drive is used, in the experimental department there is a one-thirtieth-horsepower motor driving an experimental lathe. The motor equipment is completed by a two-horsepower motor driving a cross-cut saw and a one-horsepower motor driving a printing press and a multigraphing machine.

Auburn Ignition Manufacturing Company.

The product of this company is spark plugs for gas and gasoline engines of all types. As may be imagined the work on such appliances has to be of the most accurate character to withstand the severe pressure and to insure proper ignition. There is a group of machines driven by a five-horsepower motor operating at 1,800 revolutions per minute, consisting of two small engine lathes, three small turret lathes, two No. 13 Bliss punches, one power hack saw, small planer, drill press and two emery grinders. In addition there are two sensitive drills each individually driven by a 0.25-horsepower motor.

MOTOR DATA.

National Rug Company.

No.	H. P.	Kind of Drive.	Speed R. P. M.	Pulley Dimen., Inches.	Application.
1	5	Group	1800	4	Two rotary fraying machines.
		Auburn Leather Goods Company.			
1	7½	Group	1800	5	Two hand cupping machines, seven compressed-air cupping machines, four leather splitters, single sole moulder, heel cutting machine, thick felt cutting machine, air compressor, two small engine lathes, emery wheel, small drill press, surface planer.
1	5	Group	1800	5	Group sewing machines.
		Jewell Manufacturing Company.			
1	1/30	Belt	....	..	Experimental lathe.
1	2	Belt	1800	..	Cross-cut saw. Printing press and multigraph.
1	5	Group	1800	8	Three-spindle drill, two 2-spindle drills, drill press, two small punches, medium engine lathe, two turret lathes, speed lathe, small shaper, sensitive drill, four emery grinders, small milling machine, tapping machine, power hack saw.
		Auburn Ignition Manufacturing Company.			
1	5	Group	1800	5	Two small engine lathes, three small turret lathes, two Bliss No. 13 punches, power hack saw, small planer, small drill press, two tool grinders.
2	¼	Belt	....	..	Two small drills.

Surplus Electric Power of Street Railways for Factory Use.

At a recent hearing at Boston on the cost of furnishing street railway service to workingmen, at which figures were presented to show that the cost of this class of business, coming at the times of peak load on the system, costs the transportation company more than for service furnished the rest of the day, Chairman Macleod of the Public Service Commission suggested that surplus energy generated by a railway company be used by factories, these being operated after the workmen have been delivered to the mills and closing before the evening rush homeward begins.

Predicts Wider Use of Energy in Chemical Manufacture.

The advantage of cheap hydroelectric energy in the manufacture of chemicals was pointed out by Clarence W. Marsh, of Boston, in a paper read before the annual meeting of the Maine Society of Civil Engineers at Augusta, February 2. The following facts were brought out: Scientific manufacture of chemicals has been forced on this country by the European war. The basic conditions for successful manufacture of these products are cheap transportation of raw materials and finished product and cheap power. Each new electro-chemical industry locating in Maine will bring a customer for water power hitherto wasted. These powers should be increased by means of storage basins and the regulation of stream flow by the state and by vested interests.

"Electrochemical and electrometallurgical industries are Maine's opportunity," said Mr. Marsh.

Performance of Electrical Machinery.

Miles Walker brought forward for discussion at the Institution of Electrical Engineers in London, a paper on "The Predetermination of the Performance of Dynamo-Electrical Machinery." He began his paper by showing that it was designed to open a discussion on general methods of calculating dynamo-electric machines, and he gave an outline of a method which was applicable to all types of such machines, whether alternating-current or continuous-current generators or motors, or rotary converters. Simple rules were given for determining the various quantities upon which the performance of a machine depends; in particular, the method of arriving at a temperature rise which might be expected was more completely developed than in a previous paper by himself and H. D. Symons. The appendices to the paper were longer than the paper itself and they covered the following matters: plotting the field-form of a cylindrical field, magnet with highly saturated taper teeth; the calculation K_e (a coefficient for alternator-electromotive force; calculation of the magnetizing current; armature reaction; losses in copper and iron; predetermination of temperature rise.

Introducing Electricity on the Southern Farm.

Even in the South where the farms are few and large, electricity is beginning to make headway.

The accompanying illustration shows a 10-horsepower motor operating an ensilage cutter at a dairy near Taylor, Texas. This motor is used only during certain seasons of the year but other miscellaneous uses of electricity around the dairy makes the business worth while to the central station. Energy is supplied by the Texas Power & Light Company.

Motor-Driven Threshing Machine.

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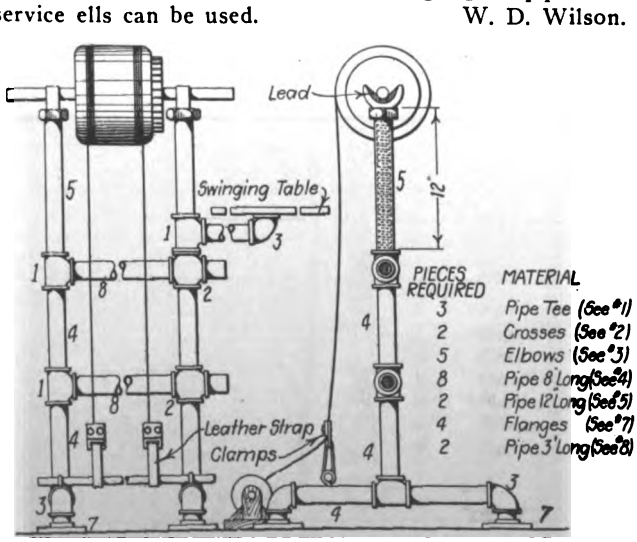
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Convenient Armature-Winding Rack Made of Pipe and Pipe Fittings.

In the accompanying illustration is shown a horse or rack for use in armature winding that is made entirely of standard pipe and pipe fittings. It is easily assembled and I have found it to be very convenient. It can be made to support practically any ordinary size of armature. The horizontal pipes *No. 8* are made to pass readily through the crosses *No. 2;* this is done either by boring out the crosses or by slightly turning down the outside of the pipes *No. 8.* In this way the horizontal length of the rack can be adjusted to suit the conditions. The stems which fit into the top uprights *No. 5* are made adjustable by being threaded and fitting over nuts. By this means the armature can be raised or lowered to the most convenient height for working upon it, and the back end of the armature can be made higher than the front when it is desired to solder in the leads so that the solder will flow to the front of the commutator and thus eliminate the danger of short-circuiting the latter. The crescent-shaped supports for the armature shaft should be lined or covered with sheet lead, babbitt metal or similar soft bearing surface to keep from scratching the shaft. The swinging table shown at the right of the front view can be easily swung towards the commutator and used for supporting tools or a blow torch for melting solder out of the commutator.

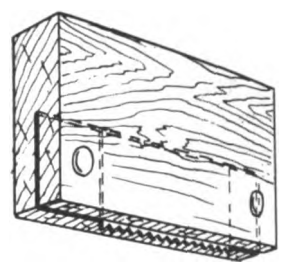
For banding the armature, eye-bolts are placed in the back part of the supporting legs; between them runs a rod upon which is slipped a strap that holds the tension block. The tension being straight down from the armature, the latter can not shake and maintains a fixed, steady position. After starting to put on the band wire an occasional tap of the hammer given to the bar on the tension block will cause the wire to fit on the armature nicely. The tension block is made of two pieces of fiber bolted together; the piece that receives the strap is about one inch longer so that in placing the wire between the two parts of the block the strap does not interfere with the wire. In the front view of the outfit, two separate tension blocks and banding arrangements are shown. Usually one is sufficient, however. Instead of using regular pipe elbows, service ells can be used. W. D. Wilson.



Front and End Views of Armature Rack.

Commutator-Slotting Tool.

For slotting commutators the use of a hacksaw has frequently been advocated. In every case of this kind that I have read or heard of, the block for holding the blade is too large and the outfit can be used only after removing the entire brushgear. I have found that a good and handy tool for cutting down high mica between commutator segments which overcomes the difficulty mentioned can be made as follows:



Small Slotting Tool.

Take a piece of hacksaw blade two inches long, a piece with fine teeth is preferable, and grind it down, if too thick to go between the segments. Next take a piece of wood three inches long, 1.5 inches wide and 0.75 inch thick and saw a slot the length of it with a hacksaw deep enough so that the two-inch piece of saw protrudes one-thirty-second inch, or more if desired, when it is inserted in the slot. Bore a hole through the wood piece on each end of the piece of saw, as shown in sketch, put in stove bolts and tighten. This tool can be used on a commutator without removing brushgear or end casting. R. F. Cooke.

Cleaning Machines Without Benzine.

Bearings and other unpainted parts of machinery that is stored away or shipped are usually protected by a heavy grease to prevent rusting. This grease is commonly removed by means of benzine, benzol or gasoline. The increasing cost of these lighter oils has called attention to another method, which is quite as satisfactory and probably cheaper. On account of scarcity of light oils in Germany, the following practice is being officially recommended:

The parts of machines should be boiled in soda lye, then brushed while the lye is still hot, and afterwards rinsed in hot water. Caustic soda is recommended as better than ordinary soda since it causes the fat or grease to dissolve more quickly. In order to dry the hot parts it is generally only necessary to let the remaining particles of water evaporate.

Use Electric Drill for Turning Down Small Things.

If it is desirable to turn down the head of a screw or make the diameter of a rod smaller, when no lathe is available, this can be done by chucking same in an electric drill, starting the drill and using a file as a turning down tool.

This scheme can be used for turning down a great number of things, such as washers, nuts, etc., if a means is found to chuck them. I have found this to be very much more rapid and to make a much smoother and neater job than filing by hand. F. C. Petersen.

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Analysis of Changes in 1915 Electrical Code

After each biennial revision of the National Electrical Code every one interested in electrical construction (architect, engineer, contractor and inspector) must make a careful study of the changes made in the Code. Such a study of the changes incorporated in the 1915 edition of the Code recently published is greatly facilitated by the complete analysis thereof made by Washington Devereux, director of the Electrical Department of the Philadelphia Fire Underwriters' Association, and his assistants. For this valuable analysis, which is published herewith, the thanks of the electrical industry are hereby publicly expressed to Mr. Devereux and his staff.

Rule 1, section c, paragraph 2.—Changed to give the preference to grounding over insulating the base frames of generators operating at a potential of 550 volts or less.

Rule 1, sec. c.—Fine-print footnote, referring to insulated platforms surrounding high-potential machines. omitted.

Rue 4, sec. b, par. 2.—"Receptacles" changed to "sockets".

Rule 8, sec. a, par. 2.—Changed to give the preference to grounding over insulating the base frames of motors operating at a potential of 550 volts or less.

Rule 8, sec. b, par. 2.—Changed to omit "unlined" conduit and requiring all apparatus and wire to be completely enclosed in grounded shields or casings, the conduit to enter and be secured to such casings or terminal boxes.

Rule 8, sec. b, par. 3.—Transferred from Rule 8, sec. b, par. 6. No change in rule.

Rule 8, sec. b, par. 4.—Transferred from Rule 8, sec. b, par. 7. No change in rule.

Rule 8, sec. b, par. 5.—Changed from "Motor leads or branch circuits" to "Conductors carrying the current of only one alternating-current motor," and the paragraph transferred from Rule 8, sec. b, par. 3.

Rule 8, sec. b, par. 6.—Changed from "alternating-current motor leads or branch circuits" to "the current of only one varying (or variable) speed motor." The table for "Classification of services" changed as follows: Motors operating tool heads reduced from 200 per cent to 120 per cent. Rolling tables increased from 120 per cent to 180 per cent. Hoists, rolls and ore and coal-handling machines reduced from 180 per cent to 150 per cent. Freight elevators and shop cranes reduced from 160 per cent and passenger elevators from 140 per cent to 120 per cent.

Rule 8, sec. c, par. 1.—Rated capacity of fuses for circuits on which small motors are grouped, increased from "6 amperes" to "10 amperes or 660 watts."

Rule 8, sec. c, par. 2.—"Motor-starting rheostat" changed to "Motor-starting device."

Rule 8, sec. c, par. 5.—Changed from permitting rubber-covered wires for leads or branch circuits of alternating-current motors of the types requiring large starting currents to be fused in accordance with Table B of Rule 18, to "Conductors carrying the current of only one alternating-current motor" and adding, "The rated continuous current capacity of a time-limit circuit-breaker protecting a motor of the above type need not be greater than 125 per cent of the motor current rating, provided the time-limit device is capable of preventing the breaker opening during the starting period."

Fine-print note and table added giving percentage of the full-load currents of motors started by means of autostarters.

Rule 8, sec. h, par. 2.—The words "alternating current" omitted.

Rule 11, sec. b, par. 2.—Changed to require instrument transformers used exclusively to supply current to switchboard instruments to be grounded unless installed and guarded in all respects as required for the higher-voltage circuit connected to them.

Rule 12, sec. b, par. 2.—Changed to permit multiple conductors for service line wires secured to strain insulators spaced not less than one foot from adjacent woodwork and secured to petticoat insulators. Also eliminates the use of wood blocks for the support of insulators.

Rule 12, sec. c, par. 1.—Changes the height of wires over flat roofs from 7 to 8 feet and recommends the use of poles independent of the buildings for the support of wires crossing roofs.

Rule 12, sec. f, par. 3.—New. Describes how service conduits shall enter a building and how they shall be grounded.

Rule 12, sec. f, par. 4.—New. Describes how service conduits shall enter and be secured to fittings and be treated before ground clamps are attached.

Rule 12, sec. f, par. 5.—New. Requiring connections to grounded pipes and conduits to be exposed to view or accessible.

Rule 12, sec. f, par. 6.—Requiring ground wires to be at least No. 6 B. & S. gauge where the largest wire in the conduit is not greater than No. 0, and at least No. 4 B. & S. gauge when the largest wire is greater than No. 0.

Fine-print note added calling attention to the fact that the ground on the conduit system is not to be considered as a ground for the secondary system. (See Rule 15.)

Rule 12, sec. h.—Addition to require the metal sheaths of cables to be grounded approximately every 500 feet.

Rule 15, sec. a, par. 2.—Requiring the neutral wire to be grounded at each distributing box through the box or on the individual service as provided in sections c to g, inclusive.

Rule 16, sec. h.—New. Requiring the neutral wire of three-wire (not three-phase) systems to be of sufficient capacity to carry the maximum current to which it may be subjected.

Rule 17, sec. d.—Additions. Prohibiting underground services from a subway to a building or any service from a private generating plant from supplying more than one building except by special permission, unless properly protected by fuses and carried outside all the buildings but the one served. Conductors in conduit or duct under two inches of concrete under a building or buried two inches back of concrete or brick walls are considered as outside the building. Exceptions made to factory yards or buildings under a single occupancy or management.

Rule 18, Table.—Misprint. Under B. & S. gauge. Three naughts (000) instead of four naughts (0000) should follow two naughts (00).

Rule 19, sec. a, par. 2.—Addition. "In two or three-phase three-wire circuits and two-phase four-wire circuits there must be a trip-coil in each of two phases, and in four-wire three-phase circuits there must be a trip-coil in each phase."

Rule 19, sec. b, par. 1.—Changed to require switches, cutouts, circuit-breakers, etc., exposed to inflammable gases or dust or flyings of combustible materials, to be mounted in approved cabinets or cutout boxes, exceptions being made to oil switches, circuit-breakers and similar devices which have approved casings. (This embraces a portion of Rule 19, sec. b, par. 2 of the 1913 Code.)

Rule 19, sec. b, par. 2.—New. Requiring cabinets and cutout boxes to be of metal when used with metal conduit, armored cable or metal molding.

Rule 19, sec. c.—Changed to require cutouts, switches, etc., exposed to moisture as in basements and similar places to be mounted in approved cutout boxes or cabinets, and in wet places or outside of buildings to be mounted in approved weatherproof cutout boxes or cabinets.

Rule 19, sec. d.—Changed to except sign flashers mounted as described in Rule 83, sec. b.

Rule 19, sec. e.—New. Calling attention to Rule 70 for specifications of spacings between walls of cabinets and cutout boxes and current-carrying parts of devices.

Rule 20.—New fine-print note added at heading prohibiting constant-current systems inside buildings except by special permission.

Rule 23, sec. a, par. 2.—Changed to except knife-blade switches mounted in approved boxes or cabinets in the requirement for fuses to protect the switch.

Rule 23, sec. a, par. 3.—Changed to prohibit a fuse or circuit-breaker in any permanently grounded service wire.

Rule 23, sec. b, par. 2.—Changed to prohibit a fuse or circuit-breaker in any permanently grounded wire except as called for in section d.

Rule 23, sec. c, par. 2.—Addition to require a space of at least two inches between open-link fuses and metal or metal-lined or glass-paneled doors of cabinets or cutout boxes.

Rule 23, sec. d, par. 1.—Changed to include 16 medium-size or 25 candelabra-size sockets or lamp receptacles.

Rule 23, sec. d, par. 3.—Addition to include 25-watt rating for candelabra-size sockets.

Rule 23, sec. d, par. 4.—New. Permitting receptacles for attachment plugs rated not over 660 watts to be connected to ordinary branch circuits and rating such receptacles as requiring not less than 40 watts. Also permitting heating or other appliances rated not over 660 watts to be connected to such receptacles when the normal load in use at any time will not exceed 660 watts. A cutout must be provided for each receptacle rated above 660 watts.

Rule 23, sec. e, par. 1.—Changed to conform to Rule 8, sec. e.

Rule 23, sec. e, par. 2.—New. Permitting the use of approved enclosed fuses in multiple for the protection of wires having safe carrying capacity exceeding the rated capacity of the largest approved enclosed fuse. This does not apply to motor circuits.

Rule 23, sec. e, par. 3.—Transferred from Rule 23, sec. e, par. 2.

Rule 24, sec. a, par. 2.—Addition. Service switches must indicate plainly whether they are open or closed.

Rule 24, sec. b, par. 3.—Omitted.

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Rule 24, sec. d, par. 2.—New paragraph embracing a portion of Rule 24, sec. **d**, par. 1 of the 1913 Code, requiring receptacles to be in especially designed boxes, unless by special permission where moisture is improbable or they are not subject to mechanical injury.

Rule 24, sec. e.—Rule confined to method of supporting switches. The word "fixtures" omitted. See Rule 30, sec. **a**, par. 5 for method of supporting fixtures not attached to gas pipes, conduit or other approved fittings.

Rule 25, sec. a.—Addition to latter part to conform to Rule 23, sec. **d**, par. 4.

Rule 25, sec. b.—Reference changed from Rule 54, sec. **d** to Rule 51, sec. **k**.

Rule 25, sec. f.—The words "or in volts and watts" added.

Rule 26.—Heading changed to include "or between any wire and the ground" after "a difference in potential between any two wires."

Rule 26, sec. a.—Changed to require wires, except in metal conduit, armored cable or metal molding to enter cabinets, cutout or junction boxes by means of non-combustible, non-absorptive, insulating bushings. For concealed knob-and-tube or open work in dry places approved flexible tubing permitted in wooden cabinets.

Rule 26, sec. e, par. 2.—Protection of wires on side walls changed from five to seven feet.

Rule 26, sec. g.—Rubber-covered wires changed to type letters R. S. for wires smaller than No. 6 B. & S. gauge and R. D. for wires of No. 6 or larger.

Rule 26, sec. k.—Rubber-covered wires changed to type letters R. S. for wires smaller than No. 6 B. & S. gauge and R. O. for wires of No. 6 or larger.

Rule 26, sec. l.—Changed to limit the number of wires in metal molding to four No. 14 B. & S. gauge and not more than 1,320 watts to be connected to a single circuit.

Rule 26, sec. n, par. 1.—Rubber-covered wires changed to type letters R. D. for twin, twisted-pair or multiple-conductor cables and for all single conductors of No. 6 and larger.

Rule 26, sec. n, par. 2.—New. Permitting slow-burning insulation for wires in conduits in permanently dry locations where excessive temperatures are present, by special permission.

Rule 26, sec. o, par. 3.—First method of supporting cables in vertical conduits changed to "approved clamping devices consisting of or employing insulating wedges inserted in the ends of conduits."

Rule 26, sec. q.—Rubber-covered wires changed to type letters R. S. for wires smalled than No. 6 B. & S. gauge and R. D. for wires of No. 6 or larger.

Rule 26, sec. v, par. 1.—Transferred to Rule 30, sec. **c** and references changed from No. 55 to No. 52 for construction of fixture wire.

Rule 26, sec. v, par. 2.—Transferred to Rule 30, sec. **c**, par. 2.

Ruel 26, sec. w.—Transferred to Rule 30, sec. **d**.

Rule 26, sec. x.—Transferred to Rule 30, sec. **e**.

Rule 26, sec. y.—Transferred to Rule 30, sec. **f**.

Rule 27, sec. c, par. 4.—The words "to which the wires must be soldered" omitted.

Rule 28, sec. f, par. 4.—The words "to which the wires must be soldered" omitted.

Rule 28, sec. g.—Changed to permit junction boxes in attics which have sufficient headroom but which are reached only by a portable ladder and permanent hatch.

Rule 28, sec. l.—New. Tables for size of conduits for installation of wires and cables.

Rule 29, sec. d, par. 4.—The words "to which the wires must be soldered" omitted.

Rule 30.—Reference changed: 24**e**, 26**v** to **y** and 55 omitted, and reference to construction rules No. 52 added.

Rule 30, sec. a, par. 5.—New. Describes the method of supporting fixtures not attached to gas pipes or conduit, unless outlet boxes or other approved fittings are used. Formerly covered in 24**e**.

Rule 30, sec. c.—Changed to specify size of fixture wire; reference to construction rules No. 52 added. Former rule transferred to Rule 30, sec. **e**, par. 2.

Rule 30, sec. c, par. 2.—Transferred from Rule 30, sec. **d**.

Rule 30, sec. d.—Transferred from Rule 26, sec. **w**.

Rule 30, sec. e.—Transferred from Rule 26, sec. **x**.

Rule 30, sec. e, par. 2.—Transferred from Rule 30, sec. **c**.

Rule 30, sec. e, par. 3.—New. Requiring chain fixtures to be wired with flexible conductors.

Rule 30, sec. f.—Transferred from Rule 26, sec. **y**.

Rule 30, sec. g.—New. Requiring fixtures to be tested for grounds or short-circuits before being connected to supply conductors.

Rule 31, sec. c, par. 1.—Changed to require sockets and receptacles, installed over especially inflammable stuff or exposed to flyings of combustible material, to be of the keyless type and, unless individual switches are used, to be at least 7.5 feet above the floor, or so located or guarded that the lamps cannot be readily backed out by hand.

Rule 31, sec. c, par. 2.—New. Permits departure from rule by special permission.

Rule 32.—New. Reference changed from No. 54 to No. 51.

Rule 32, sec. d, par. 1.—Addition to include "or other portable devices."

Rule 32, sec. d, par. 3.—Changed. Referring to guards, the word "wire" omitted.

Rule 32, sec. e.—Changed to permit the use of approved portable cord in show windows for the purpose of supplying current to portable lamps or other devices for exhibition purposes. Also permits the use of flexible cord for chain fixtures.

Rule 32, sec. g.—Changed to require flexible cords to be so connected as to relieve the strain from joints or binding screws.

Rule 32, sec. h.—New. To prohibit the use of so-called hard rubber or composition bushings threaded in outlet-box covers.

Rule 33, sec. e.—Transferred from No. 35.

Rule 35.—New. Requirements for the wiring and installation of gas-filled incandescent lamps.

Rule 38, sec. c, par. 1.—Reference to Rule 3, for requirements for switchboards, added.

Rule 38, sec. c, par. 2.—New. Requiring dimmers to be "dead" when the switch controlling the circuit is open.

Rule 38, sec. d, par. 1.—Addition. Requiring at least one-half inch separation between the metal of the box and receptacle terminals.

Rule 38, sec. d, par. 2.—Changing the maximum number of sockets on a circuit from 26 to 32.

Rule 38, sec. e, par. 2.—Changing the maximum number of sockets on a circuit from 26 to 32.

Rule 38, sec. h.—"Ironclad" changed to "enclosed."

Rule 38, sec. j, par. 2.—Addition to require dressing-room lamp guards to be sealed or locked.

Rule 38, sec. k, par. 1.—Addition to specify "No. 20 U. S. sheet-metal gauge."

Rule 38, sec. p.—"Six amperes" changed to "ten amperes."

Rule 38, sec. q.—Addition to require fixtures to be securely fastened in place.

Rule 38, sec. t, par. 4.—New. Transferred from last sentence of Rule 38, sec. **t**, par. 3.

Rule 38, sec. u, par. 1.—Changed to omit the words "used as a part of a moving-picture machine." Addition to include reference to Rule 38, sec. **k**, par. 1, 2, 3, 4 and 6 and to require incandescent lamps to be suitably enclosed.

Rule 38, sec. u, par. 3.—The words "spring hinged" omitted from the last sentence.

Rule 38, sec. u, par. 7 (1).—Requirements for ventilating transferred to Rule 38, sec. **u**, par. 7 (1) and for openings to Rule 38, sec. **u**, par. 7, (3).

Rule 38, sec. u, par. 7 (2).—New. Including a portion of the former Rule 38, sec. **u**, par. 7 (1) and adding the specifications and requirements for vent pipes and exhaust fans.

Rule 38, sec. u, par. 7 (3).—Transferred from Rule 38, sec. **u**, par. 7 (1).

Rule 38, sec. v, par. 1.—New. Requiring all equipments to be expressly approved.

Rule 38, sec. v, par. 2.—New. Limiting the entire equipment to 660 watts.

Rule 38, sec. v, par. 3.—Transferred from Rule 38, sec. **v**, par. 1 and changed to require arc lamps to be constructed as far as practicable in accordance with Rule 38, sec. **k**, par. 1, 2, 3, 4, and 6, and incandescent lamps to be entriely enclosed.

Rule 38, sec. v, par. 4.—Requirement for asbestos mat under machine omitted. Transferred from Rule 38, sec. **v**, par. 2 and changed to require rheostats, transformers, switches and similar current-controlling devices to be attached to and form a part of the machine, have no live parts exposed and comply with the requirements of Rules 65 and 78 or 81, sec. **a, b, c**.

Rule 38, sec. v, par. 5.—New. Transferred from Rule 38, sec. **v**, par 3, the words "non-inflammable" changed to "slow-burning" and the maximum length and width omitted.

Rule 38, sec. v, par. 6.—New. Requiring machines to be so constructed that they cannot be used with the full-sized commercial moving-picture machines. Fine-print note added giving the width and perforations of commercial films.

Rule 38, sec. v, par. 7.—New. Requiring machines to be marked with the name or the trade-mark of the maker, volts and current rating and plainly marked: "For use with slow-burning films only."

Rule 40.—Addition to heading calling attention to the rules as applying to all cars or locomotives used for electric service, or which are equipped with electric circuits and operating on either high or low-potential systems.

Rule 40, sec. a, par. 1.—Changed to require the underside of car bodies constructed of combustible material to be protected with fire-resisting heat-insulating material.

Rule 40, sec. a, par. 2.—Changed to specify the protection over motor trucks.

Rule 40, sec. a, par. 3.—"Air-compressor motors" added, "fire-resisting material or sheet iron," changed to "non-metallic, fire-resisting heat-insulating material."

Rule 40, sec. a, par. 4.—Changed to require all conductors, except motor leads, leads over grid resistances, as provided for in sec. **d**, par. 7, on the underside of car bodies to be installed in approved conduit or approved totally enclosed fire-resisting ducts. Leads to be brought out of conduits or ducts through approved fittings.

Rule 40, sec. a, par. 5.—Omitted.

Rule 40, sec. a, par. 6.—Omitted.

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Rule 40, sec. b, par. 1 (1).—Changed to omit reference to table in Rule 18. Size of trolley and resistance leads transferred to Rule 40, sec. b, par. 3.

Rule 40, sec. b, par. 1 (2).—Changed to prohibit the use of fixture wire.

Rule 40, sec. b, par. 1 (3).—Transferred from Rule 40, sec. b, par. 1, and changed to require heater circuit, arc-headlight and air-compressor circuit conductors to be at least 6,000 circular mils cross-section area and 4,000 circular mils cross-section area for lighting or other auxiliary circuits.

Rule 40, sec. b, par. 1 (4).—Changed to require the leads between car bodies and motors to be flexible and triple-braided.

Rule 40, sec. b, par. 2.—Transferred from Rule 40, sec. b, par. 5.

Rule 40, sec. b, par. 3.—Changed to specify means of securing cables to devices, except drum controllers.

Rule 40, sec. b, par. 5.—Omitted.

Rule 40, sec. b, par. 6.—Omitted.

Rule 40, sec. c, par. 1.—Transferred from Rule 40, sec. c, par. 2, and addition to require circuit-breakers and switches, including oil circuit-breakers and oil switches, to be of the approved type.

Rule 40, sec. c, par. 2.—Transferred from Rule 40, sec. c, par. 1.

Rule 40, sec. c, par. 3.—Changed to specify requirements for cutout and switch cabinets.

Rule 40, sec. c, par. 4.—Transferred from Rule 40, sec. c, par. 5, and changed to require circuits carrying constant loads to be fused according to table A of Rule 18.

Rule 40, sec. c, par. 5.—Changed to permit light, control, heater and auxiliary circuits to be taken off ahead of main power cutout provided each is separately fused.

Rule 40, sec. c, par. 6.—Changed to permit circuit-breakers to be housed in approved wood cabinets lined with fire-resisting material. The conduit carrying the wires to the cabinets to end just outside.

Rule 40, sec. c, par. 7.—New. Requiring a switch to cut out the third-rail shoe, when not in use, when power is derived from both third rail and overhead trolley.

Rule 40, sec. d.—Additional paragraph to fine-print note, referring to conduit boxes.

Rule 40, sec. d, par. 1 (1).—New. Requiring conduits, outlet and junction boxes to be of approved type.

Rule 40, sec. d, par. 1 (2).—Transferred from Rule 40, sec. d, par. 1 (1), and addition to require protection from wheel-wash and other causes.

Rule 40, sec. d, par. 4.—Changed to require conduit to be permanently and effectively grounded. (Exception sec. l, par. 2 omitted).

Rule 40, sec. d, par. 7.—New. Permitting conduit to be omitted for alternating-current motors carrying over 150 amperes when located wholly below the car body.

Rule 40, sec. e, par. 1.—Changed to require the use of "approved" molding and metal molding to be grounded.

Rule 40, sec. e, par. 2.—Omitted.

Rule 40, sec. e, par. 3.—Omitted.

Rule 40, sec. f, par. 1.—Changed to include "approved clusters."

Rule 40, sec. f, par. 2.—Changed to permit the use of non-metallic molding for circuits of 700 volts or less.

Rule 40, sec. f, par. 3.—Changed to require receptacles or clusters used with conduit or metal molding to be mounted on approved outlet boxes or other approved manner, and the exposed metal parts to be grounded.

Rule 40, sec. f, par. 4.—Changed to require receptacles or clusters to be mounted on hardwood blocks or fire-resisting insulating material when circuits are run in non-metallic molding.

Rule 40, sec. f, par. 5.—Changed to require headlight circuits to be in conduit when run under car bodies. Resistance to be well ventilated and mounted as specified in sec. a. Plugs and receptacles to be of approved type.

Rule 40, sec. f, par. 6.—New. Lamp or voltage regulators and controllers for axle-driven or power-driven generators for car lighting to be in approved cabinets ventilated.

Rule 40, sec. f, par. 7.—New. To require storage batteries for car lighting to be installed in approved manner.

Rule 40, sec. g, par. 1.—Addition to require metal enclosures to be thoroughly grounded.

Rule 40, sec. g, par. 2.—Changed to require panel heaters to be mounted in metal risers, set back at least four inches from front of seat.

Rule 40, sec. g, par. 2 (2).—Changed to reduce to two (2) inches separation when woodwork is protected by approved fire-resisting insulating material.

Rule 40, sec. g, par. 3.—Transferred from Rule 40, sec. g, par. 2.

Rule 40, sec. g, par. 4.—Transferred from Rule 40, sec. g, par. 3, and changed to require heating circuits to be run only in approved conduit and the connections to heaters to be protected from mechanical injury.

Rule 40, sec. h.—Heading changed to "auxiliary motor circuits."

Rule 40, sec. h, par. 1.—Changed to require motor frames to be thoroughly grounded and motors in confined space to be in approved metal box or wood box lined with one-quarter-inch fire-resisting material and ventilated.

Rule 40, sec. h, par. 2.—Transferred from Rule 40, sec. h, par. 1, and changed to require circuits under car floor to be run in approved metal conduit.

Rule 40, sec. h, par. 3.—Transferred from Rule 40, sec. h, par. 2, and changed to require air-compressor governor to be of enclosed type or enclosed in approved cabinet or box.

Rule 40, sec. l.—Heading changed to "Main circuit and devices."

Rule 40, sec. l, par. 1.—Changed to specify method of installing conductors between trolley base and cutout or breakers.

Rule 40, sec. l, par. 2.—Changed to specify method of supporting current collectors.

Rule 40, sec. l, par. 3.—Changed to require conductors between third-rail shoes on same truck to be supported in hardwood insulating molding or metal conduit. If in conduit to be fused as near as possible to contact shoe.

Rule 40, sec. l, par. 4.—Changed to require conductors on underside of car to be in approved conduit. Junction boxes or other approved fittings to be installed where branches are made. Main cables, between controllers, may be in cable boxes which may be of wood properly lined. Cables or power circuits to be in approved conduit where exposed under the car. Conduits terminating above the floor must project at least one inch.

Rule 40, sec. l, par. 5.—Changed to require motor leads leaving the motor shell to fit the shell snugly and be well bushed, to be supported on frame by hardwood or other approved cleats, and to be connected to cables with approved devices or in an approved junction box.

Rule 40, sec. l, par. 6.—Changed to require the insulation of resistance grids from frames and frames from supports, and where insulation is removed from conductors the base strands to be filled with solder to make them rigid.

Rule 40, sec. l, par. 7.—Changed to permit the insulating of frames of all electrical apparatus except main and auxiliary motors and transformers under the car.

Rule 40, sec. l, par. 8.—New. Requiring the grounding of metal casings and frames of the controllers when located above the car floor.

Rule 40, sec. l, par. 9.—New. Requiring sheet-metal guards when necessary to protect the resistance and other devices from wash, dirt, etc.

Rule 40, sec. j, par. 1.—Changed to require lightning arresters to protect main motor circuit and all auxiliary circuits and be connected ahead of all metal conduit or molding.

Rule 40, sec. j, par. 2.—Changed to require ground conductor to be at least No. 12 B. & S. gauge and to be protected from mechanical injury by means of fire-resisting or wood molding.

Rule 40, sec. j, par. 3.—New. Circuit for lightning arrester need not be run in metal conduit.

Rule 40, sec. k, par. 1.—Changed to require insulating joints in whistle or smoke pipes which project above the level of the car roof, or projecting portions of such pipes must be surrounded by a substantial guard or cage not in electrical connection with such pipes.

Rule 40, sec. k, par. 2.—Changed to require the grounding of all coal-burning heating devices and an insulating covering over hot-water tanks.

Rule 41, sec. a.—Transferred from Rule 42.

Rule 42.—New. Special rules to cover installation of all lighting, motor circuits, motors or other apparatus in garages.

Class D.—Heading covering Rules 49 to 57, changed to "Insulated wires, cables and cords." Heavy-type note added referring to examination, tests and labels before shipment and calling attention to Rules 49 to 57 as being only a summary of complete detailed rules for construction and tests of insulated wires and cords for use in conduit in accordance with requirements of Classes A to C, inclusive. Complete specifications may be obtained from the secretary of the Electrical Committee of the National Fire Protection Association. The words "specified standard," "as specified, etc.," have reference to the requirements of the complete specifications.

Rule 49, sec. a, par. 1.—Transferred from Rule 49, sec. b, par. 1, and changed to include cords.

Rule 49, sec. a, par. 2.—Transferred from Rule 49, sec. b, par. 2, and reference changed to Rule 57.

Rule 49, sec. a, par. 2 (1).—Transferred from Rule 49, sec. b, par. 1 (1), and changed to "the maximum working pressure or voltage for which the wire was tested or approved." Marking may be omitted for wires described in Rules 55, 56 and 57.

Rule 49, sec. a, par. 2 (2).—Transferred from Rule 49, sec. b, par. 1 (2).

Rule 49, sec. a, par. 2 (3).—Transferred from Rule 49, sec. b, par. 1 (3).

Rule 49, sec. a, par. 2 (4).—Transferred from Rule 49, sec. b, par. 1 (4).

Rule 49, sec. a, par. 2 (5).—Transferred from Rule 49, sec. b, par. 1 (5), and reference to Rules 50 to 57 omitted.

Rule 49, sec. b.—Transferred from Rule 49, sec. a, pars. 1, 2 and 3, and the words "specified standard" replacing the specifications and table omitted.

Rule 50.—Type letters of wires of different braids, insulations and voltages added to heading.

Rule 50, sec. a, par. 1.—New. Requiring individual conductors, whether stranded or solid, to be at least No. 14 B. & S. gauge.

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Rule 50, sec. a, par. 2.—Transferred from Rule 50, sec. **a**, par. 1, and changed to "all conductors and individual wires of stranded conductors shall be tinned."

Rule 50, sec. b, par. 1.—Changed to require conductors to be insulated their entire length with a properly applied vulcanized-rubber compound.

Rule 50, sec. b, par. 2.—New. Requiring the insulation to be "of nominal thickness given in the following table."

Rule 50, sec. b, par. 3.—New. Table of thickness of rubber insulation for rubber-covered wires and cables in 64ths of an inch for different type letters.

Rule 50, sec. c, par. 1.—Transferred from Rule 50, sec. **h**, and changed to require all single-conductor rubber-insulated wires and cables to have a covering of fibrous material applied directly to the surface of the insulating wall, and reference to strength omitted.

Rule 50, sec. c, par. 2.—New. Requiring at least one braid for any single-conductor wire for sizes from No. 14 to and including No. 8 and at least two braids for all single-conductor cables larger than No. 8.

Rule 50, sec. c, par. 3.—Transferred from Rule 56, sec. **b**, and changed to require each individual wire in twin wires and twisted-pair wires to have a fibrous covering and in addition a braid enclosing the bunched conductors.

Rule 50, sec. c, par. 4.—New. Requiring one or more additional coverings of fibrous material or of lead "for certain special service conditions."

Rule 50, sec. c, par. 5.—New. Permitting tape as a fibrous covering, but not for the outer covering.

Rule 50, sec. c, par. 6.—New. Permitting lead covering to be applied to single or multiple-conductors, and requiring lead-covered multiple-conductor cable with more than two conductors to be spirally laid.

Rule 50, sec. c, par. 7.—New. Requiring, in all cases, the individual conductors in lead-covered cable to have a fibrous covering and, except for two-conductor cables with conductors parallel, to have a fibrous covering over bunched conductors.

Rule 50, sec. c, par. 8.—New. Requiring the thickness of lead covering to be that specified for cables for the various sizes and forms.

Rule 50, sec. d.—Changed to require tests on wires to be performed according to "Underwriters' Laboratories' standards for Rubber-Covered Wires and Cables." The following are the tests specified:

A. On the wire as a whole: voltage test; insulation-resistance test.

B. On test specimens: wrapping test; chemical tests; physical tests for recovery, stretch and tensile strength.

Note:—Detailed specifications omitted throughout Rules 49 and 50.

Rule 51.—Transferred from Rule 54 and reference changed from sec. l to **k** for cords for portable heating apparatus.

Rule 51, sec. a.—Transferred from Rule 54, sec. **a**, and entire paragraph transferred or omitted except that flexible cords "must comply with requirements of Rule 49, secs. **a** and **b**.

Rule 51, sec. b.—Transferred from Rule 54, sec. **a**, and specifications omitted.

Rule 51, sec. c, par. 1.—Transferred from Rule 54, sec. **b**, par. 1, and changed to require the insulation to consist of properly applied and properly vulcanized rubber compound complying with specified physical and chemical tests.

Rule 51, sec. c, par. 2.—Transferred from the latter part of Rule 54, sec. **b**, par. 1.

Rule 51, sec. c, par. 3.—Reference changed to Rule 51, sec. **f**.

Rule 51, sec. d, par. 1.—Transferred from the latter part of Rule 54, sec. **a**.

Rule 51, sec. d, par. 2.—Transferred from Rule 54, sec. **c**.

Rule 51, sec. d.—Table for outer coverings of flexible cords transferred from Rule 54, sec. **c**, and references in last column changed as follows:

Type letter C	reference for additional rules changed from	54d to 51e
Type letter CB & CC	reference for additional rules changed from	54d to 51e
Type letter P & PO	reference for additional rules changed from	54e to 51f
Type letter PS	reference for additional rules changed from	54f to 51f
Type letter CA	reference for additional rules changed from	54g to 51f
Type letter PA	reference for additional rules changed from	54g to 51f
Type letter PWp & PkWp	reference for additional rules changed from	54g to 51g
Type letter PAWp	reference for additional rules changed from	54h to 51g
Type letter T	reference for additional rules changed from	54i to 51g&h
Type letter B	reference for additional rules changed from	54j to 51g&i
Type letter E	reference for additional rules changed from	54k to 51g&j

Rule 51, sec. e.—Transferred from Rule 54, sec. **d**, and reference to cords being "moved about sufficiently to come in contact with surrounding objects" omitted.

Rule 51, sec. f, par. 1.—Transferred from Rule 54, secs. **e** and **f**, and reference to "appearance" omitted.

Rule 51, sec. f, par. 2.—Transferred from Rule 54, sec. **e**, par. 2.

Rule 51, sec. f, par. 3.—Transferred from Rule 54, sec. **f**, par. 2.

Rule 51, sec. g.—New. Permitting tape to be substituted for the inner braid.

Rule 51, sec. h.—Transferred from Rule 54, sec. **i**, pars. 1 and 3.

Rule 51, sec. i.—Transferred from Rule 54, sec. **j**, and omitting the mention of tape as the outer cover.

Rule 51, sec. j.—Transferred from Rule 54, sec. **k**, and omitting the mention of tape as the outer braid.

Rule 51, sec. k, par. 1 (1).—Changed to "must comply with requirements of Rule 49, secs. **a** and **b**, and Rule 51, sec. **b**."

Rule 51, sec. k, par. 1 (2).—Transferred from Rule 54, sec. **i**, pars. 2 and 3, and omitting detailed specifications for construction and tests.

Rule 52.—Tranferred from Rule 55 and reference to installation rules changed to Rule 30.

Rule 52, sec. a., par. 1.—Transferred from Rule 55, sec. **a**, par. 2, and reference to size of wire and Rules 54, secs. **a** to **c** and 50 omitted.

Rule 52, sec. a, par. 2.—Transferred from Rule 55, sec. **a**, par. 2, and changed to require certain fixtures (see Rule 26, sec. **v**) to be wired with approved slow-burning wire.

Rule 52, sec. a, par. 1.—Transferred from Rule 55, sec. **a**, par. 3.

Rule 52, sec. b.—New. Requiring fixture wire to comply with Rule 49, secs. **a** and **b**.

Rule 52, sec. c, par. 1.—Transferred from Rule 55, sec. **b**, and size of strands omitted.

Rule 52, sec. c, par. 2.—Transferred from Rule 55, sec. **c**.

Rule 52, sec. d, par. 1.—Transferred from Rule 55, sec. **d**, and changed to require the "insulation to consist of properly applied, properly vulcanized rubber compound complying with the specified physical and chemical tests."

Rule 52, sec. d, par. 2.—Transferred from the latter part of Rule 55, sec. **d**.

Rule 52, sec. e.—Transferred from Rule 55, sec. **e**, and test omitted.

Rule 53.—Transferred from Rule 56, changed to permit wires of type letters R.S. (No. 14 to No. 8, inclusive), R.D., R.S.L., or R.D.L. for conduit use. Details of construction and tests omitted.

Rule 54.—Transferred from Rule 57, reference to Rule 54 in heading changed to Rule 51, and changed to require armored cable to comply with specified tests.

Rule 54, sec. b.—Transferred from Rule 57, secs. **a**, par. 3, and **b**, par. 1, and changed to require strips used in forming the armor to be of specified thickness and, if of steel, to be protected against corrosion in an approved manner. Details of construction and tests omitted.

Rule 54, sec. c.—Transferred from Rule 57, sec. **c**, and changed to require the conductors to "comply with the requirements of rubber-covered wires or cords of the specified types and construction."

Rule 54, sec. d.—Transferred from Rule 57, sec. **e**, and reference to tags on coils omitted.

Rule 55.—Transferred from Rule 51.

Rule 55, sec. a, par. 2.—Transferred from Rule 51, sec. **a**, par. 1, and changed to require the thickness of the completed covering to be not less than that specified for rubber insulation of 0-600-volt rubber-covered wires. (See Rule 50, sec. **b**.) Table omitted.

Rule 55, sec. b.—Changed to require the insulation to comply with Rule 49, secs. **a** and **b**.

Rule 56.—Transferred from Rule 52.

Rule 56, sec. a, par. 2.—Transferred from Rule 52, sec. **a**, and requirements for the completed covering changed to that of rubber insulation of 0-600-volt rubber-covered wires. (See Rule 50, sec. **b**.)

Rule 56, sec. b, par. 1.—New. Requiring "slow-burning wire" to comply with the requirements of Rule 49, secs. **a** and **b**.

Rule 56, sec. b, par. 2.—Transferred from fine-print note of Rule 52, and reference to the compound omitted.

Rule 57.—Transferred from Rule 53.

Rule 57, sec. a, par. 1.—Transferred from Rule 53, sec. **a**, and specifications changed to "comply with the specified requirements."

Rule 57, sec. a, par. 2.—Transferred from Rule 53, sec. **a**, and changed to require the thickness of the completed covering to be not less than that specified for rubber insulation of 0-600-volt rubber-covered wires. (See Rule 50, sec. **b**.)

Rule 57, sec. b.—New. Requiring weatherproof wire, to comply with the requirements of Rule 49, secs. **a** and **b**.

Rule 57, sec. b, par. 2.—Transferred from fine-print note of No. 53**a**.

Rule 65, sec. h.—Latter part changed to require "heavy clamps or screw and washer connections with upturned lugs" for "switches designed for currents of 30 amperes or less." Transferred from fine-print note.

Rule 65, sec. i.—"Twenty-five per cent excess voltage" changed to "at rated voltage."

Rule 65, sec. k.—New paragraph after Table 5, permitting the minimum separation between parts of opposite polarity, to be that given in Table 4 when approved barriers are used.

Rule 65, sec. l, par. 2.—Changed to require sub-bases to be so designed as to separate the wires at least one-half inch from the surface wired over. They must be of non-combustible, non-absorptive, insulating material, except for use with wooden molding, where they may be of hardwood.

Rule 65, sec. s, par. 2.—Transferred from Rule 65, sec. **s**, par. 3.

Rule 65, sec. s, par. 3.—Transferred from Rule 65, sec. **s**, par. 4.

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Rule 66.—Reference to test in heading, changed from sec. **d** to secs. **c** and **d**.

Rule 67, sec. j.—Addition to third paragraph of fine-print note, "except that in 125-250-volt systems with grounded neutral, the cutouts in two-wire, 125-volt branch circuits may have the spacings specified for not over 125 volts."

Rule 68, sec. f.—In table, "not over 250 volts, 0 to 30 amperes," the latter part "three-wire circuits and two-wire 125-volt or 250-volt circuits," omitted.

Rule 70.—Addition to heading to include "cutout boxes, circuit-breakers, feeder and circuit-branch panelboards, etc." Reference to installation rules, Rule 19, secs. **b** and **d**, changed to Rule 19, secs. **b** and **e**, and Rule 24, sec. **b** omitted. Heavy-type note added calling attention to the requirements as being but a partial outline, detailed specifications being obtainable from the secretary of the Electrical Committee of the National Fire Protection Association.

Rule 70, sec. a.—New. Requiring cabinets intended for enclosing feeder and circuit-branch panelboards and similar devices to be designed for either surface or flush mounting. When for the enclosure of apparatus connected within the cabinet to the wires of more than four circuits, they shall have a back wiring space or one or more side wiring spaces, side gutters or wiring compartments unless the wires leave the cabinet directly opposite their terminal connections, and must be of the weatherproof pattern when intended for installation out of doors.

Rule 70, sec. b.—Changed to define "cutout boxes" as "intended for enclosing single devices or combinations of devices connected within the cutout box to wires of not more than four circuits"; when intended for installation out of doors, they must be of the weatherproof pattern.

Rule 70, sec. c.—Transferred from Rule 70, sec. **a**, par. 1, and the details of construction omitted, a note being added to consult the detailed specifications.

Rule 70, sec. d.—Transferred from Rule 70, sec. **a**, par. 4.

Rule 70, sec. d, par. 1 (1).—New. Requiring an air space of at least one-sixteenth inch, except at points of support, between the base of the device and the wall of any metal cabinet or cutout box on which the device is mounted.

Rule 70, sec. d, par. 1 (2).—Transferred from Rule 70, sec. **a**, par. 1, and changed to require an air space of at least one inch between any enclosed fuse or current-carrying part, unless the door is lined with approved insulating material, or is of a thickness at least that of No. 12 U. S. gauge, when the air space must be not less than one-half inch.

Rule 70, sec. d, par. 1 (3).—Transferred from Rule 70, sec. **a**, par. 1.

Rule 70, sec. d, par. 1 (4).—Transferred from Rule 70, sec. **a**, par. 1, and changed to include gutter partitions, if of metal, of any cabinet or cutout box where the potentials do not exceed 250 volts, and where the potentials exceed 250 volts, the spacing to be increased to at least one inch.

Rule 70, sec. d, par. 1 (5).—Transferred from Rule 70, sec. **a**, par. 1, and changed to require cabinets and cutout boxes to be deep enough to allow the doors to be closed when 30-ampere branch-circuit panelboard switches having spool or composition handles, or when switches of combination cutouts are in any position, and when other single-throw switches are thrown open as far as their construction and installation will permit.

Rule 70, sec. d, par. 1 (6).—Transferred from Rule 70, sec. **a**, par. 4, and changed to require cabinets having one or more side wiring spaces, side gutters, or side wiring compartments to be furnished with covers, barriers, or partitions extending around or from the side or sides of all bases or groups of bases of the cutouts, circuit-breakers, or feeder and circuit-branch panelboards within the cabinet, and providing a close fit with the door, frame, or sides, so as to enclose these spaces, etc.; at sides where wires or cables are led from the cabinet at points opposite their terminal connections and other wires or cables are not placed, these covers, etc., may be omitted.

Rule 70, sec. d, par. 1 (6), No. 2.—When cabinets have back wiring spaces which are not entirely enclosed, covers must be furnished to provide equivalent enclosure.

Rule 72.—Addition to heading to include "lamp receptacles," and fine-print note omitted.

Rule 72, sec. a.—"Sockets" changed to "lamp-holding devices."

Rule 72, sec. e, par. 3.—Changed to require pendent sockets to have sufficient room in the cap for a knot in the cord without crowding. Reference to "the ordinary wireman" omitted.

Rule 72, sec. h.—The words "the parts to which wiring connections are made" substituted for "the connecting points for flexible cord." "Designed" substituted for "made" and the size of conductors omitted.

Rule 72, sec. p, par. 2.—Changed to require lead wires furnished as a part of sockets, and intended to be exposed after installation, to be approved stranded, rubber-covered wire not less than No. 14 B. & S. gauge (No. 18 B. & S. gauge for candelabra sockets), to be sealed and spaced at entrance to shell at least one-fourth inch in the clear from each other or from exterior metal parts of the socket. Fine-print note referring to porcelain sockets omitted.

Rule 72, sec. q, par. 1.—Changed to require inlet, if threaded, to have not less than three-eighths-inch pipe size for sockets not attached to fixtures.

Rule 72, sec. q, par. 2.—Changed from fine-print note and also to require sockets with threaded outlets to have a hold not less than $\frac{9}{32}$ inch in diameter for plain pendent cord, and $\frac{13}{32}$ inch for reinforced cord.

Rule 76.—Reference to installation rules omitted and note added to the heading calling attention to the requirements as "but a partial outline of the specified requirements," which are obtainable from the secretary of the Electrical Committee of the National Five Protection Association.

Rule 76, sec. a.—Changed to require approved materials, both for metal and other parts, and including that for the exterior and interior surface finishing.

Rule 76, sec. b.—Reference to insulating material on exposed surfaces omitted.

Rule 76, sec. c.—Transferred from Rule 76, sec. **e**, and changed to require insulating joints to be threaded in an approved manner. Specifications and table omitted.

Rule 76, sec. d.—Transferred from Rule 76, secs. **a**, **c** and **d**, and changed to require tests for compliance with specifications for heat, leakage, dielectric strength, torsion and bending.

Rule 76, sec. e.—Changed to require each joint and stud to be marked with the name or trade-mark of the manufacturer.

Rule 77.—Reference to installation rules changed to Rule 30, and for the construction of fixtures to Rule 52.

Rule 77, sec. a, par. 1.—Changed to require materials other than metal or wood to be submitted for special examination.

Rule 77, sec. a, par. 3.—Transferred from Rule 77, sec. **d**, par. 2, and exception made in the case of wireways in glass, marble or similar materials.

Rule 77, sec. a, par. 4.—Transferred from Rule 77, sec. **b**, and changed to require arms to be secured to prevent turning by threading and soldering, brazing, threading locked by set screw, or an equivalent method.

Rule 77, sec. a, par. 5.—Transferred from Rule 77, sec. **b**, and changed to require screw joints of arms and stems to have not less than five threads, all engaging at fixture supports, fixture bodies, etc.

Rule 77, sec. a, par. 6.—Transferred from the latter part of Rule 77, sec. **b**.

Rule 77, sec. a, par. 7.—Transferred from Rule 77, sec. **c**, par. 2, and addition to require sockets attached to the metal of fixtures to have the threading locked by set screws, brazing, or an equivalent method.

Rule 77, sec. a, par. 8.—Transferred from the fore part of Rule 77, sec. **d**, par. 1, and additions to include sharp edges in wireways and at points where wires emerge from arms, stems, chains, etc.

Rule 77, sec. a, par. 9.—Transferred from the latter part of Rule 77, sec. **d**, par. 1, and additions to require suitable fittings to protect supply wires where they enter casings of fixture stems of either straight electric or combination fixtures.

Rule 77, sec. a, par. 10.—New. Requiring fixtures for installation outdoors or where exposed to moisture to be so constructed that water cannot enter the wireways, sockets or other electrical parts.

Rule 77, sec. b, par. 1.—New. Requiring conductors to be at least No. 18 B. & S. gauge.

Rule 77, sec. b, par. 2.—New. Calling attention to the following table for the allowable current-carrying capacity of copper wires (sockets and receptacles will be considered as requiring not less than 40 watts each).

New table giving the current-carrying capacity of wires of rubber and slow-burning insulation, sizes 18 to 12, inclusive.

Rule 77, sec. b, par. 3.—Transferred from Rule 77, sec. **d**, par. 3, and additions to require wires and flexible cords, when fixtures are externally wired, to be so secured as not to be cut or abraded by pressure of the fastenings or motion of fixture and to be protected from abrasion where passing through sheet-metal pans, canopies, etc.

Rule 77, sec. b, par. 4.—New. Requiring the conductors to be spliced or joined so as to be mechanically and electrically secure without solder, the joints to then be soldered (unless made with some form of approved splicing device) and covered with both rubber and friction tape. Splices and taps not to be made in arms or stems of fixtures.

Rule 77, sec. b, par. 5.—New. Requiring receptacles to be so installed as to prevent possible turning relative to the surface on which they are mounted.

Rule 77, sec. b, par. 6.—Transferred from Rule 77, sec. **c**, par. 2.

Rule 77, sec. c, par. 1.—Transferred from Rule 77, sec. **b**, and additions to state that the thickness of the unthreaded arms will depend on the method used, all the methods used to fasten arms or stems to be of equivalent strength to that of a threaded connection, such methods to be submitted for examination, test and approval. Tubing not to be kinked, flattened or cracked.

Rule 77, sec. c, par. 2.—New. Requiring canopies to be sufficiently large, except where outlet boxes are used, to permit the proper storing away of splices to fixture leads and to keep them clear of the grounded part of gas pipes.

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Rule 77, sec. c, par. 3.—New. Requiring all methods of securing arms or stems to fixture supports to be of equivalent strength to that of a threaded connection.

Rule 77, sec. c, par. 4.—Transferred from Rule 26, sec. **v**, par. 2, and addition to require conductors used in wiring fixtures to be of approved fixture wire, flexible cord or approved rubber-covered wire, excepting that slow-burning wire, etc., must be used in wiring fixtures in which the wiring is exposed from the heat of lamps to temperatures in excess of 120 degrees Fahrenheit.

Rule 77, sec. c, par. 5.—New. Requiring the ventilating of fixtures to avoid exposing the wiring to high temperatures. The wiring, as far as possible, to be kept free from excessive temperatures.

Rule 77, sec. c, par. 6.—New. Requiring all electrical fittings to be of approved types.

Rule 77, sec. c, par. 7.—New. Requiring canopy insulators, if provided, to be of approved types and securely fastened in place, and adding specifications for same.

Rule 77, sec. d.—Transferred from Rule 77, sec. **f**, and changed to require each fixture (after wiring and assembly) to be tested with a 50,000-ohm magneto for short-cicuits or grounds.

Rule 78, sec. a, par. 2.—New. Specifications for mounting rheostats, resistance boxes, etc., to the bases.

Rule 79, sec. a, par. 4.—Addition to require the marking of the proper oil level with the starter assembled when a visual oil indicator is used and the oil level prior to assembling when the visual indicator is not used.

Rule 81.—The words "nor to instrument transformers" added to the second paragraph of the fine-print note.

Rule 81, sec. a, par. 1.—"Secondary winding of bell or other signaling transformers" changed to "low-voltage windings as specified below," and requiring sheet-metal cases to be not less than 1/32 inch and cast-iron cases not less than ⅛ inch in thickness.

Rule 81, sec. a, par. 3.—New. Requiring that leads of approved cable at least six inches in length, and so secured as to prevent strain from coming on connections to coils, be brought out of the case through approved bushings, except in bell-ringing and toy transformers, the low-voltage terminals of which may be binding screws mounted on the case.

Rule 81, sec. a, par. 4.—Transferred from Rule 81, sec. **b**, par. 3.

Rule 81, sec. b.—"Primary and all secondary voltages" changed to "the high voltage and all low voltages."

Rule 81, sec. c.—Change in method of testing air-cooled transformers.

Rule 81, sec. d.—Addition to require "bell-ringing or other signaling transformers" to comply with the requirements of sec. **a**, and the following specifications.

Rule 81, sec. e.—Changed to require the marking, where it can be plainly seen after installation, with the name of the manufacturer, frequency, high voltage and all low voltages, in addition to the proper terminals being marked "line" and "bell." The rating of the high-voltage winding not to exceed 125 volts.

Rule 81, sec. f, par. 1.—Transferred from Rule 81, sec. **d**, par. 3, and the words "while the rated voltage is impressed on the high-voltage coil" substituted for the words "while 110 volts (60 cycles) are impressed on the primary."

Rule 81, sec. f, par. 2.—Transferred from Rule 81, sec. **d**, par. 4, and the words "high voltage" and "low voltage" substituted for "primary voltage" and "secondary," respectively.

Rule 81, sec. f, par. 3.—Transferred from Rule, 81, sec. **d**, par. 4, and the words "high and low-voltage coils" and "high-voltage coil and core" substituted for the words "primary and secondary coils" and "primary and the core," respectively.

Rule 81, sec. g.—New. Requiring toy transformers to be constructed in accordance with section **a** and the following specifications.

Rule 81, sec. h, par. 1.—New. Requiring toy transformers to be marked with the name of the manufacturer, high and low voltages and rated capacity in volt-amperes.

Rule 81, sec. h, par. 2.—New. Limiting the high-voltage rating to 125 volts and the low-voltage rating to 25 volts.

Rule 81, sec. i, pars. 1 and 2.—New. Specifying the tests of toy transformers.

Rule 83, sec. b, par. 3.—Changed to require transformers, unless of the weather-proof type, cutouts, flashers and other similar devices, to be enclosed in approved "cutout boxes or cabinets."

Rule 83, sec. e, par. 1.—The requirement for double-braided wire omitted.

Rule 90.—Note added to heading stating that "all wiring, apparatus, etc., not specifically covered by rules herein given must conform to the general requirements of the Code."

Rule 90, sec. a.—Addition to require protecting hand rails around generators.

Rule 90, sec. b.—Transferred from Rule 90, sec. **d**, and changed to require the capacity to be given in volts, amperes and kilowatts, and whether shunt, series or compound.

Rule 90, sec. c.—New. To require generators on storage batteries employed for auxiliary lighting or power to be located as far as practicable above the load water line.

Rule 91, sec. a.—Changed to require wires, except around generators, at switchboards and in wire tunnels, to be enclosed in approved metal molding, or conduits, unless covered with approved metal armor or metallic braid.

Rule 91, sec. b.—Addition to require wires to conform to requirements of Rules 49 and 50. All conductors larger than No. 12 to be stranded and no single conductor smaller than No. 14 to be used, except in fixture wiring.

Rule 91, sec. c.—Changed to prohibit conductors being spliced, except at fixture, unless special permission is given in writing.

Rule 91, sec. d.—New. Requiring splices and taps to be made by means of approved connecting blocks enclosed in approved fittings, except as provided for in Rule 91, sec. **c**, located in readily accessible places and not permitted in bunkers.

Rule 91, sec. e.—Changed to require deck tubes to extend at least 18 inches above the surface of the deck.

Rule 91, sec. f, par. 1.—Transferred from Rule 91, sec. **h**.

Rule 91, sec. f, par. 2.—New. Requiring pull boxes to be installed at sufficient intervals to permit the drawing in of conductors without undue strain. Pull boxes to be provided with gasketed water-tight covers, and the length of the opening in the box to be at least ten times the diameter of the largest conductor contained therein.

Rule 91, sec. g.—Transferred from Rule 91, sec. **i**, and changed to require additional mechanical protection, where passing through coal bunkers or where otherwise exposed to severe mechanical injury, when enclosed in metal molding, flexible metal conduit, metal armor, or metallic braid.

Rule 91, sec. h.—New. Requiring metallic braid cable, passing through beams or non-water-tight bulkheads, to be protected from abrasion. All sharp bends to be avoided.

Rule 92.—Changed to require portable conductors to be made of two or more stranded conductors, each having a carrying capacity equivalent to No. 14 B. & S. gauge or larger, and each provided with an approved insulation and covering. (See rule 51, sec. **d**, Type PWp.) Specifications omitted.

Rule 93, sec. a.—Addition to require bell or other signaling wires to be not less than No. 16 B. & S. gauge.

Rule 93, sec. b.—New. To require wires, if operated at a potential over 25 volts, or connected without specially approved transforming devices to a source of supply over 25 volts, to conform to requirements of Class C and Rule 19, sec. **a**, except that No. 16 B. & S. gauge conductors insulated as specified in Rule 55 may be employed.

Rule 93, sec. c.—New. Requiring all permanent wiring in radio room and above the top metal deck to be magnetically shielded. Any protection placed around antenna leads to be of metal permanently and effectually grounded.

Fine-print note added recommending the grounding of all metalwork above the top metal deck.

Rule 94, sec. a.—Transferred from Rule 95, sec. **a**, the word "approved" added, and the words "such as marble or slate" omitted. Table also omitted.

Rule 94, sec. b.—Transferred from Rule 95, sec. **b**.

Rule 94, sec. c.—Transferred from Rule 95, sec. **c**, "main cutout" changed to "automatic cutout."

Rule 94, sec. d.—Transferred from Rule 95, sec. **d**, and changed to require each circuit leading from the board to be protected by a cutout and controlled by a switch; section **e** referring to wires being omitted.

Rule 95, sec. a.—Transferred from Rules 97 and 98 and changed to require cutouts and switches, except on switchboards and in living spaces, to be enclosed in moisture-proof cases, arranged to break all poles of the circuit and not to be located in bunkers or other inaccessible places.

Rule 95, sec. b.—Transferred from Rule 97, sec. **c**, and changed to require each freight compartment to be separately protected and controlled.

Rule 95, sec. c.—Transferred from Rule 98, sec. **c**, and "metal cabinets" substituted for "cabinet lined with fire-resisting material."

Rule 95, sec. d.—Transferred from Rule 98, sec. **d**, the words "or other current-consuming devices" added after the word "lamps," and the word "ultimately" omitted from the last line.

Rule 96.—New. Permitting the use of removable fixtures and wiring in spaces allotted alternately to passengers and cargo. Main fuses and switches not to be located within these spaces.

Rule 97, sec. a.—Transferred from Rule 103 and addition to require each side of all signal circuits to be carried through the telltale board and fused at this point.

Rule 97, sec. b.—New. Prohibiting signal circuits from supplying other than pilot house and signal lights.

Rule 98.—Transferred from Rule 104, sec. **d**, and the words "and kilowatts" added after the word "amperes." Sections **a**, **b** and **c** omitted.

Rule 99.—Transferred from Rule 105 and changed to require the wiring in any vessel to comply with Rule 86. Reference to tests and table omitted.

Fine-print note added urging a complete test of the entire electrical equipment at least once a year.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Facilitating Customer's Development.

To the Editor:

In reference to the item on this subject which appeared in the issue of January 15, I take it for granted that the Nevada California Power Company is selling current on a high-tension form of contract and metering it at low tension, customer furnishing the transformers. Such a condition would be quite impossible with our company, and I cannot exactly see how any company can justify the practice of metering current on the low-tension side of the line, when the customer owns transformers.

It seems to me that they should either call their contract a low-tension contract, furnishing the transformers themselves and metering on the low-tension side, or else they should call it distinctly a high-tension contract and meter it on the high-tension side of the transformers. In other words, they have sort of an unusual condition without much justification for it.

It would seem to me if this company believe their rates are a little high, they should make a reduction in the rate itself, rather than making such an arrangement as outlined.

C. H. Stevens.
Edison Electric Illuminating Company of Brooklyn.
Brooklyn, N. Y.

To the Editor:

In regard to article entitled "Facilitating Customers' Developments by Carrying Transformer Losses," will say that with the exception of only a few customers, this company owns all of the transformers used in connection with the supplying of power service in Louisville. This being the case, we find it more efficient to install transformers of a capacity to suit their present requirements and change the transformers from time to time as the customers load increases. Of course, where an immediate increase is anticipated, transformers are installed of sufficient size to take care of same.

Robert Montgomery,
Louisville Gas & Electric Company.
Louisville, Ky.

Grounding of Secondaries.

To the Editor:

I have been advocating the grounding of secondary circuits for some fifteen years; therefore, the letter of Mr. C. H. Hill in your issue of January 15 interests me greatly.

In our advocacy of grounding or of non-grounding we are in danger of losing sight of relative values. He who supports one side of the controversy by claiming that grounding will banish the life hazard without increasing the fire risk is not a greater special pleader than he who argues that the life hazard is too nearly inappreciable to warrant the incurring of any extra fire risk whatever.

It is human lives against dollars, Mr. Editor! And we are now presented with inferential statistics as to fatalities and casualties; but no evidence is adduced by the insurance expert to prove how many *dollars* of fire loss might have been saved by non-grounding. Shall we assume the dollars lost by grounding to be "less than one-half of one per cent of actual" fire losses?

The advocates of grounding say that nearly all fatalities and casualties attributable to grounding might have been avoided —and statistics are available to show how many cases occur annually. The opponents of grounding say merely that it "automatically increases the fire hazard." Where are *their* statistics? Until we have them we shall not be able to arrive at an intelligent decision; for we must base the decision upon the price that is paid for saving a human life—and it might perhaps be that the price is too heavy, although this has not yet been proven. For, after all, human life has a definite average money value, notwithstanding what the moralists tell us.

Now, while it is undoubtedly true that the second fuse in an underground circuit furnishes additional protection, for how long does it do this? Our experience is that when we find a jumped fuse on one leg of a circuit, we find a jumped fuse on the other leg also. The tenant or the emergency man shows no such nice sense of discrimination as would allow him to jump the fuse first blown and deter him from jumping the other when necessity arose.

Might we not just as logically demand *two* safety valves on a steam boiler, on the plea that after a chunk of iron had been hung on the lever arm of one valve the second one would furnish protection (until the fireman found that he needed another chunk of iron)?

It would prove interesting if the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, with the exceptional facilities at its command, should secure statistics as to fatalities and severe casualties due to non-grounding, and actual fire losses in dollars due to grounding.

Assuredly, tests of ground connections ought to be made annually. I do not see, however, how any general rule of responsibility can be laid down, as court rulings on this subject vary throughout the country and other local conditions are important factors.

Hubert S. Wynkoop.
Department Water Supply, Gas and Electricity.
New York, N. Y.

To the Editor:

The field experience in Oakland to date has proven the advisability of grounding.

Prior to the enforcing of grounding one leg of the secondary system in this city, there were two deaths brought to my personal attention, one from turning on a key socket while standing in a bath tub and the other from coming in contact with a broken socket over a sink. These were on our old systems of 220-440 volts.

Since enforcing the grounding we have had three fires from burnt-out conduit services and in two cases the insulation was burnt off the ground wire, which was of No. 10 B. & S. gauge. However, in the above mentioned cases no damage was done to the buildings.

Mr. Hill's letter brought out the hazardous condition of bridging cutouts on a grounded system. Our local conditions in this section of the country may be different from that of eastern cities as the majority of residences are not piped for illuminating gas, therefore the risk of grounds on interior wiring is not as great. Furthermore in our fire district and small business centers we carry on a systematic resurvey inspection which we find is clearing up the practice of bridging cutouts. I also believe that this subject is of extreme importance and look forward to reading the views of others.

Our lighting system is all alternating current, 110-220 volts.

B. C. Hill,
Supervising Inspector, Electrical Department.
Oakland, Cal.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 331.—Small Lifting Magnet.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

No. 332.—Electric Belts.—Does any recognized authority on electrotherapeutics find any curative value from the use of the so-called electric belts? Has their sale or exploitation ever been prohibited?—J. S. C., Dayton, O.

No. 333.—Electric Car Heating.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

No. 334.—Locked Cutout Cabinets.—In a large drafting room lighted by adjustable drop lamps over each drawing table considerable trouble has been caused by a rule keeping the cutout cabinet locked with only the electrician in charge of the key. When a fuse blows due to trouble on any drop lamp, the circuit for several tables is dead until the electrician can be found in some remote part of the factory. What is the best solution for the difficulty without violating the rule?—N. L. P., Milwaukee, Wis.

No. 335.—Ground Detector for Transmission Line.—I would like to have data and sketch of a ground detector that is suitable for use on an 11,000 volt, three-phase, power transmission line that is six miles long. I wish to construct this detector myself.—R. F. C., Minersville, Cal.

Answers.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

In the case of dry cells, commonly called "dry batteries," it is very usual for the jobber to have his own "brand" which is of just the same quality as the "standard" of the manufacturer, and the jobber sells both. In this case it is advantageous to the jobber and to the manufacturer. The jobber can sell a good product at a lower price, if he desires, having the manufacturer's permission to cut the price of the "brand" cell, while the "standard" cell is maintained in price, guarantee and reputation. In this case the manufacturer is a national advertiser, he has men traveling the whole country, his trade is not materially affected if the jobber puts his brand on some other make of cell.

Lets take another, the case of a manufacturer of telephone apparatus. He is not an advertiser and he has no travelers. He puts his own name on the best class of all his apparatus, in fact, he places it on all that he sells in small lots, but the bulk of his business is to jobbers selling under their own name to mail-order houses and to other manufacturers. The mail-order house has to sell under a different name from that of the jobber and it usually sells a cheaper grade, hence it usually gets more business. If the mail-order house "hooks up" with another manufacturer, it does not lose its "brand," but the maker of the first apparatus is separated from a large piece of business that he cannot recover. This particular manufacturer lost a contract of one car a day.

In still another case, a well known manufacturer of controlling devices for motors made a contract with a large motor manufacturer. Suddenly, at the expiration of one year's contract, the large motor manufacturer starts to make his own controlling devices with the lamentable result that the first factory found itself with an enormous investment in buildings and machinery for which it had no apparent use. Luckily it "pulled through" and is now one of the largest manufacturers of controlling devices in the country.

If you are making an article, or about to market one, you had better consult with a good commercial electrical engineer and abide by his decision.—R. L. L., Minneapolis, Minn.

No. 325.—Capacity-Factor of Central Station.—In a town of 10,000 or less, having a fair day load, the peak being composed of store and residence lighting, what is the proper ratio between peak load and rated capacity of the station? I am supposing that the central station makes little or no effort to increase the power load and absolutely no effort to push appliances.—F. H. G., Columbus, Neb.

If the plant consists of two or more generating units so that any one may be shut down for a while during the 24 hours and a careful inspection and adjustment made, as is generally the case with plants for towns of this size, so that units are kept in good condition and are reliable in themselves, a daily peak load, as described, of 115 per cent of rated capacity of plant can be handled with good economy and fair reliability. However, it is not advisable to reach the above ratio before considering additional equipment, for any sudden demand for service at this ratio might result in poor service for all and a hindrance to the electric development of the district.—J. F. F., Williston, N. D.

No. 326.—Automatic Electric Humidification.—Are any automatic means available through which an electric water-heater could be controlled from a humidity instrument so as to cause the heater to boil water when the relative humidity has dropped to, say, 30 per cent and be cut off when the humidity has been raised to 40 per cent? Would such a device be practical and reliable?—M. T., Lansing, Mich.

There should be no difficulty in securing a satisfactory controlling system of this kind as there are several humidity instruments on the market, which if slightly modified would answer the requirements. One, which would probably be satisfactory, is the Class III wet and dry-bulb recording thermometer or recording psychrometer manufactured by The Bristol Company, Waterbury, Conn. This instrument is designed for determining the actual percentage of humidity in the air. The recorder may be placed at some distance from the actuating part of the equipment, if necessary.

By adding two sets of contacts to the recorder hand or indicating pen, this instrument could easily be made to control the electric water-heater through the medium of a suitable relay, magnetically operated switch or contactor. One contact would be set to close the heater circuit when the relative humidity dropped to 30 per cent and to open the circuit when the humidity reached 40 per cent. The contacts could further be made adjustable so that any minimum or maximum value could be selected. The type of relay would depend entirely upon the voltage of the circuit and the amount of current required by the heater. It might be necessary to have two relays, one requiring a small amount of operating current, which would operate a larger relay, which would in turn directly control the heater circuit. The exact arrangement possible would depend upon the amount of current the contacts could be made to handle. It might further be possible to eliminate the recording part of this outfit and have the bulb part or actuating device simply close and open the relay circuit at certain predetermined maximum and minimum values. An outfit of this kind would, in my opinion, be practical and reliable as well.—G. A. S., San Francisco, Cal.

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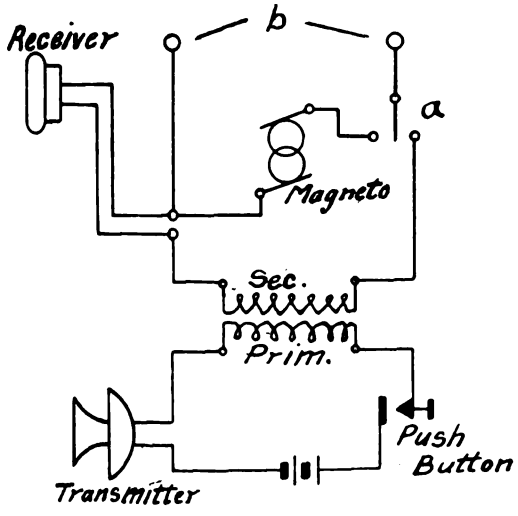
No. 327.—Reducing Glare from Table Lamps.—I have observed that practically all table lamps cause eye strain to children reading or playing on the table by shining glaringly directly into their eyes, if the children are not sufficiently tall to have their eyes screened by the shade or dome. Can anything be done to reduce this glare, aside from using full-frosted lamps?—P. M. C., Lockport, N. Y.

The full-frosted lamp would be the simplest way out of the matter. However, there is on the market a semi-indirect shade that can probably be used in this connection, but, of course, with reduced light. It is also possible to attach an inverted frosted or prismatic glass shade to some table-lamp fixtures, this also with reduced light, though this reduction is not disadvantageous when it comes at the expense of glare reduction. —P. B. W., Verbena, Ala.

No. 329.—Telephone Test Set.—Could an ordinary test magneto of 50,000 ohms be used for a telephone test set? If so, give description of plan for use and wiring diagram for attaching a head-type receiver and transmitter or a microphone set to the magneto to use in telephoning, also the batteries for the current. My idea was to use this temporary rig for use in testing transmission-line troubles on a small line of eight to ten miles in extent without a regular telephone system, the company not buying anything as expensive as a regular test set. Could it be used for talking to power house over one wire of transmission line (line dead), using a grounded return for six or eight miles?—C. D., Glenwood, Minn.

The ordinary magneto can be arranged for use as a telephone test set by equipping it with a high-resistance receiver, using



No. 329.—Diagram of Telephone Test Set.

a switch so that the magneto can be cut out of the circuit while talking and listening and the receiver cut out while ringing. Such a set is, however, not very satisfactory for talking, since when the receiver is used as a transmitter the voice currents are extremely feeble. Furthermore, if the set is to be used on one wire with a ground return there would probably be some disturbance from earth currents. A much better arrangement would therefore consist in using a transmitter with a local battery as shown in the accompanying sketch. The sketch also gives the connections and wiring.

The switch at *a* is wired so that when it is thrown to the left the set is arranged for ringing, and when thrown to the right it is connected for talking and listening. The push button controlling the battery circuit is normally open and should be closed only when the person using the set is talking. The switch and push button should be mounted on the outside of the set, and the latter should preferably be placed in a position such that the user can manipulate it with the hand used in holding the set.

The induction coil is of the local-battery type with a low-resistance primary and a high-resistance secondary and can probably be purchased from any telephone supply house. It should have a resistance of approximately two ohms in the primary and 25 ohms in the secondary. If desired a satisfactory coil can be made by winding 400 or 500 turns of No. 22 B. & S. gauge wire on a core of soft iron wire. The core should be about 0.625 inch in diameter and about 3.5 inches in length. This winding constitutes the primary. The secondary should consist of about 1,200 turns of No. 30 B. & S. gauge wire wound over the primary. Double-cotton-covered magnet wire is suitable for both the primary and secondary.

The battery should consist of two or three small dry cells. The multiple-cell units sold for small flashlight batteries would be adequate, but any two-cell battery, small enough to be mounted in the box containing the magneto, would be satisfactory. The transmitter should be mounted rigidly on the door of the box, and the receiver should be provided with 18 inches to 2 feet of flexible cord. A hook or clip should also be provided on the side of the box to hold the receiver when not in use.

The set described above can be used for talking over one wire with a ground return, unless there is an unusual amount of earth-current disturbance, as might be the case along a trolley road. Better results on the whole will be obtained by using the set on a two-wire basis. If desired, a small buzzer can be connected in the magneto circuit so that with the switch on the left contact, i. e. ringing position, a call can be received when the set is in circuit.

Leads should of course be provided of sufficient length to connect the set to the line using binding posts shown at *b* for the purpose.—H. S. P., New York, N. Y.

No. 330.—Installing Concentric Wiring.—In bending a sample of the new concentric wire in a certain direction, I notice that the seam in the outer sheath is easily opened. Is this not likely to cause short-circuits, if such wire is installed in damp places where water may enter the insulation at open seams? How can this be prevented?—L. T. K., Chicago, Ill.

If concentric wiring is to be used generally, there is no question but what the rules regarding its installation should be rigid and only men of experience and men having a thorough knowledge of it allowed to install it. The writer has a few samples of concentric wire and grounding devices, and on experimenting with them found that this wire is easily damaged and the outer sheath easily broken, if not handled right.

If the wire is bent with the seam on the inner side of the bend, it will open up or the seam will split open, which subjects it to trouble. In damp places the insulation between the inner conductor and the outer conductor becomes weakened which might result in leakage, short-circuit, or other trouble, according to the condition of the insulation. It should be bent with the seam on the outer side of the bend. The grounding should be done perfectly and the wire installed where it will not be subjected to any serious vibration.—W. T. E., Ansonia, Conn.

Concentric wire as it is manufactured at the present day is not adaptable for what is known as a water-tight installation, as is proven by the question in discussion.

Bending it in a certain direction the outer shield is opened and water easily gains admittance to the inner insulated wire. There lies one of the great dangers of concentric wiring. It will not take so very long for the water to penetrate the insulation sufficiently to cause heating. This cannot be termed as a "dead short" at this stage.

One way to overcome the condition of the outer shield opening is to use the type L Condulets equipped with stuffing glands where turns are to be made, and a type T can be conveniently used where a tap or branch is required. These glands are not a standard article but can be made up at a small cost in any machine shop and fit the one-half or three-quarter-inch Condulet threads, so all that is necessary is to screw them in the same way as one would a pipe. Concentric wiring cannot be recommended for wet places where a "water-tight" job really is the thing.—G. R. S., Brooklyn, N. Y.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Mogul Porcelain Socket with Iron Yoke.

For exterior illumination conditions frequently require a mogul-size porcelain socket that can be threaded directly to the end of a solid arm or bracket. For this purpose a yoke fitted to the socket has been found especially desirable. It gives abundant ventilation to the socket itself and provides liberal wiring space.

A socket of this type has recently been placed on the market by Harvey Hubbell, Incorporated, Bridgeport, Conn. This socket is provided with a cast-iron yoke tapped for three-eighths, one-half or three-fourths-inch pipe or rod, as desired. This design of the yoke permits ample room for the conductors to be strung from the socket to the feed wires instead of drawing them through conduit or the supporting arm of the fixture. The conductors are easily attached to the binding screws, which have especially large heads. The top of the porcelain is so arranged that the wires lead through an opening therein and thence diverge to either side of the bracket for attachment to the feeder.

Although designed primarily for use in exterior lighting, these new porcelain sockets have also been found desirable for use in interior wiring where large lamps are mounted in husks or inclosed sockets.

Mogul Socket with Yoke.

Electric Corn Popper.

Electrically Driven Corn Popper.

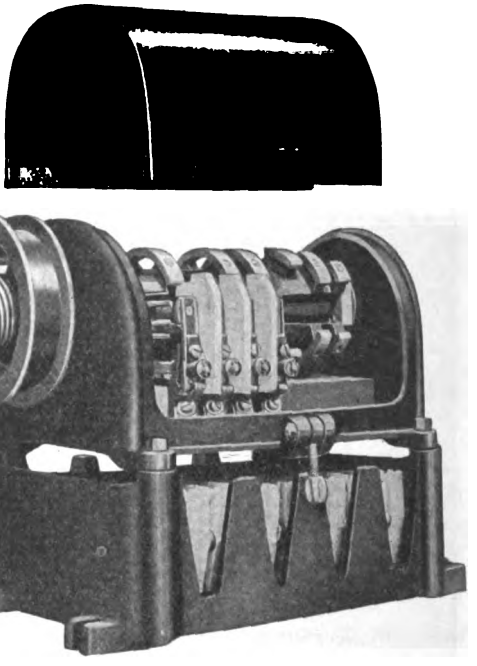
The rapidly increasing introduction of corn-popping machines, with motor-driven moving parts and electrically heated plates for keeping the butter melted for application to the corn, provides an excellent means of advertisement for electricity in its general application to household uses, besides giving the central station a constant day load for each of the machines.

The fact that these machines are publicly located—in waiting rooms, drug stores, department stores or picture-theater lobbies, gives them a wide publicity, and there is always a certain curiosity on the part of the public to be shown how the heating device is operated. The current required is about 225 watts, for machines such as are manufactured by the Holcomb & Hoke Manufacturing Company, Indianapolis, Ind.

One of these appliances is shown in the small illustration above. The small driving motor is mounted on the top of the cabinet.

New Reversible Rope-Operated Crane and Hoist Controllers.

The accompanying illustration shows a view of a new reversible drum-type controller, with inclosing cover removed, which has been designed for overhead mounting with rope operation. These controllers, which represent a new addition to the crane and hoist controller line of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., are designed for installation indoors for intermittent speed-regulating duty, such as in crane and hoist service. Two standard types are made, one giving 50 per cent



Rope-Operated Crane Controller—Usual Ceiling Mounting Is Reverse of That Shown.

speed reduction under half of full-load current and the other giving 90 per cent reduction under light-load conditions. The first type is for general crane and hoist duty, while for foundries or wherever the average load must be handled by the crane at a steady, slow speed, the controllers providing for the greater speed reduction are recommended.

Monogram-Clock Control Apparatus.

The Reynolds Electric Company, of Chicago and New York, has just completed a very intricate controller for a monogram clock built by the Gillette Electric Company for a prominent sign company in Havana, Cuba. The outfit is shown in the accompanying illustration.

The switching apparatus consists of 76 individual switches, controlling a like number of circuits in four monograms, flashing on the time of day or night. The gearing in itself is very intricate, inasmuch as there are numerous cams, one-tooth gears and Geneva movements,

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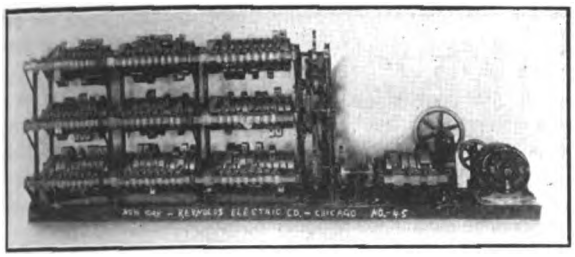

Control Outfit for Monogram Clock.

as it is necessary to revolve the lower cylinder once every minute, the middle cylinder once every hour and the top cylinder once every 12 hours; accurate timing gears are therefore essential and this mechanism is built so that it will not vary a fractional part of a second. One of the two switches on the right, next to the gear housing, controls the relay, which in turn is controlled by the master clock; the other switch controls the motor circuit, the latter starting and stopping once every 60 seconds, thus making the motor duty extremely severe. The entire mechanism is built specially for this work and represents an unusual engineering feat.

Of particular interest is the motor, which is also specially designed on account of the peculiarity of duty. It is of the 220-volt, single-phase, induction type, one-sixteenth horsepower. Contrary to precedent, the motor is constructed without a cutout or starting switch, and while the windings consist of both starting and running coils, in order to eliminate any possible switch trouble due to the frequency of starting and stopping, the starter was wound so that no internal starting switch was required in the winding circuit.. The starting torque of the motor was not affected by this change and there was no "arc" or "flash" caused by the opening of the ordinary centrifugal acting switch.

Portable Galvanometer with Self-Contained Lamp and Scale.

In most electrical measurement work involving the use of galvanometers of high sensibility the readings are obtained by deflection from the galvanometer mirror to a scale distant about a meter from the instrument, as a rule. The reading on the scale is obtained either by means of a telescope or by projecting a narrow band of light whose reflection from the mirror upon the scale permits a quick and accurate reading. Since the latter method is more convenient, it is particularly used for demonstration purposes and in rapid testing. In the testing departments of large manufacturing plants, however, a still more convenient arrangement is desirable.

This has been developed in a new combined portable galvanometer and lamp and scale recently put on the market by the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa. As shown in Fig. 1, the instrument is very compactly built. The galvanometer is contained in the rear of the box and has a convenient zero-adjusting lever mounted so as to project above the cover. The scale forms a translucent panel in the front of the box. A convenient socket is provided at the side of the box by means of which connection is obtained with an extension cord to the lighting circuit. The general arrangement of the interior, as well as the principle of operation of the instrument, is made clear from Fig. 2. The lamp is mounted in a reflecting housing, which projects a narrow beam of light upon the galvanometer mirror from which it is reflected to the glass scale. The lamp used has a straight vertical filament of high brilliancy. It operates on 4 volts and takes about one-half ampere.

The galvanometer used is similar in construction to the portable types made by the Leeds & Northrup Company. Its moving coil is suspended. The moving system is mounted in a small metal case which fits in between the pole faces of the permanent magnet. Thus in case of damage to the suspension, the moving system may be readily removed and shipped to the factory for repair without necessitating shipping the complete instrument. These galvanometers are made with a resistance of either 200 or 20 ohms. The instruments are particularly useful where a large number of measurements is to be made in quick succession, as in a testing room.

A New Line of Electric Stoves and Ranges.

One of the oldest and now largest and best known factories for the production of all kinds of stoves and ranges is that located at Hamilton, Ohio, which has been conducting a successful business continuously since 1845. This plant of the Estate Stove Company covers many acres and includes a large number of buildings. This firm has developed the business of stove making to a high state of perfection and has attempted to keep in the lead in its design and production methods. It was natural, therefore, that when it appeared that electric stoves and ranges would come into active use, for the company to develop a department especially devoted to producing a line of electric products of this kind.

Before placing any of these electric appliances on the market, an exhaustive study was made of types of heating elements and other features connected with electric cooking so as to find forms of construction best suited for the purpose. Before deciding on a finished line, the electrical details were harmonized with the company's long experience in the manufacture of gas ranges and other types of stoves, which are built along the lines found to best suit the needs of the average

Fig. 1.—Portable Galvanometer with Lamp and Scale.

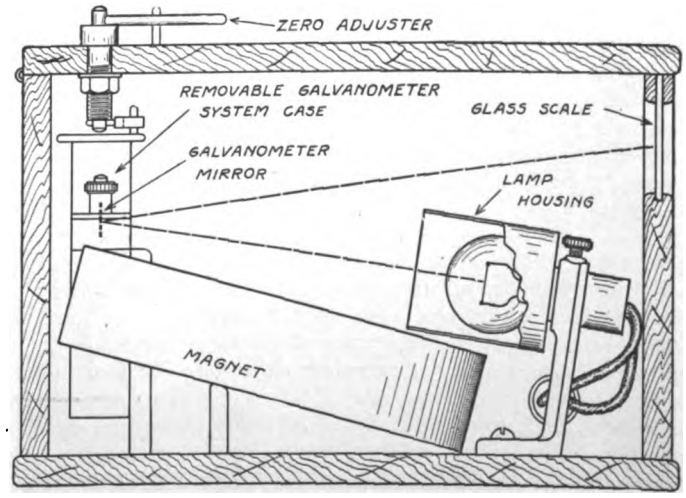

Fig. 2.—Section of Galvanometer Case, Showing Interior Arrangement.

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housewife. The line of Estate electric ranges and stoves therefore contains features that are not only particularly suitable for the requirements, but are in many respects of novel construction. Several types of ranges are included in the line, also portable plate stoves, air heaters, etc.

In the construction of the oven the idea of heat insulation was carried out so as to make the use of electric oven very economical. The walls of the ovens are two inches thick and are thoroughly insulated to make the heat loss a minimum. The oven door is likewise well insulated and fits so tightly as to make the oven practically air-tight. This oven insulation is so effective that, while the temperature in the interior may be 500 degrees Fahrenheit, the outside of the oven walls is said to be not more than 50 degrees above the temperature of the room. In the oven door there is installed a thermometer which shows the actual temperature inside so as to eliminate guesswork in baking or roasting. The oven has heating plates both in the top and bottom. A single three-heat switch controls the current to these heating elements so as to give the proper heat distribution at all times. A schedule is furnished for baking and roasting in the oven; this gives the length of time that current is to be turned on before putting in different kinds of food and the time that current should be left on; as a rule the current can be cut off quite a while before the baking is done because the heat is retained by the very effective heat insulation.

In the broiling oven a series of radiant coils is mounted in the upper portion of the compartment. Directly above these coils is an effective radiating surface so that the heat given off by the coils is projected down upon the food.

The heating plates on the surface of the range corresponding to gas burners of a gas range are either three or four in number, depending upon the size of the range. They are of the ironclad or inclosed type; this construction gives complete protection to the heating coils and gives a smooth surface for contact with the cooking vessels. Since the heating coils are entirely protected, there is no trouble from charring particles of food that may lodge among the wires in an open type construction. Each plate heating element is arranged for three degrees of heat and is controlled by a three-heat switch. Each heating plate with its self-contained unit is arranged to be easily removed; it has at the middle of the bottom three prongs that act as terminals and which fit into a porcelain receptacle; thus the heating plate needs merely to be plugged in to be ready for service. The wiring of the entire stove is readily accessable in case it is desired to inspect or repair the same.

The general arrangement of one of these ranges is shown in Fig. 1. This shows the substantial construction of the entire outfit and its clean and sanitary finish. This design corresponds to the company's popular cabinet gas range. The oven panels in the back and side of the large open cooking space are of white enamel. The cooking top is 22 by 25 inches without the side shelf, which adds 6.5 inches to the width. Three of the heating plates on the cooking top are each 6.5 inches in diameter and each takes 650 watts at high heat, 325 watts at medium heat and 165 watts at low heat. The fourth plate is 8 inches in diameter and is especially arranged for rapid work; it takes 1,200 watts at high heat, 600 and 300 watts at the lower heats. The upper or baking oven is 18 by 18 by 12 inches in dimensions and has four heating plates in the top with a total consumption of 1,500 watts at high heat. There are also four three-heat plates in the bottom with a maximum total consumption of 2,000 watts at high heat. The broiling oven has a three-heat open-coil element taking 1,500 watts at high heat. The maximum demand of the range is 8,150 watts, assuming all of the heating elements to be turned on at high heat. The probable average demand during cooking will not exceed 3,000 watts, however.

Fig. 1.—Cabinet-Type Electric Range with Two Ovens and Two Swinging Cookers.

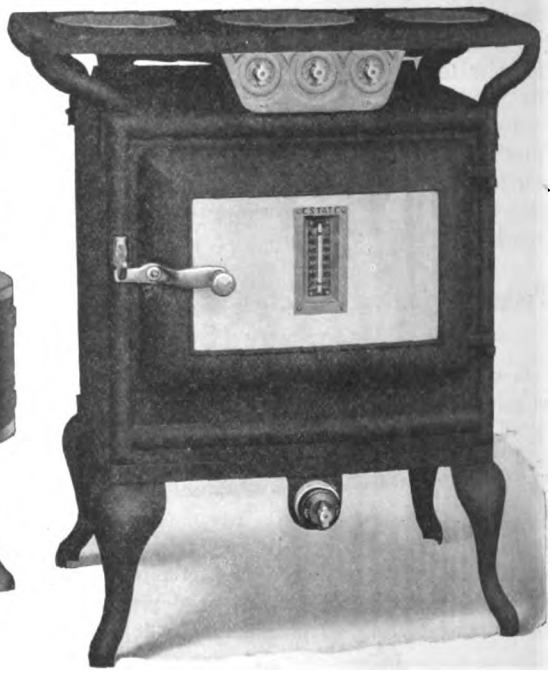

Fig. 2.—Estate Electric Range with Single Oven.

Attached to the two front legs of the range are shown two cylindrical heat-retaining cookers. These are built on the principle of an ordinary fireless cooker, but each contains an electric heating element taking 500 watts maximum. The walls of this cooker are heavily heat-insulated. Food is placed in the compartment, the cover tightly clamped on and the current turned on. After a short time the heat developed will complete the cooking operation so that the current can be shut off. In the arrangement shown in Fig. 1, these cookers can be swung under the range where they are out of the way when not in use or while the automatic cooking is going on. These cookers are an auxiliary to the range and can be obtained as

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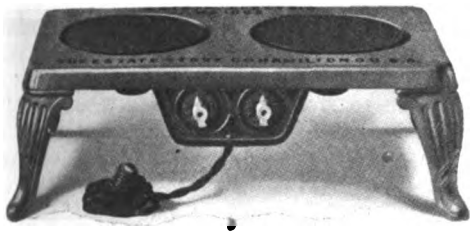


Fig. 3.—Two-Unit Portable Stove.

a separate appliance, if desired; likewise the range is obtainable with or without one or both of these special cookers.

Another form of range built particularly for small families is shown in Fig. 2. This has but one oven and three heating plates making a very compact arrangement. Two of the heating plates take 650 watts each at high heat and the third is a larger one taking 1,200 watts at high heat. The oven has two three-heat plates in the top and two at the bottom. The total wattage of the oven at high heat is 2,400 watts. The total maximum demand of the range with all elements at high heat is 4,900 watts; the probable average demand is less 2,500 watts.

Fig. 3 shows a two-plate stove of the portable type which is provided with connecting cord and plug. Each of the heating plates is 6.5 inches in diameter and takes 650 watts at high heat, 325 and 165 watts at the medium and low heats. These portable stoves are made with one, two or three heating elements.

Electrically Operated Ticket Vender and Cash Register.

A machine for selling tickets in places of amusement, such as motion-picture theaters, is considered a necessary adjunct by many present-day proprietors. The illustration shows a machine designed to pass out tickets, registering the number sold. The apparatus can be furnished to handle from one to four kinds of tickets. Five buttons are arranged opposite each class of tickets, and by pressing No. 1 button one ticket is ejected and registered; by pressing No. 2 button two tickets are ejected, and so on.

Pressing one of the buttons sets the motor in motion, which actuates the "spider," a wheel with regularly-spaced pins on its periphery, this in turn forcing the ticket strip through the slot or opening in the top plate of the machine. When one or more tickets are issued, depending on which button is pressed, the ticket strip passes through the slot, the knife cuts off the correct number which is automatically registered. The machine is returned to its normal position and the motor circuit opened. The motor is connected to the ticket-issuing mechanism by means of a series of gears.

The motor has a rating of 0.02 horsepower and is made by the Robbins & Myers Company, Springfield, O. It is a series wound type and will operate either on direct or alternating current. The ticket selling machine is manufactured by the Automatic Ticket Selling & Cash Register Company, St. Louis, Mo.

Racine Electric Fans.

The Racine Electric Company, Racine, Wis., is this year putting out a line of electric fans of the universal type that can be used on either alternating-current or direct-current circuits of standard voltage. A few of these fans are shown in the accompanying illustrations. Fig. 1 shows a 12-inch

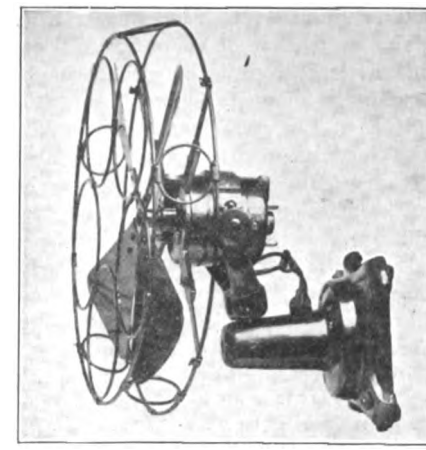
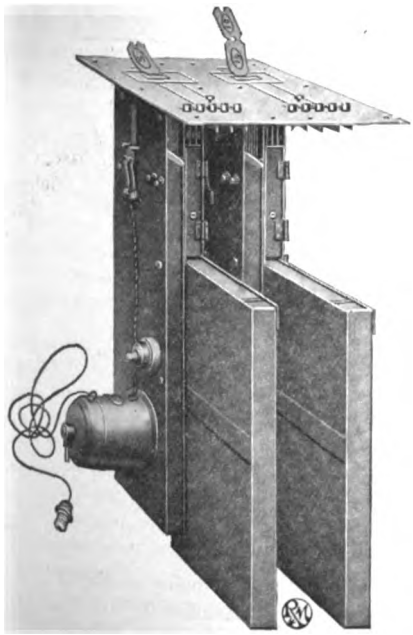


Fig. 1.—Racine 12-Inch Fan in Wall Position.

desk and bracket fan in its wall mounting. This fan has a trunnion arrangement which permits ready adjustment of the vertical angle and change from desk to wall mounting. The swiveling arrangement is also included, by means of which the fan can be turned about a vertical axis. A similar 8-inch desk fan is also made. This is shown in Fig. 2. Each of these fans is arranged for three speeds.

The fan shown in Fig. 3 is the company's popular table fan, which has been found especially serviceable for use in dining rooms and restaurants. It has a deflecting plate directly above the blades which serves to distribute the air laterally and thus give a cooling effect through a very large zone. The plate can also serve for placing upon it dishes of fruit, cake, ferns, flowers, or other food or plants.



Electric Ticket Vender.

Fig. 2.—Racine Eight-Inch Fan.

Fig. 3.—Racine Table Fan.

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Electrical Device for Finding Flaws in Iron and Steel Castings.

An electrical device for indicating differences in the homogeneity of metals of magnetic character has, according to *The Iron Trade Review,* been developed by Ethan I. Dodds, of Pittsburgh, Pa. This apparatus is designed to record the locations of internal defects in iron and steel castings and forgings, rails, ingots, and the like. Numerous tests of the method have been made at the plant of the Union Switch & Signal Company, Swissvale, Pa.

The device consists of two small horseshoe magnets. Each magnet has a primary winding, which is energized from the secondary coil of a transformer, the primary of which is fed by an alternating-current generator. The two primary windings of the magnets are connected in multiple. The secondary winding is connected with the terminals of two electromagnets of a sound-producing device or buzzer. The two buzzer armatures are tuned so that in harmony with similar currents in the windings of the magnets, they will produce sounds of substantially the same character. Adjacent to each buzzer armature is a transmitter, similar to that of an ordinary telephone.

A small magnetic current is induced through the product to be tested, the magnets being moved along its surface. As long as the metal adjacent to each magnet is of uniform character and density, approximately the same number of magnetic lines of force will pass between the two poles of each magnet, and sounds of corresponding character will be produced at the two sound-producing instruments. If there is a defect, such as a blow-hole or pipe, the magnetic field of the magnet will be weakened to such an extent that less current will be induced in the secondary winding, thereby causing the sound-producing instrument connected with this winding to produce a sound of different character from that of the other instrument, thus enabling the operator to locate the defect. A patent is pending on an instrument developed by Mr. Dodds to register the variations in the currents.

Train-Dispatching Equipment for Texas & Pacific Railroad Company.

In the fall of 1914, the Texas & Pacific Railroad Company installed its first telephone train-dispatching circuit on a 70-mile division of its line between Fort Worth and Whitesboro. The first night after the system's installation the dispatchers started using the new circuit, and it has been in continuous service ever since.

The railroad found that a greater amount of business could be handled over the telephone than with the telegraph, and with fewer errors. Booths are installed at all sidings and spurs, so that the crews are constantly in personal touch with the dispatcher. This cuts down delays in the handling of freight, assuring faster freight service and practically eliminating the company's overtime pay roll.

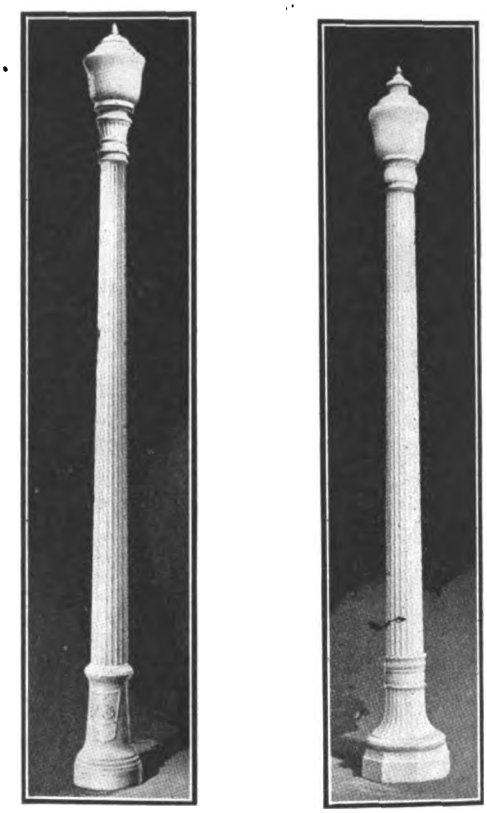
The initial installation proved so satisfactory that a 90-mile division, from New Orleans to Addis, La., was similarly equipped and put in operation last summer. On this system two circuits were installed—one for train dispatching, the other for a manual block system. Forty-eight booths were placed at sidings, spurs and stations, from any of which a conductor can ring the station either side of him, or can get in touch with the dispatcher direct.

This system, like its predecessor, has worked so satisfactorily that the railroad has given the Western Electric Company orders for full equipment, with which it will install a similar system on its Eastern division, stretching from Marshall to Fort Worth, Tex., a distance of 177 miles. This is but another step toward the complete equipping of its entire system with telephone train-dispatching apparatus.

Pressed-Steel Ornamental Lamp Standards.

Since the advent of the improved luminous or magnetite arc lamp and the gas-filled tungsten lamp a great impetus has been given to street lighting from ornamental single-light standards and a large variety of designs of these is now available. Where such standards are used on downtown business streets or on thoroughfares lined with imposing buildings, the standards likewise should be of a correspondingly massive and stately design and their construction should be such as will provide a strong post with minimum liability to danger from breakage and falling to the street in case of possible collision from runaway teams or misguided automobiles.

To meet the requirements of this and similar service, the Union Metal Manufacturing Company, Canton, O., has developed a line of pressed-steel standards, of which two typical designs are shown herewith. They are of very strong and durable construction and yet comparatively low weight. The details of the base, fluting and capitals are



Two Designs of Union Pressed-Steel Standards.

clearly brought out in the finished standard, much more so, it is claimed, than in any molded type. The base, shaft and head are furnished separately, so that it is possible to select from a relatively small number of types of these three sections combinations of great variety, resulting in exceptional flexibility of design. It is said that over 2,000 combinations can be made in this manner.

The two designs shown are equipped for Novalux Mazda type C units with two different forms of ventilating tops. The bases can be arranged for the installation of cutouts or compensators. The three parts of the post (base, shaft and head) are secured together by three steel tie rods and the whole anchored to the foundation by steel anchor rods, making a very substantial construction. In fact the manufacturer makes a very liberal 20-year guarantee to replace for a merely nominal sum, any shaft that fails in that period.

Union metal lamp standards are being marketed in the middle western states by the Minerallac Electric Company, Chicago, Ill.

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INDUSTRY ACTIVITIES

Willard Doud, consulting engineer, has moved his offices to 440-5 Old Colony Building, Chicago, Ill.

The Wagner Electric Manufacturing Company, St. Louis, Mo., will increase its manufacturing quarters by the addition of a new five-story building estimated to cost $55,000.

Reliance Electric & Engineering Company, Cleveland, O., has issued a four-page folder, Bulletin No. 1013, which gives a description and specifications of the Reliance all-gear motor drive for cone-pulley lathes.

H. O. Swoboda, consulting electrical and mechanical engineer, Pittsburgh, Pa., has been retained by the Humphrey Company, Kalamazoo, Mich., for the purpose of designing an entire line of electric heaters to be manufactured by that company.

Sprague Electric Works of the General Electric Company, New York City, is distributing a 24-page booklet, Bulletin No. 49200, which illustrates, describes and gives prices of electrical devices, equipment and accessories for use in theaters. A very complete line of lights, dimmers, switchboards, fans and wiring devices is catalogued.

American Lighting Company announces the removal of its office and plant from 617 West Jackson Boulevard to 1420-1430 West Randolph Street, Chicago. Will J. Davis, Jr., president of the company, says that the demand for Nitrogen Sunlight Flood Projectors made necessary the change to larger quarters. With the increased working space, factory production is to be quadrupled.

Ward-Leonard Electric Company, Bronxville, N. Y., is making provision for additional manufacturing space to afford facilities to handle an increasing amount of business. The contract for a two-story factory building at the corner of Pearl and South Streets, Mt. Vernon, N. Y., has been placed. The building will be 83 feet by 153 feet and will follow regular mill construction lines.

The Holtzer-Cabot Electric Company which is now occupying its new building at 125 Armory Street, Roxbury, Boston, Mass., has issued invitations for an inspection of the building February 22. The new factory will house the entire business of the company, the main building being six stories, 300 by 60 feet, and containing the most modern equipment for the manufacture of the company's output.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which recently received the order for equipment for the Inland Steel Company, the largest order for electrical equipment ever placed by a steel company, has received an order from the Phillips Sheet & Tin Plate Company, Weirton, W. Va., for the complete electrical equipment of a new mill the company is building. The contract calls for two 3,000-kilowatt, three-phase, 60-cycle, 6,600-volt turboalternators; one 1,500-horsepower constant-speed alternating-current motor; one 2,500-horsepower adjustable-speed motor, and one 800-horsepower adjustable-speed motor. The speed adjustment of about 50 per cent from high speed is obtained on the 2,500 and 800-horsepower motors by means of direct-current synchronous control, a method devised by Westinghouse engineers.

Commissioners to Investigate Street Lighting Methods.—Members of the Board of Commissioners of Knoxville, Tenn., have been invited by both the Knoxville Railway & Light Company and the Knoxville Gas Company to be guests of the two companies on trips to Eastern cities to investigate methods of street lighting. The invitations were issued in order that the commissioners might be able to choose between the bids of the two companies for the contract for street lighting. The electric company has offered to light 600 6.6-ampere enclosed arc lamps at $54 a year per lamp, the old contract price having been $72.50. The gas company's price is $27 a year for a five-year contract and $24 for ten years. The commissioners desire a short-term contract. It is not believed that public sentiment would favor a gas lamp for street lighting.

The Federal Sign System.—A test of the Kansas City (Mo.) branch offices' 24-hour service was made on the occasion of President Wilson's visit to that city recently. The committee on arrangements did not decide on an electric sign for the hall until the day previous to the reception. The order was placed with the Federal Sign System, and the sign was erected above the doorway where the national executive made his appearance. The sign was masked and none except those who ordered and erected it observed it until just before Mr. Wilson entered it blazed forth the words, "Our President," in 16-inch letters. The sign was 24 feet long, illuminated with 150 10-watt lamps, colored red, white and blue. The same alphabet of 16-inch letters was used by L. P. Brintnall, the Kansas City branch manager, in an emergency order last week for a sign for the first tractor show held by the Kansas City Tractor Club.

Westinghouse Electric & Manufacturing Company.—R. L. Wilson, formerly manager of the railway division, East Pittsburgh Works, has been appointed assistant general superintendent and will be concerned directly with trades apprentices, employment, working conditions and matters of a similar nature. Mr. Wilson was born in Shelbyville, Ind., and is a graduate of Rose Polytechnic Institute of that state. He entered the employ of the Westinghouse Electric & Manufacturing Company in 1893 as a student draftsman and subsequently became inspector, engineer of construction, and later superintendent of construction, at one time being in charge of erection work in the New York district. Later Mr. Wilson was made superintendent of the railway division, which position he continues to hold. He is chairman of the joint committee appointed by the company and the employees for the settlement of differences in opinion arising between the employees and the company, and is also trustee of the Veteran Employees' Association of the Westinghouse Electric Company.

St. Louis Jovians Study National Advertising.—W. S. Donaldson, of the National Printing & Engraving Company, in his address on "Advertising," at the weekly luncheon and meeting of the St. Louis Jovian League of Electrical Interests, February 8, at the American Annex, urged that Jovians consider the subject of "National Advertising" in the electrical trade journals. Mr. Donaldson argued that the world was looking to the United States to supply its needs. "I see no reason why St. Louis should not supply the world with electrical appliances and accessories with our large manufacturing plants. I believe now is the time for St. Louis to secure a great deal of foreign business." Sidney J. Roy, Hannibal, Mo., field secretary of the National River and Harbor Congress, spoke on the question of utilizing the Mississippi River in transportation. Mr. Roy declared that it was necessary for the manufacturer and business man of the Central West to study the economic conditions surrounding their business; that the matter of water transportation was a great economic problem.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

HEATERS, Electric.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Electric ranges and hot plates.

Catalog Nos. 2-18, 3-18, Automatic, 2-18, 3-18, Non-Automatic, 3-18R and L, Special Automatic, 21, 22, 31. 11.7 kilowatts or less, 110-220 volts.

Note.—In installation of these devices it is considered desirable, from standpoint of safety to persons, that framework be permanently and securely grounded, a soldering lug being provided on device for this purpose. The same protection of surrounding materials should be observed in installation of this device as is applied to stoves of other types used commonly for cooking.

Listed January 17, 1916.

OUTLET BUSHINGS AND FITTINGS, Couplings.—Dodson Patent Union Fittings, 511 Granger Block, San Diego, Cal.

Malleable iron galvanized coupling for rigid conduit.

Listed January 12, 1916.

PICTURE MACHINES AND APPLIANCES.—Nicholas Power Company, 90 Gold Street, New York, N. Y.

Rheostat for use with arc lamp of moving picture machine, 25-45 amperes, 110 volts. Iron grids enclosed in perforated metal case with lever and contacts for varying resistance in circuit.

The general design and construction of this rheostat are acceptable under present standards. It should, nevertheless, be noted that any device of this character will, even under normal current, reach temperatures making it necessary to take special care to avoid installation near combustible material or in a manner which will not afford entire protection against the ignition of moving picture films which may come in contact with the rheostat under conditions liable to obtain in practice.

Note.—It is recommended that for the safety of persons the exposed non-current carrying metal case of this appliance be permanently and effectively grounded.

Listed January 5, 1916.

RECEPTACLES, For Attachment Plugs.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins "Spartan."

Conduit Box, 10 amperes, 250 volts, catalog No. 113.

Listed December 29, 1915.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Keyless, back-connected receptacles, composition shell, 660 watts, 250 volts, catalog No. 24998. Standard for use only on switchboards.

Listed January 5, 1916.

RECEPTACLES, Standard.—Weber Electric Company, Schenectady, N. Y.

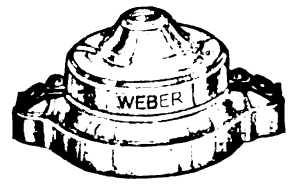
Porcelain Shell.

Keyless, 660 watts, 250 volts, catalog Nos. 4024-26 inclusive.

Listed January 3, 1916.

ROSETTES, Fuseless.—Weber Electric Company, Schenectady, N. Y.

Three amperes, 250 volts. Cleat, catalog No. 2003. Concealed, catalog No.



Cleat Rosette No. 2003.—Weber Electric Company.

2002. Combined cleat and concealed, catalog No. 2006. Molding, catalog No. 2004, 2005.

Listed November 22, 1915.

RUBBER-COVERED FIXTURE WIRE.—The Bay State Insulated Wire & Cable Company, Hyde Park, Mass.

Marking: One black thread running with wire between rubber insulation and braid.

Listed January 7, 1916.

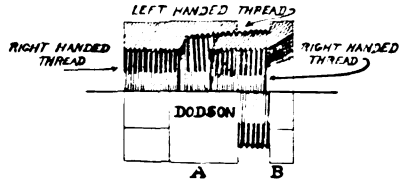
RUBBER-COVERED FIXTURE WIRE.—Boston Insulated Wire & Cable Company, Hamilton, Ont.

Marking: One coarse uncolored thread woven in a clockwise direction. direction.

Listed January 7, 1916.

RUBBER-COVERED FIXTURE WIRE.—Lowell Insulated Wire Company, Lowell, Mass.

Marking: Two yellow threads run-



Conduit Coupling.—Dodson Patent Union Fittings.

ning parallel with wire between rubber insulation and braid.

Listed January 7, 1916.

RUBBER-COVERED FIXTURE WIRE.—The Whitney-Blake Company, New Haven, Conn.

Marking: White paper strip extending length of conductor under braid next to rubber insulation, marked "W. B. Co."

Listed January 8, 1916.

SIGNS, Electric.—Electric Display Sign Company, 118 North Eighth Street, Richmond, Va.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have label attached.

Listed December 23, 1915.

SOCKETS, Candelabra and Miniature.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins," 75 watts, 125 volts.

Candelabra. For candle fixtures, catalog No. 540.

Listed December 29, 1916.

SOCKETS, Candelabra and Miniature. — Weber Electric Company, Schnectady, N. Y.

Weber 75 watts, 125 volts.

Candelabra. Keyless. For candle fixtures, catalog Nos. 2052, 2054.

Miniature. Keyless. For candle fixtures, catalog Nos. 2051, 2053.

Listed January 5, 1916.

SOCKETS, Standard.—General Electric Company, Schenectady, N. Y.

Porcelain shell. Key, 660 watts, 250 volts, catalog Nos. GE567-569, inclusive.

Standard for use only in places where not exposed to hard usage.

Listed January 11, 1916.

SWITCHES, Automatic. — Haynes Manufacturing Works, Chicago, Ill.

Automatic time switch.

This device consists of a cast-iron case inclosing an eight-day, twenty-four-hour clock mechanism, arranged to operate a standard double-pole or two-circuit snap switch. Haynes 2-10 amperes, 250 volts.

Listed November 8, 1915.

SWITCH BOXES.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

Sherardized and enameled pressed-steel switch boxes in single and gang types. National.

Catalog Nos. 4120, 4130, 4150, 4220, 4230, 4250, 4320, 4330, 4350, 4420, 4430, 4450.

Listed December 20, 1915.

SWITCHES, Door.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts. Pullman Berth Switch, catalog No. 51.

Listed January 5, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. A. M. BIBLE, formerly purchasing agent for several eastern railroads, has been appointed temporary chief of the Bureau of Lighting, Philadelphia, Pa.

MR. C. A. HASCALL was re-elected president of the Fallon (Mo.) Electric Railway Company at the annual meeting of the company recently. Mr. E. S. Berney was re-elected general manager.

MR. R. C. COFFY, manager of the Everett Gas Company, Everett, Wash., has been appointed a member of the program committee of the Northwest Electric Light & Power Association which will convene in Seattle in September.

MR. L. H. KINNARD, vice-president and general manager or the Bell Telephone Company of Pennsylvania and Associated Companies, gave an address on "He Serves His Company Best Who Best Serves the Public" at a meeting of the Telephone Society of New York, February 15, in the United Engineering Building, New York City.

MR. F. E. McCALL, formerly electric vehicle engineer with the Commonwealth Edison Company, Chicago, has accepted a position as battery sales engineer in the Chicago offices of the Philadelphia Storage Battery Company. Mr. McCall is secretary-treasurer of the Electric Vehicle Association of America, the present being his second term in office.

MR. WILLARD W. LOW, president of the Electric Appliance Company, Chicago, is back at his desk and rapidly regaining his usual robust health, after a second operation within the year. Mr. Low, accompanied by Mrs. Low, will leave Chicago on February 19, going directly to Del Monte, Cal., where he will stay until March 8. From March 8 to March 21 he will visit the officers of the branch company at San Francisco, and March 22 to March 27 will rest at Glenwood Mission, Riverside, Cal. The Electric Appliance Company at Dallas, Tex., will be visited from March 30 to April 6, and the company at New Orleans from April 7 to April 13. Mr. Low expects to be back in Chicago on April 14 or 15.

OBITUARY.

MR. G. S. SHANKLIN, president of the Fayette Home Telephone and prominent in business circles of Lexington, Ky., dropped dead in his office recently, aged 56 years.

MR. D. A. CHAPPELL, of Riverside, Cal., president of the Nevada-California Electric Corporation, died Feb. 9, in Denver, Colo. Death was caused by pneumonia following an accident incurred several weeks ago.

MR. FREDERICK BUCHERER, one of the pioneer salesmen in the electrical field, died February 7 after a short illness. Mr. Bucherer had been a salesman for the Diehl Manufacturing Company, Elizabeth, N. J., for 22 years and was well known throughout the New York electrical jobbing and contracting trade.

MR. GEORGE A. MACBETH, president of the Macbeth-Evans Glass Company, Pittsburgh, Pa., died February 11 at his home in that city, aged 71 years. Mr. Macbeth was engaged in the glass business for 50 years, and was perhaps the most thorough master of glass manufacture in this country, developing its use for many commercial, mechanical and electrical purposes, and was consulted by scientists from all over the world. He was one of the original trustees of the Carnegie Foundation.

MR. BELVIDERE BROOKS, who began as a messenger boy for the Western Union Telegraph Company in 1871 and advanced to the position of general manager in 1910 and vice-president since January, 1913, died suddenly of heart failure at his home.

Belvidere Brooks.

116 Riverside Drive, New York City, in his fifty-sixth year. Although Mr. Brooks had not been in good health for several months, he had not been absent often from his office. When he was 12 years old Mr. Brooks was a messenger boy in Wheelock, Texas, where he was born. A year later he had mastered the Morse code and became a telegraph operator, the youngest operator known to the business. After serving as manager at various offices he was appointed assistant superintendent at Denver, Colo., and in 1902 he was transferred to New York as general superintendent of the eastern division.

During the period of Mr. Brooks' general management of the company he was identified with some of the recent and important changes and development of its affairs, including the affiliation arrangement with the American Telephone & Telegraph Company, the grouping of the business under six general divisions, and the plan of the company decided upon last December for the pensioning of its employees. He had a great practical knowledge of the telegraph business, dating back 45 years, during which he had served in every executive capacity Aside from his able accomplishments and efficiency he was one of the most popular officials ever connected with the Western Union, possessing an exceedingly generous and whole-souled personality that enabled him to make many friends and which equipped him naturally to judge men and to handle them with fairness and justice.

Mr. Brooks was an officer and director in a number of subsidiary companies of the Western Union and other concerns in which he had private interests. He was a member of the New York Athletic Club and other organizations.

Mr. Brooks is survived by four sons, Gerald, Belvidere, Jr., George B., and Joseph Brooks, and a brother, Joseph W. Brooks, traffic superintendent of the Western Union Telegraph Company at Dallas, Tex.

MR. J. J. SCHAYER, formerly manager of the Electric Shop, Chicago, and well known among men of the electrical trade, died in New York February 4 from a complication of grip and pneumonia. Mr. Schayer was born in Boston in 1865. Coming to Chicago in 1893 he entered the contract department of the old Chicago Edison Company and occupied important positions with that company and the Commonwealth Edison Company for a period of 17 years. He was manager of the Electric Shop during 1909 and 1910 and did much to build up the business of that store. He was manager of the first Chicago Electrical Show, in 1906. Since 1910 Mr. Schayer has been a manufacturers' agent in eastern territory, and he was in New York when taken ill.

MR. DENNIS J. HERN, former superintendent of Street Lighting of Boston, died February 7 at his home in that city. He was a native of Boston and 61 years old. At the age of ten he entered the employ of the United States Telegraph Company as a messenger boy. Rising through the positions of line repairer, battery boy and operator, he became inspector of the city line department of the Atlantic & Pacific Telegraph Company. In 1875 Mr. Hern became manager of the Boston office, and two years later was made superintendent of the lines between Boston and New York. In 1879 he became superintendent of the Mutual Union Telegraph Company, in charge of lines between Bangor, Maine, and New York. At the same time, he was general manager of the Eastern Telegraph Company and of the Mutual District Messenger Company of Boston. In 1902 he left the telegraph business to become commissioner of health of the Port of Boston and after a four-year term was appointed superintendent of street lighting of that city. During recent years he has engaged in the advertising business. The deceased was well known throughout the country by telegraph men. His early service brought him in touch with Thomas A. Edison, and he assisted Alexander Graham Bell in his first experiments with the telephone.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BAR HARBOR, ME.—The Bar Harbor & Union River Power Company is mapping out a system of street lighting for this community. Vice-President E. R. Graham and a lighting expert have been looking over the situation.

ST. ALBANS, VT.—The holdings of the Vermont Power & Manuafcturing Company have been purchased by the Public Electric Lighting Company, a Massachusetts operating company, of which W. R. Dame, Clinton, Mass., is one of the directors. The company is making extensive plans for the future and may extend its lines to Highgate Springs and Essex Junction.

FALL RIVER, MASS.—The committee on street lights has been authorized to make a new contract with the Fall River Electric Light Company. Additional lights will be installed.

HOLYOKE, MASS.—The Park Board probably will receive an appropriation of $2,500 for an installation of electric lights in Prospect Park.

TURNERS FALLS, MASS.—A second circuit and new power transmission line from this place to Amherst is soon to be built by the Turners Falls Power & Electric Company, work to begin as soon as material for the line is on the ground. The route of the present transmission line will be followed. The work will be in charge of H. D. Seavey, Greenfield, superintendent of distribution.

CENTRAL FALLS, R. I.—The question of a municipal lighting plant for the city is being discussed by interested citizens.

BERLIN, CONN.—The Connecticut Power Company, New London, Conn., proposes to construct a steam generating station at Cromwell and to extend its transmission lines from Berlin to Cromwell and thence to Middletown.

NEW BRITAIN, CONN.—The Board of Public Works is making plans for providing a white way for New Britain at a cost of about $6,000.

NEW LONDON, CONN.—Work on the construction of the new power house of the Shore Line Electric Company has started. The station will supply power for the company's trolley line between this city and Norwich.

BUFFALO, N. Y.—According to statements of President E. G. Connette of the International Railway, the capacity of the company's power system will be increased 9,000 kilowatts, at a cost of about $175,000. One item is the equipment of the five substations with additional machinery, including seven 1,000-kilowatt rotary converters. Power will be carried from Niagara Falls to these substations by 500,000-circular-mil cables.

FULTON, N. Y.—Announcement has been made by J. J. Jordon, general manager of the Fulton Light, Heat & Power Company, that plans had been completed for a transmission line from this city to Phoenix.

NEWBURGH, N. Y.—An extension of the Orange County Traction Company's line is to be constructed on Lake street, if plans now under way materialize.

NIAGARA FALLS, N. Y.—Hugh L. Cooper, who was engineer in charge of the construction of the power plant of the Electrical Department Company, Niagara Falls, Ont., and Harry Kornfeld, who represents large financial interests in New York, are organizing a force of engineers to make a survey of the lower river with a view of promoting a power development scheme in the lower river. The plan proposed is similar to that of the Lower River Power Company, incorporated some years ago, but never developed.

PORTLAND, N. Y.—The Niagara & Erie Power Company will soon start erecting poles preparatory to furnishing the entire town of Portland with electricity. Heretofore the village of Brocton only has been furnished power by this company.

JERSEY CITY, N. J.—The Public Service Corporation of New Jersey has acquired a plot of ground adjacent to one of its substations here, ostensibly for the purpose of making additions.

BEAVER FALLS, PA., Charters have been granted for lighting companies in South Beaver, Little Beaver, Coverdale, New Galilee, Cannelton, Big Beaver and Darlington. The offices of the lighting company probably will be located with those of the Beaver County Light Company in Beaver Falls.

BUTLER, PA.—R. E. Sprenkle and others have formed the Adams Light Company to furnish electrical energy for lighting in Adams Township, Butler County.

CHRISTIANA, PA.—A new silk mill to cost over $50,000 will be erected here in the near future, the mill to be operated entirely by electricity. Address the Businessmen's Association here.

FALMOUTH, PA.—The York Haven Electric Power Company, which recently extended its lines to Bainbridge, will build lines to Billmeyer and Falmouth.

HAZELTON, PA.—The council will soon make arrangements for the installation of an electric street lighting system.

RENOVO, PA.—A new motor-generator set is being installed in the power house of the Edison Light, Heat & Power Company of Renovo. Improvements to the extent of $30,000 will soon be completed at the plant.

CUMBERLAND, MD.—The City Council will make an expenditure of about $20,000 for improvements to the city electric lighting plant.

FREDERICK, MD.—The aldermen passed a resolution asking the State Public Service Commission for authority to manufacture and sell electric power in Frederick.

CLARKSVILLE, VA.—Bonds for the establishment of an electric lighting plant here will be issued.

NASHVILLE, N. C.—A $10,000 electric light plant may be established here. A. L. T. Vaughan is city clerk.

FORT MILL, S. C.—Mayor E. C. Patterson and citizens are considering the feasibility of installing a municipal electric light plant.

FAIRBURN, GA.—The Fairburn Electric Railway Company, which operates between College Park and Fairburn, will replace its present cars, which are operated with gasoline, by storage battery cars. The company will invest $50,000.

PINEORA, GA.—The Atlantic Engineering Company, Germania Bank Building, Savannah, Ga., is doing the engineering work for the electric lighting plant in which W. L. Gignilliatt is interested.

PLANT CITY, FLA.—The Mayor and interested citizens contemplate buying or building an electric lighting plant.

NORTH CENTRAL STATES.

CHILLICOTHE, O.—The Board of Education may decide to install a power plant to supply energy for its own use.

COLUMBUS, O.—The Columbus Railway and Light Company was authorized by the Public Utilities Commission of this state to issue $225,000 worth of bonds, most of the proceeds from which will be used for extensions this year. P. V. Burington is general manager of the company.

HAMILTON, O.—The proposition of completing the cluster light contract on the west side, which calls for the extension of the lights from B to D Streets, will soon be taken up by the West Side Commercial Association.

ANDERSON, IND.—An ordinance asking an appropriation of $105,000 for improvements at the municipal light plant has been drafted and will be presented to the City Council. The money is distributed as follows in the appropriation measure: Storage binds and track trussel, $5,000; traveling crane, monorail and grab bucket, $7,000; structural iron, $5,000; crusher, hopper, bucket elevator and motor, and steel chute for conveying coal, $7,500; wire for constructing heavy feed lines to all parts of the city, $15,000; three new boilers, $15,000; building for boilers, $2,500; steam lines and fittings, $500; stack, $8,000, and turbogenerator, $40,000.

CRAWFORDSVILLE, IND.—Plans for additional facilities for the city lighting plant have been submitted to City Engineer Cragwall by Superintendent Miller.

PALMYRA, IND.—L. A. Kahl has purchased machinery for an electric lighting power station here from the General Electric Company and will install it immediately to provide local service.

BASCO, ILL.—The Basco Electric Light & Power Company has been incorporated with a capital of $5,000 by August Ancelet, W. C. Fisher and others.

CARROLTON, ILL.—Mayor Redd has plans for a municipal lighting plant under consideration.

GALESBURG, ILL.—According to Superintendent Carley, the Galesburg Railway, Lighting & Power Company will spend about $225,000 in improvements of various kinds in this city.

LIBERTY, ILL.—S. G. Lawless and others have organized the Liberty Electric Company, with a capital stock of $2,500. The company will build a power plant and furnish energy for lighting and power.

MENDON, ILL.—The Mendon Electric Light & Power Company has been incorporated to furnish electric light and power in this city. The company's capital stock is $5,000, and the incorporators are J. A. Thompson and others.

PITTSFIELD, ILL.—Substations belonging to Central Illinois Public Company at Pittsfield, Maysville, Griggsville, New Salem and Bayliss in Pike County, were either totally or partially destroyed by fire recently. The cost of making the necessary repairs and rebuilding is estimated at $20,000.

SPRINGFIELD, ILL.—The City Council has taken up the matter of providing an ornamental lighting system on Monroe and Washington streets with A. D. Mackle, general manager of the Springfield Utilities Company.

GRAND LEDGE, MICH.—The Consumers Power Company has material on the site of the building it will erect here at a cost of $7,000. The basement will be used for machinery and the first floor for offices and electrical appliance display. The company is building a dam and generating station on the Ausable River.

GRAND RAPIDS, MICH.—The Central West Improvement Association will consider a proposition for new boulevard lights on certain streets in its district at an annual meeting to be held soon.

CRIVITZ, WIS.—Residents of this community are making plans for securing an electric lighting plant.

SHEBOYGAN, WIS.—The Sheboygan Railway and Electric Company is planning to extend its interurban line from Elkhart Lake through Kiel and New Holstein to Chilton, a distance of 19 miles. Edward Hammett is general manager.

DAWSON, MINN.—The new power plant at Minnesota Falls will be completed in a month. It will increase the capacity of the Falls from 400 to 1700 horsepower. Next summer the company will build a steam plant at Montevideo of 2,000-horsepower capacity.

GILBERT, MINN.—A lighting system is proposed for this community.

NORTH REDWOOD, MINN.—Outside capitalists have secured the water rights for the erection of a power plant on the Minnesota River near here.

MINNEAPOLIS, MINN.—M. L. Lane, commercial superintendent of the Northwestern Telephone Exchange Company, made a statement recently that provision

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has been made for an outlay for improvements that will approximate $10,000,000 to be spread over a period of years. The directors recently authorized an increase of the capital stock from $15,000,000 to $25,000,000.

ST. CLOUD, MINN.—The St. Cloud Public Service Company is contemplating extensive additions to its hydro-electric power plant. A. J. Bemis is general manager.

ST. PETER, MINN.—The City Council has closed a contract with the Consumers Power Company of Mankato, Minn., for furnishing electrical energy for street and commercial lighting and power in this city.

WINONA, MINN.—Announcement has been made that the Wisconsin Railway, Light & Power Company, operating public utilities in Winona and LaCrosse and supplying a large number of towns in this section, will erect a new and modern steam reserve station in Winona, to take the place of the present emergency plant here. The proposed new plant, which will be equipped with the latest machinery, will cost $200,000. R. M. Howard is general manager of the company.

COLUMBUS JUNCTION, IOWA.—A. L. Lundquist and R. L. Van Meter have purchased the electric light plant here from E. N. Miller. Mr. Lundquist will be manager.

DENISON, IOWA.—Having installed an electric lighting plant the City Council is now taking up the matter of extending the lines to Arion and Vail, two adjoining towns.

DES MOINES, IOWA.—The City Council is considering means for lighting Polk Boulevard. A steel-post electrolier system is being advocated by W. L. Drake, P. L. Clancey and others.

NEW HAMPTON, IOWA.—F. A. Schuet, A. D. McKinley and W. W. Murray have been granted a franchise to erect, maintain and operate an electric transmission line on public highways in this vicinity.

OELWEIN, IOWA.—The Fayette County Utilities Company contemplates the extension of its transmission line from here to Hazelton.

OSKALOOSA, IOWA.—Plans are being considered for the installation of a power plant to be put in by the Oskaloosa Vitrified Brick Company.

VINTON, IOWA.—Plans are being considered by the Iowa Railway & Lighting Company to extend its transmission line from Vinton to Shellsburg, Benton County, and to Reinbeck, Grundy County.

BLUE SPRINGS, MO.—The Council may install an electric lighting plant here.

LUCERNE, MO.—The Lucerne Electric Light Company has been incorporated with a capital of $3,200 by S. L. Prough, O. E. Snyder and others.

CHERRYVALE, KANS.—The Kansas Gas and Electric Company, of Wichita, is contemplating improvements to its plant. C. Hill is local manager.

HUTCHINSON, KANS.—A proposition has been submitted to the City Commission by the United Water, Gas & Electric Company, which will make a reduction in the present street lighting rate in the city and make possible the extension of white way lights on North Main Street.

KANSAS CITY, KANS.—The Commissioners have voted to purchase a 3,000-kilowatt generator for the municipal lighting plant. This additional equipment will give the plant a capacity of 12,000 kilowatts.

McPHERSON, KANS.—Plans are being considered for improvements and extensions to the local lighting plant. A generating unit, voltage regulator and other equipment will be purchased. Arthur Groesbeck is manager.

OAKLAND, KANS.—At a meeting of the Mayor and Council of the city an ordinance was drawn which provides for the lighting of all of the streets in the city. The Mayor is authorized to make a contract with the Topeka Edison Company to furnish the city proper lighting of the streets and highways for a period of ten years, and give the company a 20-year franchise.

ROSSVILLE, KANS.—E. J. Steckel & Son, of Dwight, Kans., have been granted a franchise to furnish light and power to this city. An oil engine and generating equipment will be installed, to be in operation by March 15. The company will be known as the Rossville Light & Power Company. Transmission lines to nearby towns probably will be built.

OMAHA, NEB.—The City Council committee is considering the plan of electric street lighting submitted by the City Electrician recently, which provides for 800 additional lights. The plan contemplates the adoption of a new style 400-candlepower light and the maintenance of an ornamental system for the downtown district.

DATES AHEAD.

Illinois State Electric Association. Annual convention, Champaign, Ill., February 23-24. Secretary, H. E. Chubbuck, Peoria, Ill.

American Physical Society. Regular meeting, Fayerweather Hall, Columbia University, New York City, February 26. Secretary, A. D. Cole, Columbus, O.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Bldg., Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

ALCESTER, S. D.—This city has voted $10,000 to secure an electric lighting system.

HURLEY, S. D.—Voters here have approved a proposition for the establishment of an electric lighting plant, $10,000 being voted for the purpose.

WHITE, S. D.—George Blaisdell, owner of the White electric light plant, has disposed of the same to Charles Hillyer and H. Moore, Jr. The new owners are planning on the installation of a 60-horsepower oil engine and a generator in the spring.

WILLISTON, N. D.—The construction of a white way lighting system for Williston is now an assured fact, the work to be done during the coming summer by Edward Link of this city, who was awarded the contract.

SOUTH CENTRAL STATES.

FLEMINGSBURG, KY.—Owners of the local electric light plant are considering changing the plant over from a direct to an alternating-current system. D. Bankel, electrical engineer, of Cincinnati, has been in Flemingsburg making estimates as to the cost of such alterations.

GLASGOW, KY.—An increase of $25,000, raising it to $75,000, has been made in the capital stock of the Glasgow Electric Light & Ice Company. The company will make improvements.

HAZARD, KY.—The Kentucky River Power Company has taken over the Hazard Power Company from L. L. Stone and associates of Pikeville.

LEXINGTON, KY.—The City Commission is making an inspection of the streets to determine whether to meet the requests of citizens for additional street lights.

BIRMINGHAM, ALA.—The Board of Commissioners has authorized the City Engineer to investigate the feasibility of erecting an electric light plant in Idlewild Park.

GADSDEN, ALA.—A municipal electric lighting system may be the issue in the coming municipal campaign. More than a year ago agitation in favor of building a municipal plant was started, but the matter was dropped.

NEWPORT, ARK.—The Arkansas Light and Power Company or Arkadelphia, Ark., contemplates constructing a power plant and installing new equipment, including engines, generator and switchboard.

MIAMI, OKLA.—The sale of the Oklahoma, Kansas & Missouri Interurban Railway has been made to Kansas City capitalists. George Rice was selected as general manager. The road operates btween Miami and Commerce, and does practically all of the freight business in the Miami mining district. The road probably will be extended to Picher and Cardin.

OKLAHOMA CITY, OKLA.—A campaign for the installation of a white way system on business streets is being launched by merchants here.

TEXHOMA, OKLA.—The City Board will build a larger building and will install larger and better generating equipment. The present facilities have become inadequate, present demands upon the system necessitating improvements and extensions.

DALLAS, TEX.—Consolidation of the four traction companies in Dallas, all of which are operated under the control of the Stone & Webster Engineering Corporation, is pending. The companies embraced in the plan are the Rapid Transit Company, the Metropolitan Street Railway Company, the Northern Texas Traction Company, and the Consolidated Street Railway Company. Improvements will be made when the consolidation is effected.

DALLAS, TEX.—The Texas Traction Company and the Southern Traction Company, both of Dallas, will be consolidated under one management. The Texas Traction Company operates an interurban electric line between Dallas and Denison, and the Southern Traction Company operates similar lines between Dallas and Waco and between Dallas and Corsicana. The total interurban milage of the two companies is 230. J. F. Strickland is president of both companies. An extension of the Southern Traction Company's line from Waco south to San Antonio via Austin, a distance of about 185 miles, will be started soon.

TERRELL, TEX.—The City Commission has extended the time limit of the franchise which was granted the Stone & Webster Engineering Corporation for the construction of an interurban electric railway upon certain streets of Terrell until April 20, 1917.

WESTERN STATES.

CASCADE, MONT.—It is reported the contract for lighting city streets has been awarded to the Great Falls Power Company, which will install 30 250-candlepower nitrogen-filled lamps.

LIBBY, MONT.—New steam machinery to replace the machinery now run by water power will soon be installed by the Libby Electric Light Works & Power Company, according to H. E. Robinson, manager.

ALAMOGORDO, N. M.—The Board of Trustees has under consideration plans for constructing a municipal electric light and power plant.

CARLSBAD, N. M.—The Public Utilities Company will install new machinery in the local electric light and water works plant to cost about $10,000. A. J. Muzzy is president.

SILVER CITY, N. M.—The Silver City Light & Power Company has let the contract for another power unit. The cost of the new engine and generator will be $20,000.

FLORENCE, ARIZ.—F. A. Tackeray, agent at the Pima Indian Reservation, has announced that a right of way across the reservation for the extension of the Roosevelt power line to connect with the state prison and Florence will be granted. The route for the line has already been surveyed.

GARDNERVILLE, NEV.—The power plant of the Douglas Company, near this city, will soon be enlarged to double the present capacity.

ALBION, IDAHO.—The United States Government has approved a contract with this city which provides for the construction of a transmission line from the pumping plant of the Minidoka tract to Albion for the distribution of power.

PAUL, IDAHO.—The Paul Electric Company has filed an application with the Public Utilities Commission for permission to build a power system.

PASCO, WASH.—The proposition of developing a power and irrigation project which will bring water to 73,500 acres of land near this city, same to include the construction of a 40-foot dam on the Snake River at Five Mile Rapids and make possible the development of 40,000 horsepower the year around, and the ultimate development of 80,000 horsepower for ten months in the year, is being promulgated by the Chamber of Commerce, of which A. J. Elrod, is president. The Chamber of Commerce recently engaged E. G. Hopson, Portland, Ore., consulting engineer of the United States Reclamation Service, to make preliminary investigations, reports and esti-

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mates. Construction costs are estimated roughly at $52 to $57 per acre; operation and maintenance $2 per acre. Surplus power could be sold for $10 per horsepower at the plant, and it is claimed profit sufficient to entirely absorb operation and maintenance charges of the system could be made. Preliminary plans state the dam to be constructed will be provided with canal and locks on the south side of the Snake River. The water would completely submerge both Five Mile and Fishhook Rapids, thereby rendering the Snake River navigable throughout the year as far as Lewiston, Idaho. A portion of the stream flowing through turbines would operate powerful pumps, forcing the water through four lines of pipe, against heads of 80, 140, 205 and 275 feet, discharging into four independent canals, each supplying a network of laterals, delivering the water to each 40-acre tract.

SEATTLE, WASH.—A franchise to extend the lines of the municipal lighting and power plant over and along certain county roads in the southern part of King County has been granted by King County Commissioners. It is understood the municipal plant will begin construction in the territory as soon as the capacity of the plant is increased.

SEATTLE, WASH.—Passage of a Council bill, declaring it the intention of the city of Seattle to investigate the Sauk-Suiattle power site, with a view to early development, has been recommended by the Finance Committee of the Council. The bill also appropriates $2,000 for water meters to test the flow of water at the site.

WALLA WALLA, WASH.—An avalanche recently destroyed 60 feet of the Pacific Power & Light Company's flume on the Walla Walla River near that city, placing the plant, which supplies Walla Walla with energy for light and power, totally out of commission. Street cars were forced to discontinue operation and the streets were left in darkness. The small steam auxiliary plant in this city cared for the residence lighting business.

WINONA, WASH.—Plans are being made here for the establishment of an electric lighting system.

BAY CITY, ORE.—It is reported the Coast Electric Power Company proposes purchasing and enlarging the local power plant and system.

HOOD RIVER, ORE.—The Farmers Irrigating Company has appointed a committee to finance the development of a valuable power site on Hood River, owned by the company. Chairman J. T. Jeffrey reports the development of the project will begin at an early date.

HOOD RIVER, ORE.—The property of the Hydroelectric Company in this city has been sold to the Pacific Power & Light Company, which operates numerous plants in Oregon and eastern Washington. The reported price is $186,000. The latter company has filed in the District Federal Court a suit to enjoin the East Fork Irrigation District of Hood River from interfering with the power company's riparian rights for five miles along the Hood River. The Pacific Power & Light Company, in it complaint, alleges that its investment in the East Fork Irrigation District is $600,000, and that it will be damaged to the extent of $100,000.

PORTLAND, ORE.—Bids for furnishing materials and installing a lighting system in Holladay Park, including the furnishing of 8,000 feet of electric cable, will shortly be called for by Purchasing Agent Wood.

LOS ANGELES, CAL.—Chief Electrician Scattergood has presented specifications to the Public Service Commission calling for equipment, including 4,000 cedar poles, to be used in the extension of the municipal lighting system.

MARE ISLAND, CAL.—Mare Island will soon have an electric railroad that will join the industrial center with the magazine grounds, if Lieutenant J. W. W. Cumming, outside superintendent of the machinery department, and other officials at the local station can secure the approval of the plan of the Bureau of Yards and Docks.

PERRIS, CAL.—The Southern Sierra Power Company has been awarded the contract for installing additional lights in this city.

RIVERSIDE, CAL.—The Pacific Electric Railway has been granted a franchise for a single-track electric railroad spur at Magnolia Avenue and Myers Street, work of construction to commence within three months.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company is prosecuting condemnation suits in Placer, Sacramento, San Joaquin and Solano counties for right of way for its proposed new tower line, which is to extend from Auburn to San Francisco Bay.

SAN FRANCISCO, CAL.—The Board of Supervisors has endorsed the proposed system of lighting San Francisco's principal streets. The Finance Committee, however, has refused to appropriate more than $10,000 as the city's share of the expense. The Downtown Association, which is responsible for the campaign for better lights on Market Street, asked that the supervisors appropriate at least $14,000 of the $23,194 necessary for the installation and upkeep of the new system. The merchants will start a campaign for the raising of more funds and will meet with the Finance Committee again after another effort has been made to raise the money.

New Incorporations

LANGLEY, WASH.—Whidby Electric Company. Capital, $50,000. Incorporators: H. E. Wood and others.

BROOKLYN, N. Y.—Rubes Electric Devices, Inc. Capital, $100,000. Incorporators: Nicholas Rubes and others.

NEW YORK, N. Y.—Habirshaw Electric Cable Company. Capital, $925,000. Incorporators: E. W. Moore, J. W. Murphy and J. B. Guargglia.

YONKERS, N. Y.—Barlow Electrical Specialties Company. Capital, $10,000. Incorporators: W. N. Barlow, M. E. Blauvelt and C. W. Boote.

BANTAM, CONN.—The Trumbull-Vanderpool Electric Manufacturing Company has increased its capital stock $22,000, making a total of $92,000.

CANTON, O.—The Edward E. Early Company. Capital, $10,000. Dealing in electrical supplies. Incorporators: E. E. Early, M. A. Early and others.

COLUMBUS, O.—The Enzor-Hoel Company. Capital, $25,000. Dealing in gas and electrical supplies. Incorporators: F. K. Enzor, R. E. Hutchinson and others.

NEW YORK, N. Y.—Wilson Electric Devices Company. Capital, $10,000. Incorporators: D. H. Wilson, A. M. Lovibond and M. C. Dobson, all of New York City.

CHICAGO, ILL.—Anderson Electric Specialty Company. Capital, $5,000. Manufacture electrical devices. Incorporators: W. L. Hall, C. E. Burnap and C. O. Shervey. Z.

BROOKLYN, N. Y.—The Erickson Automatic Electric Water Purifier Company. Capital, $75,000. Incorporators: G. E. Erickson, C. E. Peterson and Frederick Teden.

INDIANAPOLIS, IND.—Electric Controller Company. Capital, $40,000. Manufacture electrical controllers. Incorporators: H. E. Welchel, J. J. Turner and W. E. Munk.

NEW YORK, N. Y.—The Electrical Publication's Syndicate. Capital, $10,000. Publish papers devoted to electrical industry. Incorporators: Ralph Neumuller, Irving Crumb and J. A. Fitz Randolph.

DUBUQUE, IOWA.—The Alamo Farm Light Plant Dubuque Company. Capital, $10,000. Manufacturing electric lighting plants and accessories. Incorporators: B. J. Schwind, A. G. Jaeger and B. J. Schwind, Jr.

BOSTON, MASS.—Choralcelo Company of Massachusetts. Capital $10,000. Manufacture electrically-operated musical instruments, motors, batteries and appliances. Incorporators: W. E. Farrington and G. E. Hills, Brookline, and E. F. Dunlop, Boston.

Financial Notes

The Georgia Railway & Light Company, of Atlanta, which recently held its annual meeting, reported that net earnings for the year were $212,466. P. S. Arkwright was re-elected president; G. W. Brine, vice-president and general manager; W. H. Glenn, vice-president and operating manager.

The Portland (Ore.) Railway, Light & Power Company has a total investment in Portland of $59,350,464, according to its quarterly report which shows the operating revenue of the street-car system to have been $790,425 and the operating expenses $483,892. Lighting revenue was $590,228, with expenses amounting to $143,409.

The California Railroad Commission has issued an order authorizing the Northern California Power Company to enter into an agreement with the holders of its $670,000 of series A debentures dated February 1, 1912, or more than three-fourths of the holders thereof, providing a postponement of the maturing of these debentures from February 1, 1916, to February 1, 1920. The bonds are to bear interest at 6 per cent and the agreement is that the power company shall pay monthly $5,000 on account of principal.

The Northern States Power Company has increased its capital stock from $17,500,000 to $30,000,000, and also has filed a change in name of the Consumers Power Company of Minnesota, its principal subsidiary, to Northern States Power Company. The increase in the capital stock will be used to retire the present stocks of subsidiary corporations, and when this is completed steps can be taken to put into effect a complete reorganization. With this completed, the way will be opened for the payment of dividends on the common stock, on which the company is now earning in excess of 12 per cent.

National Carbon Company had another highly successful twelve months in the fiscal year to December 31. The balance of profits was equal to between 18 per cent and 20 per cent on the $9,965,500 common stock. In 1914 the common shareholders were given a 50-per-cent stock dividend, while during the same period further issuance of new common was made to absorb the balance of the Ever Ready Company, not previously owned. If National Carbon earns 20 per cent for its common, it will have a surplus above dividends and the usual depreciation charge of approximately $900,000, bringing its surplus item up to $2,000,000, or over 20 per cent for the common.

The Manhattan Railway Company has advertised for direct sale to the public $4,523,000 second-mortgage 4-per-cent bonds, due June 1, 2013. The issue is made under a second mortgage for $5,409,000, which was authorized by the New York Public Service Commission on February 3, but which was arranged for in the lease, which the Manhattan Railway Company made of its property to the Interborough Rapid Transit Company on January 1, 1903. Under this lease the Interborough, besides paying annual rent to the Manhattan Railway Company of $10,000 and undertaking to meet the interest on its stocks and bonds, was to have the right at any time after July 1, 1908, to call upon the Manhattan Railway Company to issue a new series of bonds to the amount of $5,409,000, which were to be secured by a mortgage covering either all or a part of the Manhattan Railway Company's franchises, rights, privileges, and property. The proceeds of these bonds were to be used to repay the money expended by the Inter-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 14.	Feb. 7.
American Tel. & Tel. (New York)	127⅝	126⅞
Commonwealth Edison (Chicago)	144¼	144¾
Edison Electric Illuminating (Boston)	246	244
Electric Storage Battery common (Philadelphia)	65⅜	63
Electric Storage Battery preferred (Philadelphia)	65⅜	63
General Electric (New York)	171⅜	170½
Kings County Electric (New York)	128	128
Massachusetts Electric common (Boston)	7½	6
Massachusetts Electric preferred (Boston)	40	36¼
National Carbon common (Chicago)	182	179
National Carbon preferred (Chicago)	122	—
New England Telephone (Boston)	137	135¾
Philadelphia Electric (Philadelphia)	27⅞	28
Postal Telegraph and Cables common (New York)	87¾	81½
Postal Telegraph and Cables preferred (New York)	67½	66
Western Union (New York)	89¼	87⅞
Westinghouse common (New York)	67⅝	66
Westinghouse preferred (New York)	77	76

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borough in improvements of the Manhattan Company's tracks.

Dividends.

	Term	Rate	Payable
Am. Tel. & Cable	Q	1.25%	Mar. 1
Cent. Ark. Ry. & Lt. Corp., pf.	Q	1.75%	Mar. 1
Cent. Miss. Val. Elec. Prop., pf.	Q	1.5 %	Mar. 1

Reports of Earnings.

CONTINENTAL GAS & ELECTRIC.

Continental Gas & Electric Corporation reports for the fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$566,589	$550,330
Expenses and taxes	361,996	352,867
Net earnings	204,593	197,463
Interest charges	85,330	70,315
Surplus	119,263	127,148

While the business of the subsidiaries of the companies increased materially in 1915, reductions in rates cut down the revenue to some extent, and the earnings for the year do not reflect the real expansion of the company. In 1915 the company expended $223,370 for extensions and additions, and $50,000 for acquisition of additional properties.

CITIES SERVICE.

	1915	1914
December gross	$532,195	$404,807
Net after expenses	514,407	392,763
Surplus after charges	473,573	351,930
Balance after preferred dividends	342,731	221,097
12 months' gross	4,479,800	3,934,453
Net after expense	4,306,944	3,817,545
Surplus after charges	3,816,944	3,397,545
Balance after preferred dividends	2,246,939	1,761,552

Proposals

ELECTRICAL WORK.—Bids will be received until February 29 for the complete electrical work to be done in the new Mosser School Building, Allentown, Pa. T. P. Wenner is secretary of the Board of Education. Runyon & Carey, 845 Broad Street, Newark, N. J., are the engineers and Ruhe & Lange, Allentown, Pa., are the architects.

GENERATOR AND ENGINE.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., March 1, 1916, for a new engine and generator in the United States postoffice and courthouse at Philadelphia, Pa. Specifications may be obtained from the custodian of the building, Philadelphia, Pa., or at the Supervising Architect's office.

LIGHTING FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m. March 23, 1916, for the mechanical equipment (except elevators) and lighting fixtures of the United States customhouse, appraisers' stores, and courthouse, Wilmington, N. C., in accordance with drawings and specifications, copies of which may be obtained from the custodian of the site at Wilmington, N. C., or at the Supervising Architect's office.

Electrical Patents Issued February 8, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,170,519. Lamp. D. H. Elkins, assignor to Gray & Davis, Boston, Mass. Details of automobile headlight body.

1,170,526. Apparatus for Purifying Air. W. H. Gaither, Pittsburgh, Pa. Comprises fan for centrifugally separating dust at mouth of reflector containing lamp, together with means for absorbing carbon dioxid and moisture.

1,170,545. Signaling Device for Apparatus for Stopping Vehicles. J. J. Keenan, assignor to M. A. Keenan, New York, N. Y. For signaling from one station to another along roadway.

1,170,552. Means for Producing Alternating Current by Cathode-Ray Tubes. A. Meissner, assignor to Gesellschaft Fuer Drahtlose Telegraphie M. B. H., Berlin, Germany. Receiving arrangement for sustained high-frequency electric oscillations.

1,170,556. Keyboard Apparatus. D. Murray, assignor to Western Union Telegraph Co., New York, N. Y. For telegraph instruments.

1,170,557. Toy Telegraph Sounder. J. S. Newman, Cleveland, Ohio. Structure of solenoid frame.

1,170,566. Paneiboard. F. F. Skeel, assignor to Crouse-Hinds Co., Syracuse, N. Y. For three-wire system. (See cut, next page.)

1,170,596. Reflector Connection. L. W. Anderson, assignor to Plume and Atwood Mfg. Co., Waterbury, Conn. For securing to lamp socket.

1,170,599. Pendant Switch. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Details of device having pivoted tilting operating member at bottom.

1,170,607. Electric Measuring Instrument for Iron-Loss Testing. L. W. Chubb, assignor to Westinghouse Electric Mfg. Co., E. Pittsburgh, Pa. Comprises relatively movable, mutually reacting coils.

1,170,608. Method and Means for Testing Electrical Apparatus. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. For testing inductive apparatus.

1,170,613. Signaling System. G. Crosby, New York, N. Y. Automatic starting signal for cars at starting station.

1,170,614. Apparatus for Regulating the Temperature of Fluids. H. Darwin and C. C. Mason, assignors to Taylor Instrument Co., Rochester, N. Y. For maintaining constant temperature by electro-thermostatically controlling mixture of fluids of different temperatures.

1,170,615. Safety Manipulating Device for Machinery. W. W. Dean, assignor to Benjamin Electric Mfg. Co. Hands of operator, kept out of danger by requiring both to manipulate switches controlling trip solenoid of press.

1,170,618. Induction Motor. A. M. Dudley, assignor to Westinghouse Electric & Mfg. Co. Winding for polyphase, multi-speed motors.

1,170,620. Vapor Rectifier. S. W. Farnsworth, assignor to Westinghouse Electric & Mfg. Co. Container for vapor-electric apparatus.

1,170,657. Alternating-Current Commutator-Motor. F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. Inductively related lap and wave stator windings, one adjustably connected to brushes bearing an armature commutator and other to supply source.

1,170,670. Electromagnetic Relay. E. A. Reinke, assignor to Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Special compact structure for telephone use.

1,170,680. Selective Wireless-Telegraph Apparatus. F. G. Sargent, Westford, Mass. Sending of radio signals accompanied by lighting of appropriate annunciator lamps.

1,170,689. Rectifier-Anode. E. F. Sipher, assignor to Westinghouse Electric & Mfg. Co. Details of hollow electrode for mercury vapor apparatus.

1,170,690. Electric Conduit Fitting. F. F. Skeel, assignor to Crouse-Hinds Co., Syracuse, N. Y. Box with socket fittings and globe support.

1,170,718. Ceiling-Light Hanger. J. Williamson, assignor to R. Williamson & Co., Chicago, Ill. Attachment to junction box.

1,170,723. Strain Insulator. C. N. Allerding, assignor to Ohio Brass Co., Mansfield, Ohio. Details.

1,170,725. Wire Clamp. A. O. Austin, assignor to Ohio Brass Co. Adjustable suspension clamp.

1,170,727. Apparatus for Regulating the Temperature of Furnaces and the Like. R. E. Baker, Cleveland, O., assignor to A. G. McKee. Thermoelectric.

1,170,728. Circuit Controller. T. E. Barnum, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Manual and automatic device with movable contacts and normally stationary contacts movable to break circuit at any position of movable member.

1,170,731. Voting Machine. W. J. Bohan, St. Paul, Minn., and W. E. Johnston, Sacramento, Cal. Electromagnetic vote-registering devices.

1,170,738. Circuit Controller. H. H. Cutler and F. S. Wilhoit, Milwaukee, Wis. Controls motor and magnetic clutches for variable speeds.

1,170,751. Rail Bond. A. B. Herrick, assignor to Electric Railway Improvement Co., Cleveland, O. Special structure of bond terminal and electrode to facilitate electric welding.

1,170,789. Train-Stopping Apparatus. J. F. Webb, Sr., and J. F. Webb, Jr., assignors to International Signal Co., New York, N. Y. Track-operated, electrically controlled air brake.

1,170,796. Electromagnetic Telegraph-Key. R. L. Boulter, Los Angeles, Cal. Vibratory instrument having electromagnetically controlled vibrator.

1,170,811. Electrical Resistance. C. E. Hay, Illford, and H. W. Sullivan, London, Eng. Formed of insulated conductors arranged so that induction is neutralized by capacity.

1,170,819. Galvanic Cell. M. L. Kaplan, assignor to Beacon Miniature Electric Co., New York, N. Y. A depolarizing material comprising discrete particles of graphite coated with higher oxid of manganese.

1,170,840. Tension-Regulating Mechanism for Printing Presses and the Like. W. S. Morse, Philadelphia, Pa. Brakes on paper rolls electrically controlled by web tension.

1,170,853. Signaling Apparatus. H. Shoemaker, assignor to Marconi Wireless Telegraph Co., Jersey City, N. J. Solid and fluid dielectrics alternately inserted between spark-gap electrodes to clear out heated gases and regulate sparking.

1,170,881. Wireless Receiving System. L. DeForest and C. Logwood, assignors to Radio Telephone & Telegraph Co., New York, N. Y. Audion arrangement.

1,170,882. Automatic Switching Device for Telephone Systems. L. DeForest, New York, N. Y. Radio-telephone system; voice-controlled means for connecting transmitter with antenna.

1,170,907. Protective Liquid-Dispensing System. H. Hillebrand, N. Y. Electric indicating and recording device for beer spigot.

1,170,909. Automatic Telephone System. D. S. Hulfish, assignor to Canadian Independent Telephone Co., Toronto, Can. Arrangement of relays, contacts, indicators, etc., for two-movement selector switch.

1,170,920. Insulating Joint. L. McCarty, Boston, Mass. Flanged, tubular, threaded members secured together in insulated relation.

1,170,924. Master-Controlled System of Electric-Light Wiring. I. L. Matson, assignor to K. M. Gair, Boston, Mass. Lamps controlled by individual switches and also a master switch.

1,170,943. Electric Heating Element. H. O. Swoboda, assignor to Moffat Stove Co., of Weston, Ontario, Can. Two continuous resistors are strung back and forth across an open center frame in alternation with each other.

1,170,946. Electric Rat and Animal Trap. O. Weiss, Salt Lake City, Utah, assignor of one-half to W. Sunday, Salt Lake City, Utah. Platform has conducting sections connected in circuit when platform descends under weight of animal.

1,170,951. Cover-Locking Device. J. Anderson, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. For railway motor covers.

1,170,954. Direction Indicator for Vehicles. H. H. Broyer, G. Cambeilh and J. Papale, San Francisco, Cal. Arm has lamp at pivot and another at tip which is lighted when arm is horizontal and extinguished when vertical.

1,170,959. Marine Lamp and Electric Connection. A. S. Campbell, Medford, Mass. Special plug and socket for connector for ship's light.

1,170,969. Means of Transmitting Intelligence. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Wireless telegraphy; signals transmitted by altering continuous stream of cycles of impulses.

1,170,974. System of Motor Control. S. H. Keefer, assignor to Niles-Bement-Pond Co., Jersey City, N. J. Motor-reversing system.

1,170,990. Inclosed Switch Construction. C. D. Platt, Bridgeport, Conn. Combination of switch, casing and cover adapted to have box lock closed and switch open. (See cut, next page.)

1,170,996. Retaining Mechanism. O. A. Ross and H. B. Taylor, assignors to General Railway Signal Co., Gates, N. Y. Special arrangement of electric motors for railway signals.

1,171,002. Electric Hand-Lamp. G. A. Soehnlein, Brooklyn, N. Y. Attachment for dry cell.

1,171,013. Screwless Electric-Shade Holder. L. W. Andersen, Waterbury, Conn.

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Shade support detachably connected to socket canopy.

1,171,021. Speedometer. A. A. Canton, New York, N. Y., assignor to Device Testing Co. Indicator is inductively operated by rotating magnetic field; temperature compensation is provided.

1,171,042. Alarm. J. J. Greytak, Great Falls, Mont. Details of circuit-closer.

1,171,052. Internal-Combustion Engine. E. B. Jones, Hornell, N. Y., assignor of one-third to E. B. Kreason, Hornell, N. Y. Special spark-plug mounting.

1,171,055. Engine-Starting, Lighting and Ignition System. C. F. Ketering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Special system comprising storage battery and motor-generator starting and then driven by engine.

1,171,059. Resistance Unit for Electrical Apparatus. A. J. Loguin, Petrograd, Russia. Helically wound coil with convolutions elongated and circumferentially displaced.

1,171,088. Alarm System for Fire-Escapes. D. E. Burkhart, Spokane, Wash.. Use of escape closes alarm circuit.

1,171,104. Electric Heater. H. W. Denhard, assignor to Cutler-Hammer Co., Milwaukee, Wis. Distribution of heat storage in sad iron.

1,171,109. Car-Controlling Apparatus. W. C. Dust, St. Louis, Mo. Intercontrol of air brake driving motor, sander and trip fender.

1,171,117. Process and Apparatus for the Electric Firing of Materials and Ores. W. H. Hampton, assignor to Conley Electric Furnace Co., Wilmington, Del. Comprises subjecting the ore to electrically heated airblast.

1,171,126. Insulator Pin. J. G. S. Lindholm and A. P. Lindholm, Chicago, Ill. Divided sheet-metal shell.

1,171,127. Metallic Cross Arm Pin. J. G. S. Lindholm, assignor to A. P. Lindholm. Formed of a plurality of channeled sheet-metal sections.

1,171,129. Fire-Alarm System. J. McFell, Chicago, Ill. Arrangement of alarm boxes and circuits.

1,171,130. Synchronous Converter. S. H. Martin, Chicago, Ill. Has combination of squirrel-cage and form windings on magnetic screen between field and armature.

1,171,134. Dynamo-Electric Machine. A. H. Neuland, Burgenfield, N. J. Rotating field within stator and driven magnetic member between stator and field.

1,171,142. Ground Connection for Electrical Conductors. D. Rosen, Philadelphia, Pa. Clamp for attaching to pipes, etc.

1,171,145. Carburetor. J. Sachs, Hartford, Conn. Primer for explosive engines has electric heat for vaporizing chamber, and admission valve for chamber controlled by common circuit.

1,171,148. Method of Forming Armature Coils. J. C. Simonsen, assignor to Chalmers Motor Co., Detroit, Mich. Wound in open spiral and then telescoped.

1,171,151. Quick-Break Switch. P. Sorenson, New York, N. Y. Two push-button, oscillatory device.

1,171,166. Lightning Arrester. L. S. Brach, New York, N. Y. High resistance and adjustable spark-gap in parallel between line and ground.

1,171,171. Adjustable Electric Lamp. R. D. Chandler, Spiceland, Ind. Bracket for incandescent lamp, pivoted for vertical and horizontal adjustment.

1,171,180. Electric-Lamp Socket. V. R. Despard, Chicago, Ill. For mounting in sign board.

1,171,190. Fan. G. H. Graves, Chicago, Ill., assignor of one-half to H. M. Campbell, Chicago, Ill. Has coin-controlled motor.

1,171,192. Explosion Indicator for Internal-Combustion Engines. C. T. Haas, Tucumcari, N. M. Indicator circuit controlled by exhaust.

1,171,193. Arc Lamp. C. A. B. Halvorson, and J. T. Beechlyn, assignors to General Electric Co. Schenectady, N. Y. Maintains main and auxiliary electrodes, having different rates of consumption, in proper relationship throughout their consumption.

1,171,208. Voltage Regulation. L. B. Jones, Kansas City, Mo. Operating electromagnet has provision for compensating for change in temperature of coil.

1,171,213. Electrical Instrument. O. A. Knopp, Oakland, Cal. For measuring current; magnetic effect of current is automatically neutralized and neutralizing current noted.

1,171,237. Automobile Headlight. G. Pelham, Lead, S. D., assignor of one-half to Chambers Kellar, Lead, S. D. Special two-way, centering switch.

1,171,254. Temperature-Regulating System. E. H. Ruckle, assignor to Hughes Electric Heating Co., Chicago, Ill. Circuit of heating element thermostatically controlled by series of concatenated relays of different current capacities.

1,171,255. Treatment of Ores. O. C. Rudolph, assignor to Otto Stalmann, Salt Lake City, Utah. Treatment for ores having volatile constituents, such as lead, zinc, etc., comprises fusing by passing electric current through charge without reducing it.

1,171,258. Electric Heater. S. Schneider, assignor to General Electric Co. Electric stove has oven formed between two separable plates of high heat-storage capacity.

1,171,267. Insulator for Electrically Charged Wires. G. B. Smith, Arlington, Md. Tubular insulator with special metal-gripping strip.

1,171,270. Automatic Switch for Controlling the Operation of Pumps. K. Sorge, New York, N. Y. Particular pressure-operated controller for compression motor.

1,171,271. Arc-Lamp Clutch. R. G. Standerwick, assignor to General Electric Co. Details of electrode-adjusting mechanism.

1,171,272. Oil Switch. G. Stern, assignor to General Electric Co. Has air chamber above oil divided to prevent spread of ignition of explosive gases.

1,17,274. Portable Electric Lamp. J. L. Strauss, assignor to Rose Strauss Co., New York, N. Y. Lamp standard rotatably mounted on base provided with cord reel, contacts, etc.

1,171,279. Electrolytic Meter. J. N. Tuttle, assignor to General Electric Co. Has mercury anode and finely woven silk diaphragm, preventing passage of mercury to cathode, except electrolytically, but permitting return of mercury deposited at cathode.

1,171,284. Street Indicator. H. W. Vernson, Blue Rapids, and H. F. Lutz, Lawrence, Kan. For electric trolley systems; electromagnetically controlled bank of sign cards.

1,171,291. System of Remote Control. J. D. Williamson, assignor to American Engineering Co., Philadelphia, Pa. Relates to electromagnetic reversing-switch mechanism.

1,171,332. Train Signaling and Control System. T. M. Freeble, Rochester, Pa. Block system having brake valve controlled by track circuit and speed conditions.

1,171,333. Safety Apparatus for Railways. T. M. Freeble. Modification of above.

1,171,334. Combination Fixture Insulator. C. H. Gaffney, Medford, Mass. Details of compressed fibre structure for securing fixture to outlet box.

1,171,338. Safety Device. H. G. Hillman, assignor to J. T. Clarke, New York, N. Y. Door circuits for elevators.

1,171,351. Apparatus for Transmitting Power. A. H. Neuland, San Francisco, Cal., assignor to Neuland Electrical Co., New York. Arrangement of stationary member and two rotatable magnetic members held in synchronism by magnetism.

1,171,352. Dynamo-Electric Machine. A. H. Neuland, assignor to Neuland Electrical Co. Commutating, inductor machine.

1,171,366. Motor. W. F. Straub and A. R. Radtke, Chicago, Ill. Armature moves step-by-step in response to successive energization of surrounding magnets.

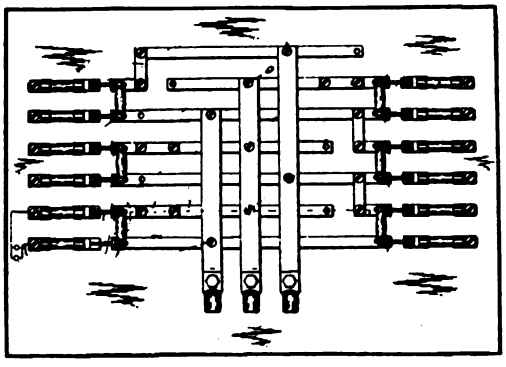
1,171,374 and 1,171,375. Starting Mechanism for Automobiles. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. First patent: Starting motor has longitudinally movable armature to shift gear and variable number of field poles. Second patent: Modification.

1,171,379. Printing Telegraph Receiver. J. E. Wright, Pittsburgh, Pa. Mechanism for operating type wheel.

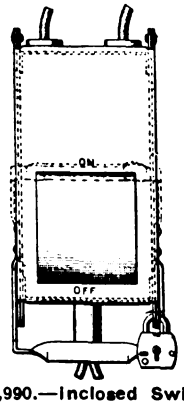
1,171,396. Margin-Regulating Mechanism for Web Rolls. G. S. Williamson and C. E. Mandelick, assignors to Publishers Utilities Co., New York, N. Y. Mechanism for controlling motor for shifting roll spindle axially.

1,171,399. Electrical System. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Apparatus for changing the form-factor of a peaked voltage wave.

Reissue 14,060. Attachment for Installing Magnetos on Gas Engines. W. G. Swift, assignor to Splitdorf Electrical Co., Newark, N. J. Original No. 1,107,374. Dated Aug. 18, 1914. Magneto driving connection for "Ford" engines.



No. 1,170,566.—Paneiboard.



No. 1,170,990.—Inclosed Switch Construction.

PATENTS EXPIRED.

The following United States electrical patents expired on February 14, 1916:

619,269. Electrical Transmission of Sound. F. M. Bell, New York, N. Y.

619,276. Signal-Recording Apparatus. W. L. Candee, New York, N. Y.

619,287. Electric Railway. J. B. Entz, Philadelphia, Pa.

619,293. Prepayment Electric-Fan Motor. W. C. Fish and F. P. Cox, Lynn, Mass.

619,296. Dynamo-Electric Machine. S. S. Forster, Schenectady, N. Y.

619,299. Retaining Band for Commutators. J. R. Grindrod, Lynn, Mass.

619,302. Two-Rate Meter. C. D. Haskins, Newton, Mass.

619,307. Electric Motor. T. D. and F. W. Hollick, London, Eng.

619,314. Electric Heater. C. W. Jones, North Temescal, Cal.

619,316. Trolley Catcher and Retainer. W. B. King, Willoughby, O.

619,320. Trolley. C. W. Larson, Schenectady, N. Y.

619,324. Battery Switch. R. Macrae, Jersey City, N. J.

619,349. Process of and Apparatus for Extracting Precious Metals from Ores or Slimes. H. Riecken, London, Eng.

619,360. Insulating Alternating-Current Circuits. C. P. Steinmetz, Schenectady, N. Y.

619,410. Telegraph-Key Attachment. A. J. Hendricks, Crockett, N. Y.

619,440. Duplex Faradic Battery. J. H. Robertson, New York, N. Y.

619,448. Electric Burglar Alarm. J. Tomney, New York, N. Y.

619,449. Electric Protective System. J. Tomney, New York, N. Y.

619,465. Electric Switch. A. Brier, Manchester, Eng.

619,471. Electric Branding Device. E. Fellowes and H. Van Hoevenbergh, New York, N. Y.

619,476. Mechanical Time Switch for Two-Rate Electric Meters. J. H. Gerry, New York, N. Y.

619,493. Telephone Attachment. F. Lind, Jr., Paterson, N. J.

619,519. Electric Branding Device. H. Van Hoevenbergh, New York, N. Y.

619,527. Motor Vehicle. C. E. Woods, Chicago, Ill.

619,555. Telegraph Insulator. I. B. Frantz, Allenport, Pa.

619,618. Ships or Similar Compass. L. Rellstab, Kiel, Germany.

619,620. Electric Motor. C. L. Rosenquist, New York, N. Y.

619,621. Alternating-Current Electric Motor. C. L. Rosenquist, New York, N. Y.

619,622. Secondary Battery. A. Schanschieff, London, Eng.

619,632. Indicating and Recording Mechanism for Measuring Fluids in Motors, etc. J. E. Thebaud, Buffalo, N. Y.

619,636. Apparatus for Separating Magnetic Materials. O. A. P. Trustedt, Stockholm, Sweden.

619,662. Telephone-Signaling System. D. M. Bliss, Brookline, Mass.

619,667. Electric Printing Machine. G. L. Campbell, Dushore, Pa.

619,679. Galvanometer. A. A. Dittmar, Jersey City, N. J.

619,687. Electrical Sign. W. A. Harvey, Scranton, Pa.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

COURTESY AND GOOD WILL.

Reiteration of the value of courtesy towards customers is always in order. It cannot be kept too much to the front in the consciousness of the salesman and other employees who come into contact with customers or with the public. In the case of dealers it will increase trade; in the case of contractors it may lead the way to new contracts; in the case of utility corporations it may be a large factor in developing good will.

The story is told of the president of a company operating a chain of retail stores, who one afternoon sent a telegram to each store manager inquiring "Did you say 'Thank you' to every man who bought a cigar today?" This executive considered it worth while to spend one or two hundred dollars in impressing the necessity of courtesy upon the local representatives. He appreciated its value.

It is sometimes necessary to shock people into a realization of their delinquencies. The mere statement of an old idea receives little or no attention. Interest must be created by presenting it in a new form or by a new medium or in a new connection. The principles of advertising should be applied.

INTELLIGENT MERCHANDISING.

There is a common idea that when merchandise stands too long upon the shelf, the appropriate thing to do is to mark it down and have a bargain sale for the sake of moving it. This is usual department-store practice, and department-store methods have evidenced so much success in general that there is a tendency to assume that they are invariably good. But the discriminating electrical dealer will not make such generalizations without analysis. His stock is special in its character, and even devices intended for general use frequently have technical features which put them in a class which requires handling different from that accorded to the stock of a general store.

An article in the department of Electrical Merchandising this week calls attention to a different method of procedure which is especially applicable to the electrical store. This article shows that there may be very definite reasons why a particular item of stock does not meet with public interest. The logical answer is, of course, to supply the element which has been lacking, and not to mark down the price. The latter procedure is always a confession of one of two things; either the goods are not right or real salesmanship is lacking. Of course there are often odds and ends which are not worth much attention or effort, and are most easily disposed of by dumping. The bargain counter, however, has a tendency to demoralize future sales, and certainly should not be applied by the electrical dealer to any line of perfectly good stock. Merchandising effort of the right kind is what is most often needed, and a little study of the particular problem will usually suggest how this effort may be applied.

The proper utilization of the show window is an important item. Spectacular displays frequently serve to get first attention. The next step is to get the individual inside. This involves featuring some object about which enough information is given to stimulate further inquiry. When this is achieved, stock with intrinsic merit will not remain on the shelves to age if the salesman is alive to the opportunity.

ACCURATE ESTIMATING.

If the electrical contractor is to be successful he must not only be familiar with the technical aspects of his work, but he must carry on his business efficiently. To achieve efficiency, all departments of the business must receive adequate attention; neither soliciting, estimating, purchasing, installation work, accounting nor collections is to be slighted. Some of these elements are generally looked after rather closely. Others are frequently neglected. Among the latter may be mentioned estimating and accounting, and the latter is here taken to include record-keeping.

Accurate estimating depends upon a knowledge of three things: cost of material, cost of labor, and overhead expense. The first of these is the easiest to secure and presents little difficulty. The cost of labor depends upon the rate of wages and other local conditions, and can be accurately estimated only when good judgment is combined with a knowledge of costs for previous work. Here is where the value of keeping records comes in. If the figures are available for the amount of labor and the cost of each previous job, and these have been properly analyzed with respect to the type of work and the accompanying conditions, there will be little difficulty in the predetermination of the labor cost.

The same statements apply to overhead expense. This item will vary from place to place, from month to month, from small jobs to large ones, and can be accurately estimated only by a critical analysis of past experience. Good estimating is therefore dependent upon thorough cost keeping and keen analysis of the records. Inability to estimate accurately and predetermine costs spells failure sooner or later. How soon or how long postponed will depend largely upon one's competitors and one's luck. Some contractors continue in business

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for an amazing period with slipshod methods before fortune is unkind to them.

Besides knowledge and accuracy, efficiency connotes sincerity and honesty. It is a trite saying that honesty is the best policy, and its truth is not always manifested in temporary results. It is in the long run that such a policy proves itself. Then it is demonstrated that it pays to be honest with your employees, with those with whom you have business dealings, and with your competitors. Use the best methods you can discover in your business, and to discover the most you should be associated with both local and national organizations of men in the same business.

DUPLICATION OF SERVICE.

The public-utility laws of most of our states provide that no new utility company can inaugurate service in a territory already supplied with such service, without first obtaining from the state commission a certificate attesting to the necessity of such duplicate service for public convenience. Established concerns are thus protected from destructive and wasteful competition. In many municipalities, however, duplications already existed before the enactment of these laws, and such cases present some of the most puzzling problems in the realm of commission regulation.

An amicable arrangement was made in the case of two telephone companies having franchises in Washington, Kans. According to the terms of a contract entered into between the municipality and the two companies, each of the latter was to confine itself to a certain district of the city, but service over both systems was to be rendered to the subscribers of each. This was the most satisfactory arrangement for subscribers, who thus received the same service as if there had been but a single system. One of the utilities chafed under these restrictions, however, and finally violated its contract by connecting a subscriber in forbidden territory.

An interesting question then arose as to whether the courts would sustain a contract of this kind. The offended company sued for an injunction restraining such violation of the contract and encroachment upon its field, and the Supreme Court of Kansas has sustained the validity of the contract. The city is thus protected from a duplication of service in the same territory, with its multiplicity of poles and other inconveniences. Emphasis is given to a peaceful and reasonable method of adjustment in the case of conflicting or overlapping franchises. The results are largely the same as would be obtained by a consolidation of the two companies, and it might be that greater efficiency in management and other operating advantages would be secured by such action.

The language used by the court in this case is of interest: "Two telephone systems serving the same constituency place a useless burden upon the community, cause sorrow of heart and vexation of spirit, and are altogether undesirable. The Public Utilities Commission, with its power over rates and sufficiency and efficiency of service, can quickly suppress any evil consequences of monopoly, and good public policy favors rather than discountenances a single system." The old idea that competition between two utilities was good for a community has well nigh universally disappeared.

CENTRAL-STATION CONDITIONS IN ENGLAND IN WAR-TIME.

It has been suggested in this journal that with the exception of perhaps electric vehicle popularization, and the pushing of electric heating and cooking in a strictly limited number of places, electrical development work would have to remain practically at a standstill in England so long as the war lasted. We mean *organized* electrical development work, work designed to produce business that might not have come uncultivated or unsought. We are not referring to power installation work in munitions factories in industrial centers where the need for electricity has itself forced the pace, where the demand has grown practically automatically and in some cases has even had to be kept down with a discreet hand. As time passes neither the conditions obtaining, nor the capacity of the manager and his limited remaining staff, encourage the putting forth of enterprise, and in the following we have endeavored to reflect some of the prevailing features of the present position.

The employment of women as conductors and drivers of electric street cars and as ticket clippers and collectors, also elevator attendants and baggage porters on electric tube and other railway systems is becoming fairly general. But female service is also to be noted in some departments of electrical activity where it would only have been suggested humorously a little time ago. The story of a certain American light and power station run by a lady was noted with considerable amusement in the English press several years ago, and English cartoonists have made merry at the mere idea of members of the fair sex finding occupation as shift engineers in electric supply stations. But many a true word is spoken in jest and many a jest of former days is coming true in the unprecedented times through which England is passing. It has become necessary, for instance, at the Glasgow Corporation electricity works, owing to the depletion of the staff consequent upon war service, to take women on experimentally for work in both power and substations. Among their duties are the operation of switchgear and the reading and taking of records. There is every prospect of the experiment being successful and being continued, and what Glasgow does today municipally many another town thinks it can do tomorrow. It has to be borne in mind that in such cities the difficulties of the engineers and remaining staff, already great enough because of men being away, are added to by the bigger load that has to be carried due to the big power demands for factories which are working night and day. At Glasgow the power—traction and domestic—demand has grown by 30 per cent during the past year. The same sort of experience is of course being faced in many places.

Another class of borough, where the load on the elec-

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tricity works is only very slightly indeed an industrial one, is the popular seaside resort such as Brighton. Here the restrictions of the military authorities against public lighting and the reduced consumption, which private and business establishments are practicing, in keeping with those regulations, and in sympathy with the spirit of the times, have told very heavily on an undertaking which once had a splendid record for cheap and progressive electricity supply and which only in recent years was stepping out boldly with a domestic heating and cooking policy. Mr. Christie, the borough electrical engineer of Brighton, has reported to his council that the factors mentioned above have caused a decrease of $35,000 in revenue for the past year, while the present movement in coal prices and all costs of generation point to an exceptionally difficult situation arising before long. He suggested that the charges to the consumer must be increased to meet the conditions. The old charges for electricity were based upon the ability of the department to get coal alongside the wharf at from $3.36 to $3.60 per ton, but today the cost stands at $11.

Some months ago it was stated in these pages that advances of ten per cent in electricity charges were becoming fairly general throughout the country, but the tendency is further upward now. Islington (London), for instance, has found that if the threatened deficiency is to be avoided the consumer must pay fifteen per cent more, and the issuance of notices to this effect gave rise to questions on the matter in the House of Commons, presumably by those who know little concerning the terms of the powers under which electricity supply authorities work. So long as they do not exceed certain figures or transgress the requirements of certain clauses in their Acts of Parliament, electricity suppliers are at liberty to raise their prices, just as they have been at liberty to lower them as greater efficiency in production and greater enterprise commercially has made such action desirable. Interesting questions have, however, been raised as to their ability to raise charges to power consumers where special contracts, perhaps for big supplies and for a term of years, were in existence prior to the war. The matter has reached the courts in one case, and it may safely be said that a number of other proceedings depend upon the settlement of this case.

The case in mind is that of a power consumer making war requirements which keep the works going night and day at full speed—works which could not possibly run if the supply were cut off. The local authority notified the said consumer, who was under a long-term contract at a specified price per unit, that it would have to raise the charges for energy by so much per cent—a very substantial rise. The consumer would not agree to the alteration, and said so, whereupon the authority notified him that unless he would so agree the supply would be cut off for so many hours in the afternoon daily. Prompt application to the courts for an injunction to restrain the authority from cutting off the supply on the ground that the national interests would be interfered with, was sucessful, and an understanding was had not to cut off the supply until the courts had given a decision on the point involved. That point will be before the courts fully in a short time now.

The question of coal shortage has been one of great perplexity to most central-station managers ever since the outbreak of the war, and though supplies came in more freely at one stage as the result of deputations to the Government, the difficulty is just now as great as ever. According to reports, Manchester electricity department, which naturally has as large a coal consumption as any works of its kind in the Kingdom, was recently faced with a serious shortage. Its consumption is about 4,500 tons of coal per week, but its deliveries have only been between 3,500 and 4,000 tons per week, rendering it necessary to draw upon the accumulated reserves (which originally stood at 20,000 tons) in order to meet the deficiency. It is not the decreased output of the collieries that is to blame for the difficulty, so much as the impossibility of securing quick deliveries on the railways, and government measures to ensure the demands of so important a supply system as that of Manchester being met are thought to be possible. Smaller systems are in a similar predicament. For example, at St. Annes on the Sea the manager of the plant has reported that he has sent out a number of inquiries to coal contractors but so far has not been able to secure a renewal or offers for any quantity, excepting a hundred-ton lot! A Lancashire town close to the collieries (with transportation problems non-existent) in ordering 16,000 tons has had to pay 75 cents per ton more than a year ago to the same colliery company. A prominent Yorkshire borough needs additional generating plant but it must not raise loans and new plant cannot be obtained expeditiously, so it is buying a second-hand generating plant for $15,000 and is going to pay for it out of the profits. At Hereford permission has been refused for a loan to be raised to extend the generating plant, as the government department does not consider the extension a pressing necessity in this case. The Haslingden Council has decided that during the continuance of the war the whole cost of any service connection shall be borne by the prospective consumer. Another central station has decided to refuse any application for power supply except in special cases, owing to the station being at present fully loaded.

It will be understood that the foregoing are only typical of numerous experiences that are being encountered by central-station managers in the United Kingdom at the present time. In other countries in Europe such officials are meeting their own particular problems. Everywhere there is a fuel problem. Italy wishes that it had more extensively availed itself of its hydroelectric possibilities so as to be free from too great dependence upon imported coal; Greece fears for the failure of some of its electrical services if imported coal cannot be secured; Russia has its fuel-oil problem; and England its transportation congestion. This last, however, is probably the least troublesome of all these difficulties.

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Happenings in the Industry

Kansas City Company Sold—Employees of Tenney Syndicate Hold Annual Meeting—Water-Power Topics Discussed by Utah Electrical Interests—Good Factory Lighting Described at Chicago Meeting—Jobbers Hold Important Meeting at Detroit—Miscellaneous Items of Interest

Sales of Kansas City Traction and Light Properties Confirmed.

The sales of the street railway and light properties at Kansas City, Mo., to new companies provided for in the "Hook plan" were made February 4 and 11, and confirmed February 15. The Kansas City Railways Company held a meeting February 15, and elected Philip J. Kealy president, to succeed John Egan. Mr. Kealy will continue to act as company member of the board of control, Robert P. Woods being the city member. Mr. Kealy has also been made general manager of the Kansas City Light and Power Company. One of the biggest problems of the reorganization is the separation of the two companies, and until that is effected Mr. Kealy will probably continue to act as general manager. At present the officers elected last year of the Kansas City Light and Power Company continue, Frank Hagerman being president and Clyde Taylor vice-president. The receivers of the street railway will not be discharged for at least 90 days.

Business Problems Discussed at Meeting of Employees of Tenney Company.

The annual Tenney Service Convention of company managers, office managers, heads of departments and accountants connected with the various properties under the engineering management of Charles H. Tenney & Company, Boston, occurred at the Engineers' Club, in that city, February 11 and 12.

The session of Friday morning was devoted to subjects of interests to accounting organizations. The following subjects were presented and were discussed: "Accounting Organization," I. S. Hall; "Delegating the Details," G. W. Hurn; "The Accounting Department and the Good Will of the Customer," C. N. Alexander; "Handling Stock as Money, or the Storekeeper as a Member of the Accounting Department," W. H. Phillips; "The Accounting Department and the Public Service Commission," H. F. Peirce; "Prepayment Meters," A. G. Neal; "Garage Costs," E. A. Harris.

The sessions of Friday afternoon and Saturday morning dealt with topics of a general nature. The following papers were read: "Covering 200 Miles of Territory," E. C. Peebles; "Remodeling the Company's Building at Haverhill," F. L. Ball; "Salem's Recovery," S. Fred Smith; "The Science of Buying," G. A. Rust; "Accident Prevention," C. E. Paige; "Inspection," A. E. Bliss; and several papers on gas subjects.

The convention concluded with a reception and dinner at the Copley-Plaza Hotel, with an address by L. J. Chase on "The Soul of a Nation."

The paper of Mr. Peebles, who is manager of the Rockland Light & Power Company, Nyack, N. Y., described the organization which was created to handle three properties which were brought together under Tenney management a few years ago. Mr. Smith, manager of the Salem Electric Lighting Company, described the rehabilitation of that city since the conflagration of June, 1914. Up to the present time about 650 buildings, 1,500 tenements and 11 factories have been built, representing more than $7,000,000 in excess of the property loss. A new water system has been installed with double the pressure of the old system. The generating plant, which came through the fire practically unscathed, is being surrounded by fine new brick structures. The rebuilding of the vast plant of the Naumkeag Cotton Mills has insured the future business growth of the city. The mills will be operated throughout with central-station power, this being one of the most conspicuous instances of the kind. To meet the added demands, a new 6,250-kilowatt horizontal turbine has been added to the generating equipment, with four 750-horsepower Bigelow-Hornsby boilers, equipped with economizers, superheaters and forced and induced draft. The station changes have been made with slight interruption to service.

Details of service conditions are of interest. The fire destroyed 702 meters—624 lighting and 78 power. Since that time, to January 1, 2,551 lighting and 98 power meters have been installed. The fire destroyed the premises of 64 power customers using 2,322 horsepower, and the transmission line to the Bay State Street Railway was destroyed, entailing the loss of 700 horsepower. Up to January 1, a net gain of 6,392 horsepower has been installed, the total then being 9,513 horsepower. The destruction of overhead lines made reconstruction of the entire outdoor system necessary. Three hundred and forty-one poles have been set, 50 miles of wire run and 100 new overhead and 18 underground transformers installed; 1,168 buildings have been connected overhead. The total number of customers was, on January 1, 4,245 compared with 3,560 at the time of the fire.

Water Powers Discussed by Utah Electric Club.

At the regular luncheon of the Utah Electric Club, Thursday, February 10, W. W. Ray, United States District Attorney for the state of Utah, discussed the subject of "Federal Control of Water Power Sites." Mr. Ray traced the history of the public lands and the questions relating to public lands from the organization of the government to date, and the conflicts which have always arisen as to the federal and state rights in the control of these matters. He showed how the common law principles which it was attempted to apply to these conditions would not fit at all because these principles had been developed under conditions which are entirely different from those obtaining in the western states. He cited figures given in the 1914 report of the Secretary of the Interior, showing that there are approximately 2,200,000 electrical horsepower now developed on the public domain, whereas there are 29,000,000 horsepower yet available for development. He called attention to the fact that the question of conservation as applied to the waterpower was entirely different as applied to most other natural resources on account of the fact that there is no possibility of exhaustion. It is important, therefore, for the government to adopt such a system as will protect the interests of the people as a whole, and at the same time encourage the fullest development of the nation's water-power resources. The regulatory measures

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passed by Congress from 1901 to 1906 conferred certain powers upon the Secretary of the Interior and upon the Secretary of Agriculture in the matter of licensing privileges of developing water-power sites. One feature of this legislation which was most objected to by the power companies was the fact that the permits granted under it were revokable at the will of the Secretary of the Interior, which did not provide the necessary security for the investment, which is required to develop water-power propositions.

The so-called Ferris Bill has been proposed to correct the objections to former legislation. This bill, however, has met with objection both from the water-power interests and from the representatives of most of the western states. As explained by Mr. Ray, the principal features of the Ferris Bill provide for 50-year leases which are not revokable except for non-compliance with the provisions of the lease, which fact is left to the determination of a court of proper jurisdiction. Not more than 50 per cent of the power generated may be sold to one company. Power cannot be sold to a distributing company except on permission of the Secretary of the Interior and at the end of the 50-year lease, it may be cancelled upon three years' notice, the Government having the option to buy the plant at a fair price. Mr. Ray explained that many of the plants in Utah have become involved in litigation growing out of the acts of Congress, covering the acquisition of power right on the public domain and that three of the cases are now before the United States Supreme Court for final adjudication, the outcome of which will be watched with much interest on account of its importance to development of this section of the country.

Importance of Good Factory Lighting Emphasized.

Fred Schwarze, electrical engineer of the Pfister & Vogel Leather Company, Milwaukee, Wis., made an address on "Factory Lighting" at the February 10 meeting of the Chicago Section, Illuminating Engineering Society. Mr. Schwarze pointed out the close relations between the factory owner, the employees and the illuminating engineer. The latter must design an installation that will pay the employer and at the same time suit the needs of the employees as regards safety and quality of the illumination. It is necessary to make a very careful study of the condition prevailing in factories or departments thereof before deciding upon the system to be used. The system chosen should be one that can be installed and maintained at minimum expense. Mr. Schwarze called attention to the educational work undertaken by the Industrial Commission of Wisconsin to stimulate interest on the part of factory owners in providing good lighting. Among the ways undertaken by the Commission are the publication of a bulletin upon the rudiments of good lighting, a traveling exhibit of reflectors and lighting equipment which has been shown in some 20 towns in Wisconsin, and by the special inspectors of the Commission.

The lighting of a factory should be looked upon in the same way as a tool; in most plants the manager does not hesitate to install labor-saving tools but too frequently he forgets the necessity of providing good light. Compared to its value, the cost of good lighting is negligible. The number of types of reflectors on the market is now so large that it is possible to find practically any type needed for any particular purpose. For most shops the porcelain-enameled steel reflectors are found most practical and most serviceable. For most general purposes, the shallow-bowl type of reflector has been found to give the best results.

Mr. Schwarze has found that generally it is best to place responsibility for regular cleaning and the general condition of lamps and reflectors upon the foremen of the various departments; they should also see to it that walls and ceilings are whitewashed and windows kept clean so as to insure proper daylight conditions.

Chairman E. W. Lloyd opened the discussion by calling attention to the co-operative work undertaken by the Wisconsin Industrial Commission on behalf of factory owners and factory employees. J. J. Kirk stated that success of the individual plant depends upon the efficiency of the men in it. Anything that adds to the efficiency of the men should be given the most careful consideration by the owner. The results obtained through the factory-lighting campaign conducted by the Commonwealth Edison Company, of Chicago, have shown conclusively that the efficiency of production is greatly enhanced by good lighting. He showed a large number of views of factories illuminated on the company's rental proposition which has been found very advantageous to all concerned. F. X. Mettinet spoke of some of the difficulties of the lighting salesmen in convincing factory owners of the necessity and advantages of good lighting. Such a salesman should thoroughly understand the principles of illuminating engineering. Carrying out these principles causes some of the greatest difficulties. Both factory owners and employees must be educated to the need of eliminating glare. They must also be taught the proper intensity of illumination to give the best results is usually much less than that to which they are accustomed through the common use of individual lamps on drop cords. Shadows must be carefully avoided. The salesmen in all cases must exercise great tact. One of the difficulties experienced is the high cost of wiring or rewiring.

S. E. Church said he had found that sewing-machine operators required individual lighting. He has found the chain-suspended fixture much better than the stem fixture. Cleaning of lamps in a large establishment can be done better by a regular maintenance division than if left to the opinion of the various foremen. All lamps should be put in locked sockets, both to prevent shifting about and breakage, as well as theft. It is better to use a relatively large number of small lamps than to use a small number of large lamps of high wattage; if one or two burn out it does not cripple a department or section of a large room. Although not most efficient, the steel reflectors are the most practical for general shop lighting. O. L. Johnson stated emphatically it is not necessary to use localized lighting in general factory service.

Mr. Schwarze said that the cleaning problem is merely one of organization. The foremen can be given responsibility over this matter just as they are of other safety work. In some departments where dust prevails very frequent cleaning is necessary. If this is left to a maintenance crew which made regular rounds throughout the establishment once a month or so, such departments would nearly always have very poor lighting; the foreman can readily be instructed to watch this matter just as he does other features relative to the production in his department. Experts of liability insurance companies have found that about 25 per cent of industrial accidents could be avoided by proper lighting. Others who discussed the subject were J. Stair, A. Scheible, C. A. Luther, E. W. Lloyd, and A. L. Arenberg.

Springfield Central Station to Enlarge Plant.

The United Electric Light Company, Springfield, Mass., will soon begin an extensive addition to its generating station on State Street, so that when completed it will be the largest steam station in western New England. From statements of the architects, McClintock & Craig, Springfield, steam will be produced by 12 700-horsepower boilers, capable of 300 per cent operation, with automatic stokers connected directly with a coal bunker of 2,000 tons capacity, erected over the boilers, the coal feeding by gravity to the stokers. The equipment will consist in part of a 20,000-kilowatt turbogenerator with jet condenser.

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French Academy Honors Pupin.

At a dinner on February 17, at the University Club of New York City, tendered by his professional associates and friends, Dr. M. I. Pupin, the distinguished electrical engineer and physicist, was officially notified by the Academie des Sciences de l' Institut de France, through Dr. C. O. Mailloux and Gano Dunn of the award to him of the distinction of the Hebert prize for his "method of mathematical anlysis of electrical circuits, which is today recognized as classical" and for his "discoveries and inventions in electrical resonance, the tuning of electrical circuits and the loading of telephone lines," which has come to be known as "pupinization."

Among those present were: Elmer E. Corthell, D. S. Jacobus, John J. Carty, Edward J. Nally, Schuyler S. Wheeler, C. O. Mailloux, Cary T. Hutchinson, Union N. Bethell, Gano Dunn, H. B. Thayer, H. G. Stott, Frank J. Sprague, C. E. Scribner, Willard V. King, and Theodore N. Vail.

Motor Car Dealers' Convention Requires Large Installation of Electrical Equipment.

In order to secure adequate space the tenth annual show of the Kansas City (Mo.) Motor Car Dealers was held in the J. I. Case Threshing Machine Company's warehouse, February 7 to 12. The building is 140 by 200 feet, and four floors were used for the show. One of the largest tasks of preparation was the lighting of the building, which was not wired, except for office lighting. The contract was given to the Empire Electric Company, and under J. M. Deacy, manager, a dozen men worked three weeks stringing wires, installing generators, motors and switchboards. Additional feed wires were strung to the building, and the four floors were wired. An International Electric Machine Company's switchboard and two motor-generator sets were installed, current being supplied by the Kansas City Electric Light Company. About 40 motors were used in various displays and the lighting equipment consisted of 1,200 100-watt lamps. Four hundred 40-watt lamps were used in a large electric sign. The department of accessories on the ground floor included electrical equipment of cars, batteries, etc.

Massachusetts Contractors' Activities.

The Massachusetts Electrical Contractors' Association is soon to publish a Contractors' Reference Book, containing a draft of the state licensing law, and the names, number and addresses of all holders of Class A certificates. These books will be distributed throughout the state and to a large extent through New England.

Through the activities of J. E. Wilson, the association's special representative, the organization has been increased about 20 per cent. Mr. Wilson's duties consist in maintaining headquarters at 246 Summer Street, in following up reported infractions of the licensing law, and in promoting the work of the association before the legislature and elsewhere. The office has had requests for copies of the Massachusetts law from various parts of the country, among the applicants being the president of the New York Contractors' Association, who is interested in putting such a law in force there. New York City now has a very stringent licensing ordinance. A Massachusetts contractor working in that city, however, on applying to the Board of Water Supply, Gas and Electricity, was advised that since he held a Massachusetts Class A certificate he need have no further credentials.

Four unlicensed journeymen electricians, working in Dorchester, Boston, were recently convicted in the local court and fined $10 each.

Electric Lighting on Rural Section of Lincoln Highway.

Fourteenth South Street, which continues directly out of Salt Lake City south to Garfield, and which is the Lincoln Highway, has been electrically lighted for the entire distance of 18 miles between the city limits of Salt Lake and Garfield, with 50 electric lights to the mile. This is the only electrically lighted section of the Lincoln Highway between New York and San Francisco, outside of the corporate limits of a municipality.

It is expected that other cities located along the route of the Lincoln Highway will follow the example of Salt Lake City in extending the lighting system out into the open country for the benefit of the increasing volume of transcontinental tourists who will this year use that route in reaching the Pacific Coast.

Flood Lighting Adopted by Bank Building in Knoxville.

In recent years there have been many forms of spectacular advertising, and various methods have worked their way into all parts of the country. One of the most effective methods is the "Sky Line" lighting on high buildings, and the effect is shown in the accompanying illustration of the Holston National Bank Building, 12 stories high, in Knoxville, Tenn.

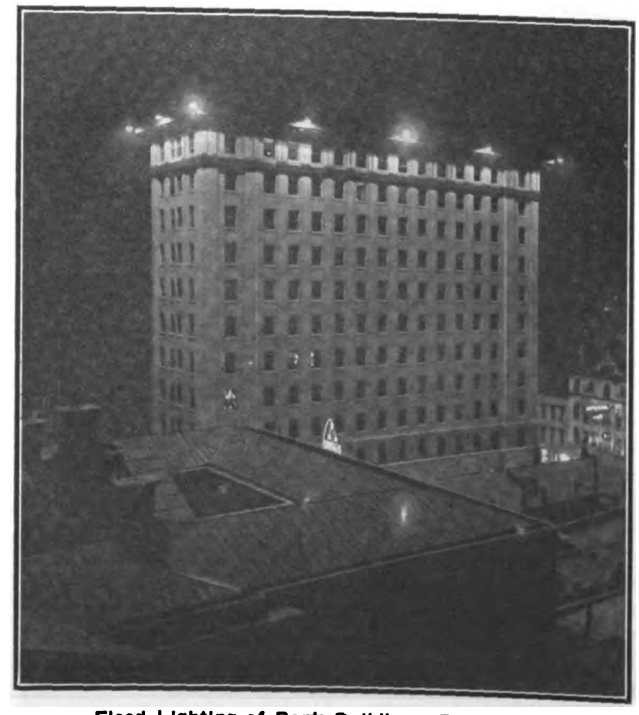
The installation referred to consists of 12 1,000-watt Type "C" Mazda lamps equipped with Holophane metal reflectors, which are arranged symmetrically along the cornice of the parapet wall of the building, extending out approximately 3.5 feet.

The plan of the building is rectangular, and the lamps are arranged as follows: one on each corner on an extension arm which bisects the right angle, and the other lamps placed equidistant between corners.

The main conduit is run along the top of the parapet wall, using street ells for connecting the extension supports for the lamps so that this extension may be readily lifted and lamps cleaned or changed without the slightest trouble or danger.

The stems supporting the lamps are slightly tilted in order to throw the rays of light against the surface of the building.

The building is constructed of light buff face brick, which adds materially to the effect of lighting. This lighting effect can be seen from a great distance.



Flood Lighting of Bank Building at Knoxville.

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Electrical Supply Jobbers Hold Important Sessions at Detroit.

"Preparedness" was the keynote sounded at Detroit at the midwinter convention of the Electrical Supply Jobbers' Association, February 15, 16 and 17. General Secretary Franklin Overbagh, reviewing the conditions which have obtained in the electrical industry for the past seven or eight years, said that the time had now come for the electrical supply jobbers to take stock of themselves and particularly with regard to association effort. So pronounced were the influences growing out of the educational work of the Association that it was important to diligently search out every opportunity whereby the great influence of the Association for good could operate to the greatest advantage. It was particularly in the personnel of the various standing committees of the organization that Mr. Overbagh felt that the first step should be taken to make possible the most effective use of the possibilities of the Association in promoting better business conditions among the various elements of the industry. To this end he suggested that a committee on committees be appointed and that this committee secure expert advice with regard to the most efficient methods of establishing the Society's efforts, and with this expert opinion as a basis to select for the various standing committees of the Association those members who, through experience, location and definite attributes of availability, might best fit into the function assigned to each. Mr. Overbagh's suggestion was heartily commended, and upon motion he was instructed to appoint a committee of six members of the Association who should make a thorough-going investigation into ways and means, the present standing committees to continue until the efficiency committee should report and its recommendations be adopted.

Another conspicuous feature of the convention was the keynote address by Willard W. Low, president of the Electric Appliance Company, of Chicago, on "Co-operation." Mr. Low defined in very specific terms the absolute responsibility which exists between the manufacturer and the jobber in establishing a relation which would work for the economic distribution of electrical supplies to the end that the ultimate consumer might be served most efficiently and at a reasonable cost. Assuming that the interests of the manufacturer and the jobber were one, any friction or lack of teamwork would result in a loss to one or the other department of effort, which in turn would result in either poorer service or higher cost to the consumer. The well-being of every interest involved is wrapped up in a manful understanding and adjustment of the equity and justice to which each is entitled. If manufacturers condoned bad business policies upon the part of distributors not inclined to deal fairly in business, or if the jobber condoned offensive business methods upon the part of manufacturers, the manufacturer and jobber striving to maintain a high degree of business integrity suffered, and the manufacturer and distributor not inclined to strictly fair dealing gained nothing. It was time that both the manufacturer and the jobber established a high standard of business practice and adhered to this practice notwithstanding apparent temporary losses in volume of business and profit available.

A gratifying evidence of harmonious relations and the development of a spirit of business co-operation was presented in the reading of the reports of several committees. The agreement of practically all of the leading manufacturers of electrical apparatus with the suggestions made by the jobbers at the Hot Springs meeting, regarding the contents, labeling and freighting stipulations with regard to standard packages, was especially to be noted. There was a practical unanimity upon the part of the manufacturers to comply with all requirements, especially with respect to the packing of porcelain fittings, the elimination of cord and plugs in marketing fan motors, and in the packing and labeling of switches, sockets, receptacles and boxes.

A study of averages resulting from a questionnaire regarding percentage of operating expenses and percentage of net profit indicated the desirability of a standard classification of accounts in securing relative figures which would be valuable if all were based upon a single method of computing the factors entering into the study. However, it appeared to be proved that under conditions prevailing for the past year the profit to the jobber had been meager even under the most economical and efficient methods of operating the business.

The meeting was largely attended by representatives of the leading electrical supply houses of the country, and by many prominent representatives of the leading manufacturers of electrical apparatus and supplies. The address of E. N. Hurley, vice-chairman of the Federal Trade Commission was greatly appreciated, and an address by William Mather Lewis, of the Naval Security League, aroused those in attendance to a great pitch of enthusiasm, several hundred making application and paying initiation fee for membership in the League as a result of the eloquence of Mr. Lewis.

H. W. Alexander, director of publicity of the Society for Electrical Development, explained specifically the plans for the carrying on of the house-wiring campaign, and invited the jobbers to take advantage of the direct dealer assistance which the Society staff had made available.

In well chosen words Thomas B. Debevoise, general counsel of the Association, outlined the standards of business procedure to which the members of the Association might adhere. He pointed out clearly that there need be no subterfuges and there need be no cynical aspect given to the considerations to which the meetings of the Association might be devoted. A proper understanding of the right relationships of the various elements of the business and a true conception of the returns to which all are entitled would give wide opportunity for discussion and establish methods of doing business to which all might subscribe.

W. E. Robertson, president of the Robertson-Cataract Electric Company, Buffalo, N. Y., brought home to many present the necessity of taking careful cognizance of the underlying factors which regulated sane business procedure. He pointed out that in a falling market no matter what might have been the cost to the jobber of the material upon his shelves, this material was worth only what the consumer could be induced to pay for it. If business fell off and money was scarce the difference between the cost to the jobber and the price secured was either the jobber's loss or gain. Similarly, therefore, under present conditions it can easily be determined that there is a great deal of stock now upon the jobber's shelves which can be replaced only at a greatly increased cost, and in many cases not at all except at a prohibitive cost. A study of these factors will indicate the necessity of establishing a basis for the disposition of present stocks upon an appreciation of their replacement value.

As the Association now meets but three times a year in place of the customary four meetings, it was decided that there would be a special meeting of the Atlantic Division and the Central Division some time before the June meeting of the general association. The Atlantic Division will, therefore, hold a one or two-day session at Atlantic City the latter part of March. The Central Division will hold a similar session at Excelsior Springs in April.

The election of officers and executive committee of the Atlantic Division resulted in the re-election of Frank S. Price, Boston, as chairman. The other members are E. C. Graham, Washington, D. C.; G. L. Patterson, New York City; H. L. Gorke, Syracuse, N. Y.; F. R. Elliott, Philadelphia; W. A. Dalrymple, Pittsburgh; W. L. Adams, Providence.

For the Central Division, Arthur J. Selzer, Chicago, Ill., was elected chairman, the other members being W. R. Herstein, Memphis, Tenn.; W. W. Low, Chicago; N. G. Harvey, Chicago; F. M. Bernardin, Kansas City, Mo.; Charles Scudder, St. Louis, Mo.; F. D. Van Winkle, Cincinnati; B. B. Downs, St. Paul, Minn.

E. W. Rockafellow was elected committeeman at large.

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Miscellaneous NEWS NOTES

Kansas City Jovians "Buy" Theater.—The Jovian Electric Club of Kansas City, Mo., "bought" the Garden Theater for March 6. The proceeds will be used to defray the expenses of the degree team to the Indianapolis meeting next October.

To Construct Large Electrically Operated Shovel.—The Marion Steam Shovel Company, of Marion, O., which has for some time been producing shovels designed for electrical operation, is now engaged on the construction of the largest machine of this type which it has yet made. The shovel will have a capacity of eight cubic yards and is to be used in removing earth for mining operations.

Ohio State Convention.—The annual convention of the Ohio Electric Light Association will be held at Cedar Point, July 18 to 21. Wednesday will be "Technical Day" and Thursday will be "Commercial Day."

Swedish Water-Power Exploitation.—It has been stated that the Swedish government, in connection with further electrification of state railways, is contemplating the purchase of the Kranzede Falls. The capacity of these falls is calculated at 64,000 horsepower, and after certain regulations have been completed, at 155,000 horsepower.

Novel Electric Reading Lamp.—An exhibit at the recent automobile show in Kansas City was an electric reading lamp made of standard United States shells, consisting of 3-inch naval shrapnels, four one-pounders and four 30-30 rifle cartridges, with three sockets for lights. The fixture was made by J. M. Hoggett, a member of the F4 crew, and was raffled for the benefit of local Battery B.

Electrical Prosperity Week, December 2 to 9.—As previously mentioned in these columns, the Society for Electrical Development has decided to hold another "Electrical Prosperity Week" next winter, the date to be December 2 to 9. This was decided at a meeting of the Executive Committee of the Society on February 15. An Advisory Committee, representative of all branches of the industry, was appointed to arrange all details.

To Raise Standard of Work in Massachusetts.—A bill which amends the electricians' licensing act of 1915, in Massachusetts, so as to remove the five-year experience exemption and require all applicants to take examination, and to make mandatory upon officers of the law the prosecution of unauthorized workmen, was heard by the committee of the legislature, February 17. The amendments offered had been agreed to by the state examiners, the contractors and the labor interests.

Kansas City Utilities to Have Publicity Department.—A publicity department has been established for the Kansas City Railways Company and the Kansas City Light & Power Company, under the direction of E. B. Atchley, a well known newspaper man. The department will care for welfare work for the street-railway employees, as well as gather "tips" on news from the various departments of both companies for the assistance of the reporters. It will also promote "Safety First" work and ideas along this line.

Lynn Section Lecture.—On February 16, under the auspices of the American Institute of Electrical Engineers, Lynn Section, Walter D'Arcy Ryan gave an illustrated lecture on "Illumination at the Panama Exposition" in the auditorium of the Classical High School. This was a joint meeting with the New England Section of the Illuminating Engineering Society. The address was along the line of Mr. Ryan's well known illuminating engineering efforts and was greatly enjoyed by an unusually large audience. On March 1, M. Luckiesh, of Nela Park Laboratory, Cleveland, is scheduled to speak before the section on "Light, Shade and Color in Illumination."

Duplicate Equipment Not Always Reliable.—Duplication of equipment failed to prevent suspension of service at the plant of the Memphis (Tenn.) Consolidated Gas & Electric Company recently. Pump trouble made it necessary to start the alternate feed water pump, but the gate valve went wrong almost instantly. The service was interrupted for half an hour.

Important Contract for Chicopee Company.—The municipal electric lighting plant of Chicopee, Mass., has closed a contract with the Quigley Furnace & Foundry Company, to supply 850 horsepower. This is the largest amount of energy to be delivered by the plant to a single customer.

Symposium on Street Lighting.—On the evening of February 28 a meeting will be held at the rooms of the Western Society of Engineers, in the Monadnock Block, Chicago, at which street lighting will be the topic of discussion. This will be a joint meeting of the Electrical Section of the Western Society of Engineers and the Chicago Sections of the Illuminating Engineering Society and the American Institute of Electrical Engineers. The following papers will be presented: "Recent Street-Lighting Problems and Developments," by J. R. Cravath; "Some Experiences and Tests in Connection with Chicago Street Lighting," by A. C. King; "Street-Lighting Plans of Milwaukee," by F. A. Vaughn.

Oregon Electrical Contractors Meet.—The following officers and trustees were elected at a recent meeting of the Oregon Electrical Contractors and Dealers' Association in Portland, Ore., for the purpose of reorganizing and adopting a new set of by-laws and code of ethics: W. O. Fouch, Western Electric Works, president; S. G. Jaggar, Morrison Electric Company, and J. Tomlinson, Pierce-Tomlinson Electric Company, vice-presidents; J. Tomlinson, S. G. Jaggar, F. C. Greene, of R. L. Knight & Company and Guy C. Littler, West Coast Engineering Works, trustees. Under the new organization central-station men, jobbers and others not actually retailing or contracting, but who manufacture or deal in power or electrical equipment are given an associate membership in the state organization. The electrical interests in Oregon are following out a line of action in which they desire to conserve the electrical business for electrical concerns strictly.

Underwriters Entertained by Electrical Supply Manufacturers.—The Associated Manufacturers of Electrical Supplies were hosts at a dinner given in New York City January 26, in honor of W. H. Merrill, Dana Pierce and A. R. Small, of the Underwriters' Laboratories. Those present at the gathering were: R. K. Sheppard, president of the association; J. W. Perry, treasurer; C. E. Dustin, secretary; T. M. Debevoise, counsel; LeRoy Clark, E. B. Hatch, S. Morris, N. L. Otis, W. C. Robinson, B. E. Salisbury, H. R. Sargent, J. H. Trumbull, J. E. Way, L. W. Downes, D. C. Durland and J. F. Kerlin. B. E. Salisbury, president of Pass & Seymour, addressed the gathering relative to the needs of the different sections for cooperative work with the Underwriters' Laboratories. Responding to the remarks of Mr. Salisbury, W. H. Merrill, manager of the Underwriters' Laboratories, described graphically a practical method by which, through the establishment of industry conferences, every branch of the electrical manufacturing industry that has need of cooperation with the Underwriters' Laboratories may obtain the greatest harmony and develop standardization. LeRoy Clark, president of the Safety Insulated Wire & Cable Company, closed the speaking for the evening by describing the work and the success of the rubber-covered wire industry conference, which has linked together the rubber insulated wire manufacturers and the Underwriters' Laboratories for many years.

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Electricity in a Coal-Refining Plant

New Industry in the Western Coal District for Obtaining Tar Products Offers Opportunities for the Sale of Central-Station Power—Motor Data Are Given on a Typical Plant

By Frank D. Burr

Industrial Power Series—Article No. 155

A new industry is just being started in Denver, Colo., the light and power for the operation of which is being supplied by the Denver Gas & Electric Light Company. Object of the coal company is to obtain from lignite, or non-coking coal, the tar products. Its purpose is entirely the converse of the gas company, due to the fact that the latter uses all of the products of the coal in order to enrich the gas sufficiently, while the new company will save all of the products of the coal to enrich the tar and oils, without regard to the gas, which it hopes to make as lean as possible.

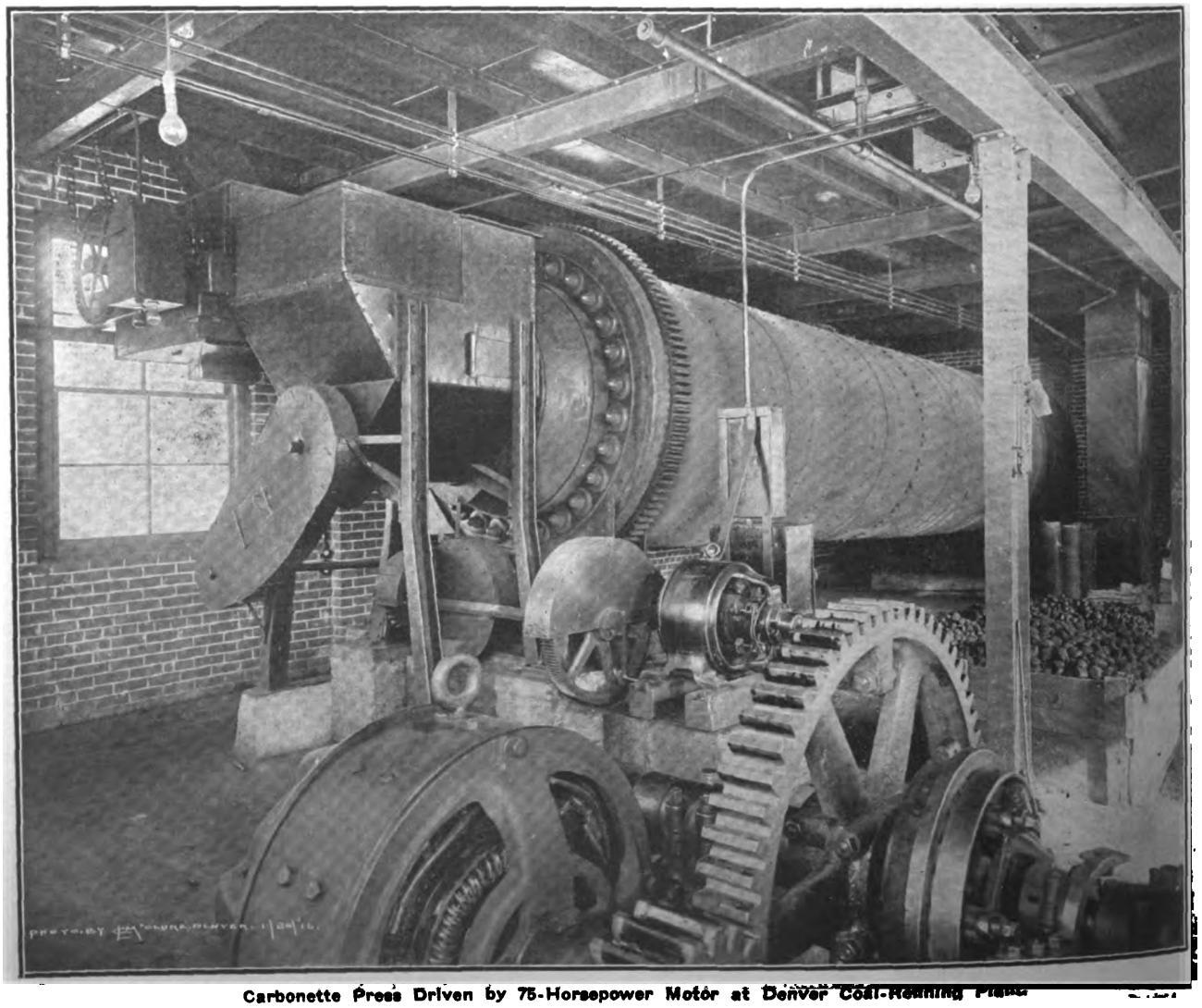
The process and all of the machinery were originated and designed by Charles O. Hoover, general manager and chief engineer of the coal company.

A railway siding enters the grounds of the company, and each car of coal is spotted over the Jeffery track hopper, into which the coal is dumped by means of a hoist driven by a 7.5-horsepower, 500-volt motor. The coal is elevated from the pit below the hopper by means of a Jeffery 23-inch steel apron bin conveyor operated by a three-horsepower, 500-volt, 1,175-revolutions-per-minute motor. The coal falls from the conveyor into the hopper of a Jeffery single-roll crusher, 18 by 18 inches, driven by a 15-horsepower, 500-volt, 1,130-revolutions-per-minute motor. The coal falls from the crusher into the pit, from which it is taken by a bucket elevator, 8 by 20 inches and elevated 60 feet to the top of storage bins, where it is evenly distributed into the bins by means of two screw conveyors. The bucket elevator and screw conveyor are driven by a 10-horsepower, 500-volt, 900-revolution-per-minute motor.

At the bottom of the bins is operated a larry car of 10 tons capacity. This receives the coal from the bottom of the bins and by means of a five-horsepower motor and trolley conveys it over the top of the four ovens, into which it is dumped into a hopper, feeding each oven.

A steam-operated air compressor, 10.5 by 12 inches, cross-compound, is operated at 85 pounds pressure. The air is mixed with gas and heats the oven burners.

A 50-horsepower, 500-volt motor running at 1,200 revolutions per minute drives a Connersville exhauster, which



Carbonette Press Driven by 75-Horsepower Motor at Denver Coal-Refining Plant

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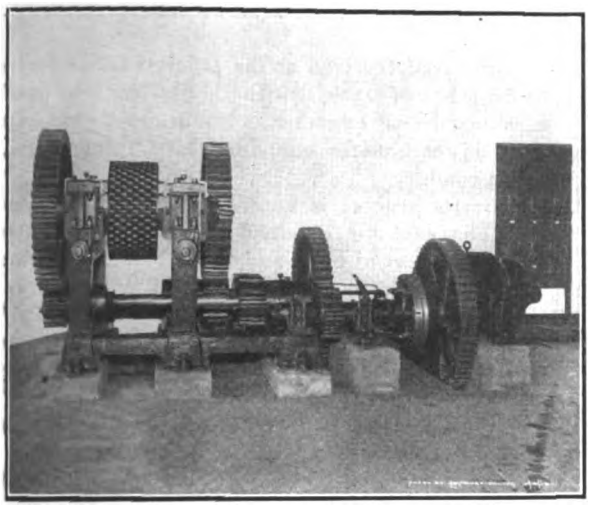
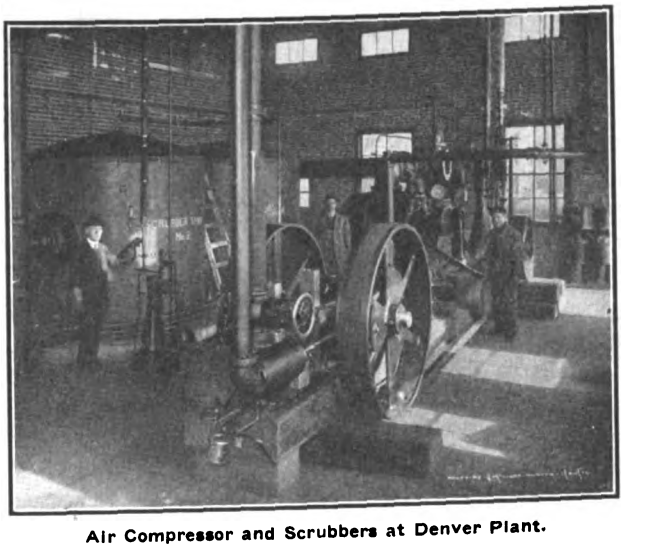


Motor and Speed-Reduction Gears for Carbonette Press.



Air Compressor and Scrubbers at Denver Plant.

draws the gas from the ovens and forces it into the holders. A three-horsepower, 1,200-revolution-per-minute motor drives a rotary pump for the circulation of the high-boiling-point oil through the benzol scrubbers.

A five-horsepower, 500-volt, direct-current motor operates by means of a trolley, a conveyor or oven discharger. This conveyor may be operated by extending into the oven, after the furnace door is opened, the conveyor taking out the carbonized coal to the front of the oven. The conveyor can be backed out and driven in a direction at right angles to the previous direction, to the next oven, and so on, until all the ovens have been cleaned of the carbonized coal, from which the gas, tars and oils have been extracted.

The coal is removed from the front of the ovens by means of a cast-iron screw conveyor, driven by a five-horsepower, interpole motor, running at 1,150 revolutions per minute. The coal drops from this device into a pit, from which it is elevated by means of a double-flight conveyor operating up an incline of 14 degrees, to the rotary screens. The conveyor is driven by a five-horsepower, 500-volt, direct-current, 1,150-revolution-per-minute motor.

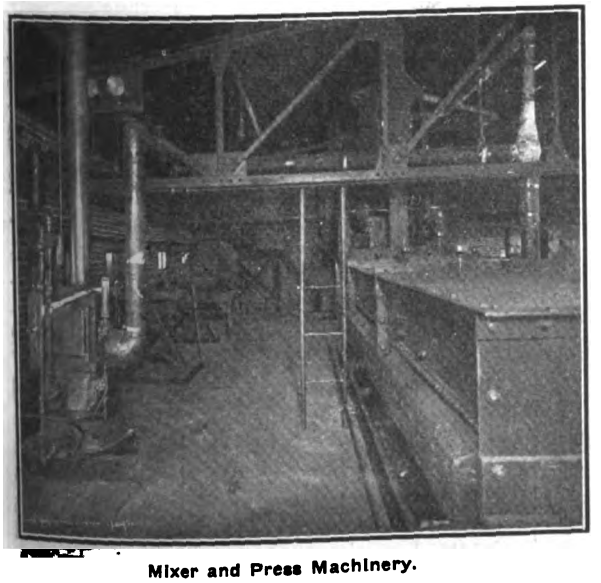
The 0.25-inch rotary screens are driven by a 15-horsepower, 500-volt, direct-current, back-geared motor, operating at a speed of 1,175 revolutions per minute.

All the above machines have a capacity for handling 60 tons of coal per hour. All of the over-sized coal passing from the rotary screen falls into a pit below, from which it is taken by a flight conveyor driven by a five-horsepower, 500-volt, direct-current motor to the ball mill. The ball mill is driven by a 25-horsepower, 500-volt, direct-current motor, of 775 revolutions per minute.

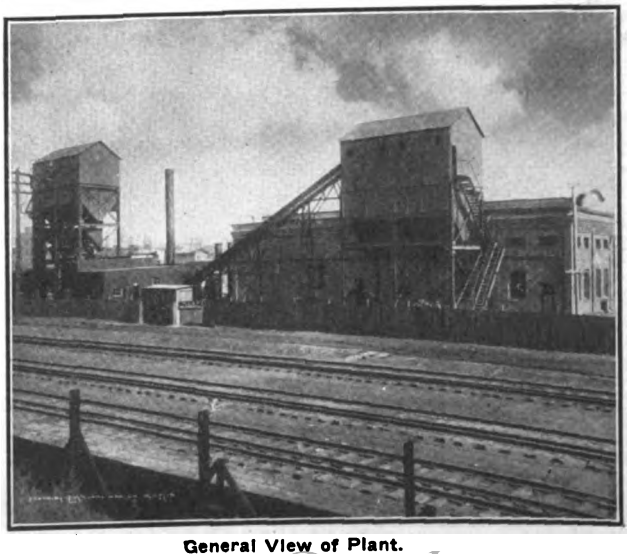
The pulverized coal from the ball mill is deposited into the pit below the rotary screen. A flight conveyor, 150 feet in length, driven by a 10-horsepower, 500-volt, direct-current, 900-revolution-per-minute motor, elevates the coal to the bins, above the carbonette house. The carbonized coal is taken from these bins, passing over a magnetic separator, which takes out scrap iron, tool steel, etc., using five amperes at 500 volts.

The coal is then conveyed to the rotary preheater, heated by gas and driven by 7.5-horsepower, 500-volt, direct-current, 1,000-revolutions-per-minue motor. This machine preheats the coal at the proper temperature, so that when it comes in contact with the binding material in the mixer they will both be of the same temperature and properly mixed. From the pre-heater the carbonized coal is then elevated to the hopper of the mixer by means of a bucket elevator driven by a 10-horsepower, 1,000-revolutions-per-minute motor.

This motor also drives measuring devices and transmission machinery. A 1.5-horsepower motor, running at 1,750 revolutions per minute, drives a Viking No. 2 rotary pump, for pumping the binder into the mixer. The mixer is driven by a 50-horsepower, 760-revolution-per-minute, back-geared motor, driving the shaft which drives the mixer by means of a double-steel-roller chain. After being thoroughly mixed the combination is then conveyed to the carbonette press, where it is deposited between rolls of the press, containing pockets, which compress the mixture into car-



Mixer and Press Machinery.



General View of Plant.

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bonettes of suitable size for use in cook stoves, base burners and furnaces and for industrial purposes. The press is driven by a 75-horsepower motor, running at 635 revolutions per minute, connected to the speed reduction by means of a Dodge clutch. The press rolls, four inches thick, are made of special chrome steel specified by Mr. Hoover, who also specified the special bearing metals he desired for the gears and pinions for a fit within one one-thousandth of an inch. The pockets in the press rolls were milled, requiring an hour for each pocket. This machine was built by the Denver Engineering Works, of Denver.

The switchboards are equipped with an automatic circuit-breaker for each motor in the plant, controlled by a button near each motor, so that in case any machine should be choked up with coal the motor may be stopped immediately and a red electric lamp lighted, so that every workman will know that the power is shut off from accident, instead of having failed from a blown fuse or no power on the line.

The lignite coal received at the Jeffery track hopper has a calorific value of 9,800 British thermal units per pound. The carbonized coal contains 12,800 British thermal units. The finished carbonette contains 14,061 British thermal units per pound.

Mr. Hoover's process is known as the low-temperature process. The coal tar obtained contains 14 per cent of light oil, 14 per cent of pitch and 10 per cent of free carbon, while the creosote oil contains 40 per cent of tar acid.

The refinement of the coal tars will produce carbolic acid, crysilic acid, creosotes, flotation oils. Separate tanks are used for taking out the acids from the creosote oils, being agitated by means of compressed air.

Five million cubic feet of gas are produced per day and the plant will consume one-half of its output.

Populations, Customers and Lamps Compared

Interesting Study of Central-Station Conditions in Massachusetts Cities

An interesting study of contrasting conditions found in the lighting business of a dozen Massachusetts central stations, which serve rather diverse communities, is presented in the accompanying table, which sets forth the population of territory, number of lighting customers and other data.

The character of the company, general characteristics of the community and its location are found to have a natural reflection in the extent to which incandescent domestic and commercial lighting prevails therein. As might be supposed, the high-class residential cities show a more intense distribution of house electric lighting than the average manufacturing community. Industrial towns vary widely among themselves. It is to be noted that those centers where shoe manufacturing and highly paid metal working are carried on—notable instances being Lynn, Springfield and Worcester, Mass.—show much larger numbers of customers per 100 of population than the average of textile centers. The latter, characterized by comparatively low-paid workers, have a more general use of gas as the house illuminant.

The point is further emphasized by a comparison of customers in two specimen towns served by combination gas and electric companies. In the case of the textile city, customers number only 1.9 per 100 population, while a shoe city, likewise served, has 8.7 customers. The number of lamps per customer, however, is greater in the textile city, due perhaps to a more general use of lighting in the mills.

The largest numbers of lamps per customer and per hundred of population are found in the strictly residential and summer residential towns. An example of the general use of electric house lighting is found in the case of Concord, Mass., a town of 6,500 people, served by a municipal plant. Here the figures are higher, without doubt, than they would be were gas a competing agency. The same is true of the summer residential communities, the number of lamps per 100 of population reaching in one instance the large average of 580. This condition arises from the presence of a large number of "palatial" residences in which lighting is not stinted.

Farming populations naturally show a small number of lamps per customer and per 100 people, though the average of customers may be larger proportionately than in many cities. Medium-class suburban towns do not show so large a use of electric lighting as one might be led to expect. This is in part due, no doubt, to the absence of large industrial and mercantile establishments.

The relation of price to use of electric lighting is indicated by a study of the table. The unusually low rate prevailing in the city, devoted to paper manufacture, where the maximum net price is only six cents per kilowatt-hour, is clearly responsible for the large number of lamps in use, while the comparatively high rates prevailing in the country districts, a small shoe manufacturing town, and another industrial town where gas is supplied by the same company, must be regarded as a deterrent to a larger use of electricity. Price is obviously no hindrance to the abundant use of electric lighting by the summer residential population referred to, here the rate being 25 cents per kilowatt-hour to part-year customers, and 15 cents to others.

In general, the most favorable field for electric lighting seems to be a community having a diversity of industries with highly-paid employees.

COMPARATIVE DATA, CUSTOMERS AND LAMPS.

Plant.	Nature of Territory.	Approximate. Population.	Number Lighting Customers.	Equivalent 50-watt Lamps.	Lamps per Customer.	Lamps per 100 Population.	Customers per 100 Population.	Maximum Net Lighting Rate.
Electric	Business center	150,000	8,875	225,000	25.3	150	5.9	9
Electric	Textile manufacturing city	126,000	3,206	117,500	36.6	93	2.5	9.5
Electric	Boston suburbs	117,000	6,983	145,500	20.8	125	6.0	11
Combination	Textile manufacturing city	111,000	2,164	71,500	33.0	64	1.9	11.7
Combination	Shoe manufacturing city	105,000	9,126	186,000	20.4	177	8.7	10
Electric	High-class manufacturing city	104,000	8,001	254,500	31.8	245	7.7	9
Electric	Shoe manufacturing center	94,000	3,844	110,000	28.6	117	4.1	12
Municipal electric	Paper manufacturing city	58,000	4,242	171,000	40.3	295	7.3	6
Electric	Residential and manufacturing	45,000	2,565	66,000	25.7	147	5.7	11
Electric	High-class manufacturing	38,000	3,182	61,500	19.3	162	8.4	10.8
Electric	Small towns and farming	34,000	2,055	32,000	15.5	94	6.0	15
Electric	Shoe manufacturing city	25,000	1,764	56,250	31.9	225	7.0	15
Municipal electric	Tanning city	16,000	1,182	30,000	25.4	187	7.4	10.8
Combination	Manufacturing town	7,000	63	2,000	31.7	28	1.0	15
Municipal electric	Residential	6,500	740	18,500	25.0	295	11.4	9
Electric	Summer residential	3,000	420	17,382	41.3	580	14.0	15 / 25

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COMMERCIAL PRACTICE

New Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Nashville Company Will Co-operate in Vehicle Campaign.

In its efforts to increase the use of the small electric delivery wagon in its territory, the Nashville (Tenn.) Railway & Light Company is actively co-operating with the local agents of the Ward electric in a comprehensive selling campaign that provides for the solicitation of business among the various industries in a systematic manner. The lighting company is preparing lists of power users who come under the wholesale rate schedule, and these lists are covered by the automobile agency as preferred prospects. Power users in the classification enjoy a rate that would permit them of installing a charging equipment at a very low cost for energy. Bakeries, laundries, groceries, dairies, etc., are being shown the economy of electric delivery under such conditions.

Popularizing Electricity by Lectures on Home Economics.

What is proving a campaign of unusual interest in popularizing electric household devices is being carried on by the New York Edison Company among the women's clubs of New York City. Recently Miss Anne Broome, manager of the Bureau of Home Economics, arranged with Mrs. Charles Daniel Hirst, chairman of the Home Economics Division of the Federation of Women's Clubs of New York for a series of six lectures on Home Economics to be given under the auspices of the Division in the New York Edison Company's model apartment at 124 West Forty-second Street for the members of the various clubs. The first lecture of the series, which was held on February 9, was a decided success. About 170 women gathered to hear Mrs. Charles Husted Goudiss, editor of the *Forecast* magazine, speak on "Household Efficiency." Miss G. H. Shearer, of the Philadelphia Electric Company, also spoke, her topic being "Electricity in the Home." Demonstrations were given of various devices and electrically prepared tea was served.

Summer Residents of Hull, Mass., Object to High Rates.

Arguing that the prevailing rate of about 20 cents per kilowatt-hour to summer residents of Hull, Mass., is an excessive price for electricity, Ex-Mayor John F. Fitzgerald of Boston called on the Legislative Committee on Public Lighting to recommend a bill which would require the Gas and Electric Light Commissioners to investigate the cost, supply and service to customers of the municipal plant in Hull.

Mr. Fitzgerald said he had taken up the question of rates with the Selectmen and the lighting authorities, but without satisfactory result. He then called upon the Commission and found that that body had no authority over rates of municipal plants. The ex-Mayor held that the summer residents, who pay about 75 per cent of taxes but are not local voters, should have some recourse, and that the State authorities should have power to regulate rates of municipal plants. He regarded a 20-cent rate as excessive, despite the fact that it is based on service rendered during only a few months of summer.

Everett W. Burdett, for the Massachusetts Electric and Gas Association, suggested that the Gas and Electric Light Commissioners be asked whether they have not now authority to regulate rates charged by municipal plants, and if not, whether they should not have such power.

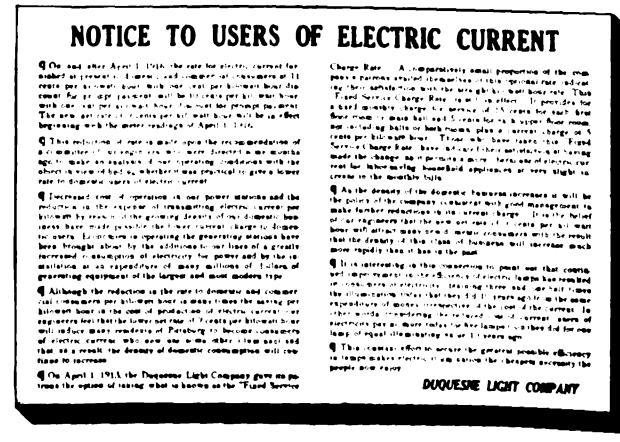
It should be noted that the Town of Hull recently contracted with the Weymouth Light & Power Company for a supply of electricity to the town's lines, the terms of which will enable the town to reduce its summer rate to about 17 cents. A rate of 20 cents prevails with several companies for like service.

Pittsfield Company to Build Iron-Wire Line.

The Pittsfield Electric Company, Pittsfield, Mass., is considering the extension of its service into the town of Richmond. The company desires a yearly income of $1,200 from the extension, and it is believed this can be subscribed for, as local manufacturers are being interested in the project of electric power service. It is possible that iron composition wire would be used, on account of the present high price of copper. The length of the proposed line is about nine miles.

Duquesne Company Reduces Rates.

Announcement is made by the Duquesne Light Company, Pittsburgh, Pa., that beginning April 1, 1916, rates for energy furnished at present to domestic and commercial consumers at 11 cents per kilowatt-hours with one cent per kilowatt-hours discount for prompt payment, will be reduced to 10 cents per kilowatt-hour with one cent discount for prompt payment. The advertisement shown herewith was published in all daily papers, and explained that "as the density of domestic business increases it will be the policy of the company, consistent with good management, to make further reductions in its current charge. It is the belief of our engineers that the new net rate of nine cents per kilowatt-hour will attract many new domestic consumers, with the result that the density of this class of business will increase much more rapidly than it has in the past."


NOTICE TO USERS OF ELECTRIC CURRENT

DUQUESNE LIGHT COMPANY

Advertisement of Pittsburgh Company Announcing Rate Reduction.

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Printed Salesmanship for Central Stations

A Discussion of the Fundamental Principles of Advertising With Specific Suggestions for the Preparation of Effective Central-Station Copy

By Charles H. Seaver

The sale of electricity by the central station to the general public is as susceptible to the methods of modern salesmanship and live advertising, as are the best known food products and household articles on the market today. Yet there is still a tendency on the part of many companies to stand back in the matter of regular, systematic advertising—the kind that will develop the field to the utmost.

Every central station advertises, because the remarks of satisfied customers, the appearance of new electric signs, and the well lighted stores and homes it serves are in themselves advertisements. This is at the best an undirected, unintentional sort of advertising—the kind that is done because it cannot be avoided.

It must be made directional—it must be given force, and the company that strives for direction and force is well repaid.

Advertising is subject to definite laws; the development of business moves in fixed channels. Conditions change, but human desires, and the things that appeal to these desires remain the same as they were years ago. Naturally the ways of appealing to these desires and converting them into sales have changed to meet the different conditions.

Calkins and Holden, in their book on "Modern Advertising" define the new meaning of advertising as applied to modern publicity. "Advertising," says this book, "has come to mean not merely the printed announcement of the merits of an article or institution, but that high and unusual power of impressing a great number of people with a given idea. Advertising is that subtle, powerful but indefinable force, whereby the advertiser creates a demand for a given article in the minds of a great many people, or arouses a demand that is already there in latent form."

This definition applies as well to the central-station industry as to any other line of commercial effort. The number of people need not be great, and the commercial man or advertising man who writes vital copy that creates business may feel that he has a place in the ranks of real advertisers, even though the number of people reached is comparatively small. Neither does the writer of effective copy need to be born with the "high and unusual power" of impressing people by printed words. The case of the average advertising man would be sad indeed if this power could not be cultivated.

The central station that is content to go on with hit-or-miss publicity methods is a supply company—nothing more. It is content to fill the wants of the public; to supply wants which are realized, but it is passing untold opportunities for creating new desires and awakening new customers. It is leaving untouched fields as profitable as those already served.

There is not a central station in the country that is handling all the business available in its territory, yet every day many of them are passing by opportunities, content in the belief that they are doing all possible to enlarge their field, or that the limit has been reached. In either of these cases it is safe to say that intelligent, systematic advertising will provide the needed stimulus and open up new possibilities.

After a certain point central-station growth may be slow but it can be made certain. One of the largest central stations in the country, which has been foremost in advertising and selling electricity for years, estimates that it has only about one-third of the business which its territory should yield. It is spending thousands of dollars each year for systematic, definite advertising, and every day the number of customers is growing and entirely new fields are being opened up.

In the matter of advertising definite articles there is even more of an indication of backwardness than in pushing service. Some central stations advance no particular fan, flat-iron or cooking utensil. "Let the manufacturer do it," says the commercial manager, "it is enough that we advertise electricity."

It is not enough.

Copy Must Be Specific.

This advertising that lacks a definite idea—something to tie to—is very apt to be the advertising that does not pay.

The laws of psychology—the roads to a reader's attention—are very much the same whether you are advertising a cheap, widely sold article, or electric power, sold right in the limits of your own city. It is the learning of these laws, and their application to modern business development that is bringing all advertising to a higher level. Central-station advertising is improving, slower perhaps, but no less surely than the rest. In no line of selling can the advertiser tell how much publicity a dollar will buy, or how must time it is advisable to spend on preparation per dollar's worth of space used, but it is sure that your copy cannot hit the mark unless thought is given to the writing, and care to the placing of it.

RATES FOR
Electric Light
further reduced August 1, 1907

More Light for the Same Money;
The Same Light for Less Money.

COMMONWEALTH EDISON COMPANY
'Phone Main 1280 General Offices: 139 Adams Street

Fig. 1.—Plain Announcement of a Few Years Ago.

The only way of testing the value of an advertisement outside from actual trial is by analysis. This is easily done and gives surprisingly good results. The habit of correctly analyzing your work can be acquired. Take each point and determine how it appeals; what emotions it would move; why it would be remembered. Would you be influenced by the points in your copy? Would your neighbor, whose tastes you know, be impelled to read more about your special offers? If such questions can be answered in the affirmative, the art of writing "selling" copy is in your grasp.

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A glance at a central-station advertisement of today and a comparison of it with one of a few years ago, is the best illustration possible of the better publicity now in use. A reader of the older advertisement, Fig. 1, gains no idea of just how much the rate has been reduced. There is no thought aroused of the advantages of electric light in the reader's home. Compare this with the later copy, Fig. 2, which not only makes the reader feel the convenience of electric light in his home, but tells him clearly how much cheaper it is, and makes a definite offer.

Advertising Must Arouse Interest.

The valuable advertisement may be one that instructs, or merely attracts, but it must arouse interest. It may make the reader think agreeably of electricity in connection with himself—and as applied to some particular lamp or utensil. In this lies the biggest work of advertising. A man in reading his morning paper comes across an advertisement containing an attractive picture of a family reading by an artistic lamp. Under it may be the heading "A Beautiful Electric Lamp for Your Reading Table." Further down is the line, "As Easy As Daylight on Your Eyes." Without realizing it the majority of people looking at such an advertisement would imagine that lamp on their table in place of their lamp. In other words they have not only perceived the illustration, but they have apperceived it. They have seen the lamp in relation to their rooms and to themselves. They have thought of something you sell as making their homes more comfortable.

Although a reader might not remember such an advertisement, he has the idea and it is pretty sure to stick. As an illustration of this, Prof. Walter Dill Scott, in his "Psychology of Advertising," tells of an instance where a buyer who was prejudiced against general advertising, answered under the impression that he had been referred to the company by a friend. He had seen the article in relation to himself, and had entirely forgotten the source of his information.

While the matter of getting the prospect's attention is important it is rather a waste of ammunition unless this is finally crystallized into something definite. The attention advertisements must be followed up and enforced by copy "with a hook." Some inquiry; some indication of interest must be given to the commercial department in order to realize on the investment put into advertising. This inquiry value, if it is genuine, is most valuable, for it puts the commercial man in a position to explain details personally to some one whose interest is already aroused.

Specific washing-machine, or house-wiring advertising cannot be expected to bring either as quick or as large returns as will that copy devoted to the exploitation of smaller things, but it should be no less certain. Whether the space used is large or small, the specific advertisement should be made to bring replies, or its value is in a great measure lost.

An entirely different field is occupied by the purely informative advertisement, yet it can be so used that it will support and give interest to succeeding publicity. The

These Tungsten Electric Lamps will make your home three times brighter at no increase in cost

JUST imagine what a convenience three times as much light in your home would be. You could have three times as much illumination in one room; or, three times as many rooms lighted; or, three times as many hours of light. If you live in an electrically lighted home, you can now enjoy all the advantages of this improved lighting and increased economy, by using Tungsten Electric Lamps. For the same amount of electricity now consumed by a carbon filament lamp, one Tungsten Lamp gives three times as much light.

If your home is not already equipped for Electric Light, now is the time to have it wired—if you own it, and it is located on one of our distributing lines, we will wire it and allow you two years' time for payment — equal monthly installments — no interest.

For a small extra charge, we will exchange Tungsten Electric Lamps for used carbon lamps. The 40-watt Tungsten—obtainable in exchange for one carbon lamp and 26 cents — is especially recommended for home use.

Write today; or, telephone Randolph 1280—Contract Dept.

Commonwealth Edison Company
120 West Adams Street.

Fig. 2.—Copy With a Strong Appeal.

THE LATEST NEWS ABOUT

MAZDA LAMPS

(The trade name given to the improved Tungsten Lamp by the manufacturers.)

First—New Low Prices

REDUCTION IN PRICE

Customers entitled to free renewals of carbon incandescent lamps can, beginning today, April 1, obtain Mazda lamps at the following excess prices:

	Old Price	New Price
15 watt		$ .35
25 watt	$ .45	.35
40 watt	.45	.35
60 watt	.55	.45
100 watt	.65	.50
150 watt	.90	.75
250 watt	1.15	1.00

Second—New Small Lamp

The company now offers for the first time a 15-watt lamp. Just the lamp for economy service. One cent's worth of electricity will light this lamp for 6 hours and 40 minutes.

Third—Increased Use

Our customers increased their use of MAZDA lamps from 45,000 in 1908 to 160,000 in 1911. During the past three months they have been using them at the rate of over 200,000 per year.

During these four years the excess prices of these lamps have been reduced over 50%.

The Edison Electric Illuminating Company of Boston

Boston, Edison Building, 39 Boylston Street
Newton, 309 Centre Street (Nonantum Sq.)
Waltham, 431 Moody St — South Framingham, Howard St
Lexington, Depot Square — Walpole, West Street
Chelsea, 275 Broadway — Winchester, 557 Main Street

April 1, 1912.

Fig. 3.—A Good Advertisement of the Educational Type.

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advertisement from which Fig. 3 was made is an excellent example of this style of copy. It is practically a bare statement of fact, yet it may be looked at in so many different lights, and seen in so many relations with other things, as to offer an almost unlimited opportunity for advertisements "with a hook" that would land inquiries, and actually bring prospects into the office.

Illustrations Liven Copy.

An appropriate illustration often can and should be made the strongest part of an advertisement. Where there is an opportunity to put human interest in a picture by all means do it. The "human interest" picture is not merely the attractive one, or the one with a man, woman or group in it, but a picture that makes the reader connect the article shown with himself, his home or his business. Frequently a reader, when glancing at a newspaper advertisement, folder or booklet, does not take time at first to read all the type matter. There are few people who will pass by an attractive illustration and fail to take in its message. The woman who dreads ironing on a hot day and sees an attractive picture of a cool comfortable-looking person doing her ironing on an apparently breezy porch, can hardly fail to have a longing for an iron that will do work as easily, and permit her to be so composed while the task is being done. But the picture must be attractive—it must strike the mark. A well illustrated piece of newspaper copy is shown in Fig. 4.

Fig. 4.—Copy That Appeals to Desire for Comfort.

Fig. 5.—An Advertisement That Is Easy to Answer.

Tie your illustrations to your reading matter, or if you must use certain pictures, write copy that fits. The picture aids the imagination and the reading matter enforces the point of the picture. When they both work together to start the imagination of the reader in the right direction he is in a fair way to be induced to enjoy the advantages of electric light, or the particular utensil advertised. Every advertisement you run should be so prepared as to start the reader's thought in a direction favorable to your company.

Getting replies is the most difficult part of any campaign—unless a reduced price is offered, a special rate, premium or some other reward for prompt action. Very slight differences in an advertisement are often responsible for a great change in its reply value. In general these differences are very easily seen after a little practice. Some cases there are where the pull or lack of it that exists defies the most careful analysis, but the "hook" that brings in replies can, in nearly every case, be included with just a little careful thought.

Aid Prospect to Reply.

The interest-catching first line, the attractive illustration, and the explanatory text of the prospect-getting advertisement must lead the attention to the point of replying. For the person who gives more than a casual look at the advertisement, the chain that impels him to a reply must be unbroken. Avoid the commonplace. Be specific. Remember that a suggestion of action on the part of the reader is the first step toward getting a reply. The mere statement of the company name is not as valuable by half as some such line as: "We are as close to you as your telephone. Just call Main 20 now, and ask for details."

This feature of removing obstacles, and making it easy for the prospect to answer applies as much to booklets, letters or circulars as it does to newspaper advertising. The return card, the corner coupon, the tear-off slip at the bottom of a letter, are all aids to the person whose in-

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terest is awakened. A well-arranged advertisement of this sort is shown in Fig. 5. Too much insistence on immediate action may frighten some prospects away, but too little is certain to result in the advertisement or letter being laid away and its entire value as an answer-getting scheme is lost. Where the article offered is a heating appliance, lamp, or any of the lower priced "things electrical" there is even more need of securing quick action. Placing a time limit on the offer helps, for it gives an explanation of the special terms offered.

Proper explanation of a reason, where such special terms are offered, is well worth careful attention. A long explanation is not necessary, but a hint should be given of the reason for a reduced price. Where a particular brand of utensil is being introduced this alone offers a most plausible reason, but a more ingenious idea may often be uncovered. If it is, embody it in your headlines. Feature it. Let everyone know why they are getting the washing machine or flat iron at a *low price*. Take the public into your confidence. They will remember the reason, if it is at all unusual, long after the price is forgotten.

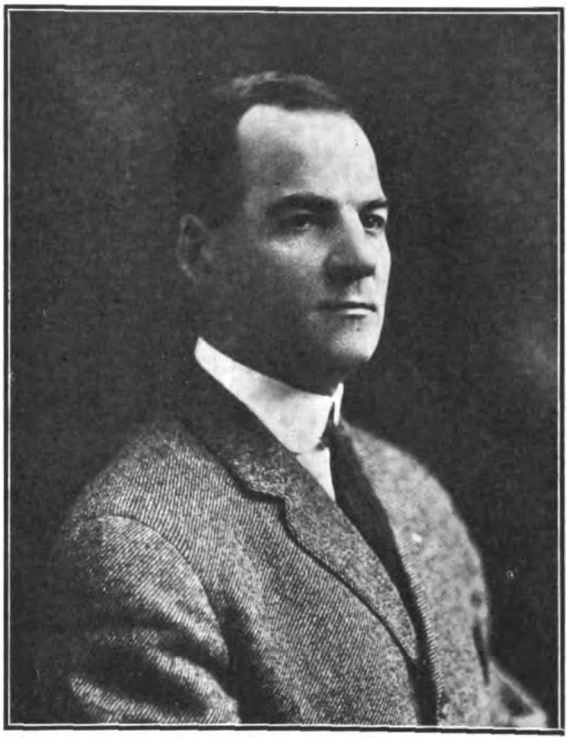
SUCCESSFUL COMMERCIAL MANAGERS.

Robert W. Hoy.

Robert W. Hoy, commercial manager of the Elmira (N. Y.) Water, Light & Railroad Company, one of the best known central-station officials in the East, dates his experience in the industry from the spring of 1888 when he accepted a position with the Edison Electric Light Company in Harrisburg, as a lamp trimmer and wireman's helper. The company was in its infancy at that time, having been in existence only a few years. The plant was strictly Edison three-wire, direct-current, as at that time very little was known of the alternating-current system. The company's competitor at that time was the Harrisburg Gas Company, and the commercial lighting was about equally divided between gas and electricity. The principal unit for commercial lighting was T. & H. brush arc lights. On dark days the poor merchant was at the mercy of an open gas jet until about four or five o'clock when the arc circuits were thrown on. About 20 horsepower comprised the total power load on the lines and three private residences were all the residential business served. Nothing was known of electric appliances in those days and the nearest thing to an electric fan came along several years later, when belted fans driven with a small electric motor were used. These were in use probably four to six years when the direct-connected electrically driven fan was put on the market. A short while after the fan came the iron.

All during Mr. Hoy's connection with the company up to within a few years ago, there was lively competition both from competitive electric companies and the gas company. The old Edison Company took over two electric light companies that had been successful in getting franchises to operate in the city, and it was finally taken over in 1911 when the Susquehanna Electric Company, now the United Gas & Electric Engineering Corporation, purchased the Harrisburg Light & Power Company, the Paxtang Electric Company and the Harrisburg Steam Heat & Power Company. This merger was finally closed after an ordinance had been introduced and passed finally in the city council permitting the two electric companies to consolidate. Mr. Hoy was active in this movement and it was at that time that he was placed in charge of the Commercial Department. Prior to taking charge of the Commercial Department he had entire charge of line construction and all interior wiring. For a number of years he was the only wireman in the city, helpers were taken on from time to time and when they became proficient in the wiring business they were either kept on until the force grew as high as 20 to 25 first-class wiremen and helpers, or left the employ of the company to engage in business for themselves. Mr. Hoy says: "I saw our plant grow from a small hole in the wall to one of the most successful as well as economically operated plants in the country serving a population of 75,000 and outlying districts of 100,000 more."

Shortly after taking charge of the Commercial Department many campaigns were started and he was very successful with all of them. Among them was a sign campaign and if the merchants of Harrisburg continue to hang out electric signs in the future at the same rate they have been installing them for the past four years, Harrisburg will be known as the white-way city of Pennsylvania. Mr. Hoy has been very successful in securing borough and township franchises and street and roadway lighting, and



Robert W. Hoy,
Commercial Manager, Elmira (N. Y.) Water, Light & Railroad Company.

had an active part in getting the several business sections of the city lighted with standard lights; the entire installation and operation of same was borne by the city.

On November 1, 1915, the total power load that the company was serving was between 12,000 and 13,000 horsepower. From three wired houses the residential business grew to practically 6,500, and business in both of these sources is increasing rapidly.

On November 1, 1915, Mr. Hoy was transferred to Elmira, N. Y., in charge of the Commercial Department. Before leaving Harrisburg he was very active in the Chamber of Commerce, serving as chairman of the Industrial Committee for two years. He was also very much interested in civic improvements in the city and took an active part in many of them. He is an active member of the N. E. L. A. and other organizations.

Reduced House Lighting Rate at Providence.

The Narragansett Electric Lighting Company, Providence, R. I., has decided to reduce its maximum residence lighting rate from 10 cents to 9 cents per kilowatt-hour, after the conference with a special committee of the City Council. If the proposal is accepted by the Council, the new rate will go into effect July 1.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

OPERATING DATA ON AN IMPORTANT ELECTRIC FURNACE INSTALLATION.

Advantages of Electric-Furnace Steel Shown in Easton Plant.

By W. J. Kyle.

The electric furnace is an important factor not only in the development of central-station industrial loads, but also to the manufacturers of steel products, and above all, to the ultimate user of such materials in the form of castings, rods, or other forms of steel.

The purpose of this article is to bring the merits of the electric furnace before the central-station industry and to call the attention of users of steel products to the advantages of this process over all others, and by so doing, give the central-station power man the powerful arguments for the electric furnace that are evident to all familiar with the subject.

There are a great many manufacturers selling so-called steel castings, that are no more than cast iron, and if you were to attempt to forge such steel, it would be about like trying to forge a china vase. But if it be true steel, whether in the form of rails, beams or castings, it can be forged. Armor plate is first cast and then forged and rolled to size. The chemical analysis as usually made, is not a sure guarantee of the nature of the material or its method of manufacture, and such materials should be subject to a forge test to distinguish between cast iron, steel or wrought iron; this test will also give much information as to the quality of genuine steel.

Steel in an electric furnace can be made to any specifications and analysis, the furnace being at all times under the control of the operator, who is not required to do the guess work required with other methods of steel manufacture, and the steel is not only purer chemically, especially as regards sulphur, but castings poured from it have a higher static value for the same composition than those made commercially from any other process. Their tensile strength is greater, and the elastic ratio decidedly higher, and in many cases, equal to acid open-hearth castings with vanadiun, other conditions being equal. It is also proved that dynamically electric-furnace steel castings surpass any other kind with similar conditions.

Eminent authorities affirm the opinion that the purer the steel, the better its properties and that the superior purity of electric-furnace steel is unquestionable.

Types of Furnaces Available.

There are several makes of furnaces commonly used in this country, all of which operate on the same general principles,

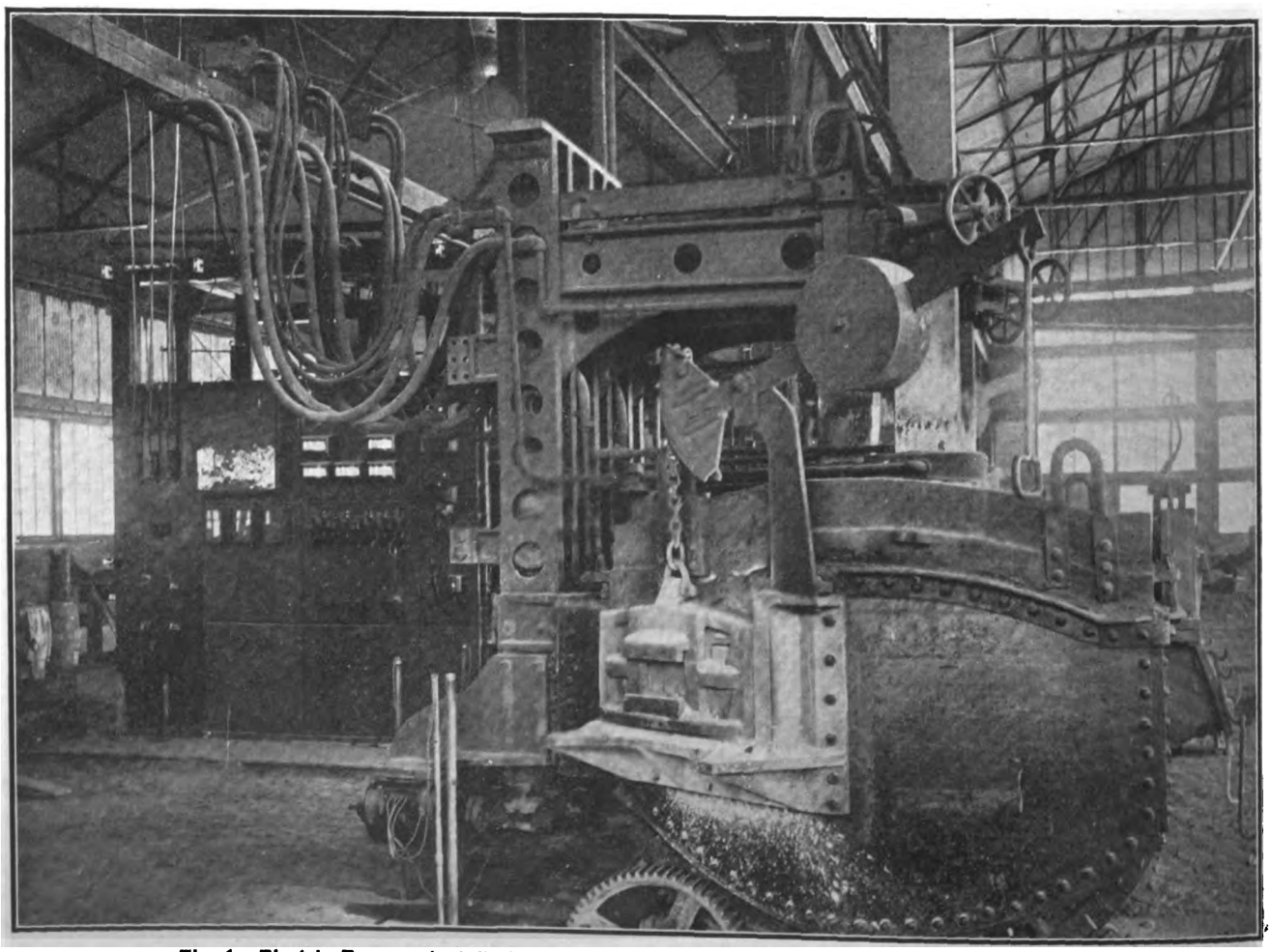

Fig. 1.—Electric-Furnace Installation at Plant of Treadwell Engineering Company, Easton, Pa.

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namely, the use of the electric arc, but with different arrangements of the electrodes.

In the Snyder single-phase furnace, as will be noticed by the diagram in Fig. 2, the movable carbon is placed in the center

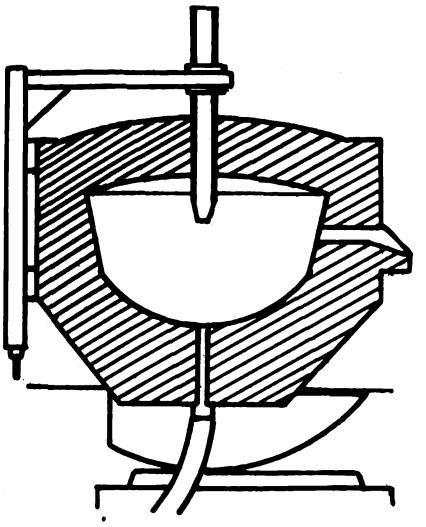

Fig. 2.—Diagram of Single-Phase Furnace.

of the top and is fed to the charge or bath by either hand or motor operation, while the other electrode is placed in the bottom and comes in contact with the charge and bath. The claim for this type is that the bottom of the bath is just as hot as the top and there cannot exist any cool spots in the bath during the refining process.

The Heroult furnace is a three-phase furnace and it will be noticed by referring to Fig. 3 that the electrodes all pass through the top in the form of a triangle and give a well balanced load on a three-phase system.

In this type of furnace, the heat is distributed through the bath by the movement of the molten metal constantly passing under the arc. It has given excellent results in connection with the refining which is the most important function of the electric furnace.

There is another type of furnace known as the Rennerfelt electric furnace made for two-phase operation. It will be noticed by referring to Fig. 5 that two electrodes enter the side and two electrodes enter the top which are adjustable, controlled either by hand or motor.

It is claimed in this type of furnace, due to the relative position of the arcs, that a wider distribution of heat is secured and that it combines the advantages of the single-phase and three-phase furnaces. This is a question to be proved in America, but this furnace has been used extensively in Sweden for a number of years.

The electrodes used can be either carbon or graphite. The latter has about twice the conductivity of the former for both electricity and heat. The graphite electrodes are more expensive than carbon but from the experience gained by some operators of electric furnaces, the graphite electrodes are to be preferred, due to their economy and conductivity.

These furnaces are lined with a special refractory material imported from Europe which is put in cold instead of being burned in, as are open-hearth bottoms. When new bottoms are put into an electric furnace, it is customary to melt a wash heat of cast iron and carry it to a high temperature to set the bottom into a solid mass. If holes appear in the bottom, they can be patched by running the metal out by tilting and placing the patch.

The load-factor and power-factor on the electric furnace are high. The load-factor will depend on the tons output and whether the charge is made hot or cold. In cold charging the load-factor is not quite as high as when hot charging is used. The power-factor on the electric furnace will run at 90 per cent, which is much higher than for the same capacity of motor load and is much in its favor for central-station loads.

The Treadwell Engineering Company, of Easton, Pa., foresaw five years ago the possibility of the electric furnace, and its judgment has proved beyond measure the advantage of electric steel. This furnace is of the Heroult type, two-ton capacity, operating 24 hours per day and it is still unable to fill the demands for the product.

This furnace is shown in Fig. 1 and output will be increased by an additional four-ton furnace and a further increase of 150 horsepower in the machine shop, making an increased load of 900 kilowatts. This installation is cited as an example of the type of plant having use for electric furnaces and the following short description may prove interesting.

The Treadwell Engineering Company manufactures in the electric-steel department, magnetic steel, automobile parts, gear cases, cement-mill castings, and special steel castings of any analysis. It is important to call attention to the high magnetic qualities of electric steel for the manufacturer of electrical apparatus.

The company employs 500 men, operates 24 hours per day, in the steel department and machine shop. In the machine shop and iron foundry there are manufactured hot metal and slag cars, rolling-mill machinery, sugar-mill machinery, hydraulic forcing presses and special design work.

The maximum demand of the furnace is 400 kilowatts, of the machine shop 382 kilowatts, a total of 782 kilowatts.

In the operation of the electric furnace when starting, the arc on a cold charge will, for short periods, draw 600 kilo-

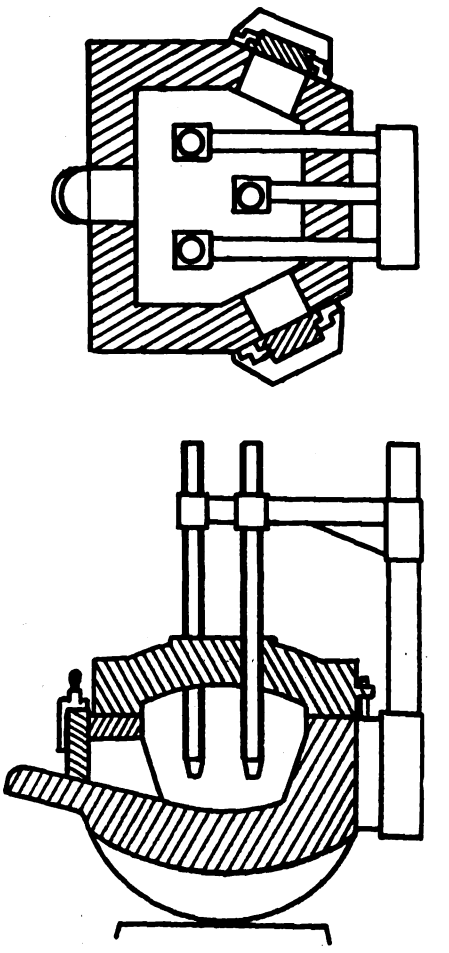

Fig. 3.—Diagram of Three-Phase Furnace.

watts. After the arc is well started, this drops to 400 kilowatts, but during the melting down of the metal, short fluctuations may occur, due to the arch of metal breaking down and increasing the height of the bath; these are very short swings and are not of serious consequence to a fair-size electric system. In small power plants where these fluctuations may prove serious to the system, it is recommended that reactance coils

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of proper size be placed in the primary circuit. In that way it makes it possible for the small central station to handle such loads without serious disturbance.

There are many and various claims of electric-furnace manufacturers as to the energy required for the production of electric steel. but the writer's experience indicates 200 kilowatts demand per ton of furnace capacity, and with a cold charge in the furnace, melting and refining between 800 and 850 kilowatt-hours per ton of steel produced. These furnaces are sometimes charged with hot metal or metal in the molten state, having been brought to that state in an ordinary cupola or other melting furnace and then refined by the electric process. This method has some advantages, namely, the absence of the fluctuations on the electric system, the reduction to 350 to 450 kilowatt-hours per ton of output and the increasing of the output of the furnace about 60 per cent.

The last method is to be employed in a six-ton electric furnace to make high-grade tool steel, for which furnace the writer recently closed a contract. This furnace is being installed by one of the best known men in the United States, and his statement was that there is no method of steel manufacture today that can even approach the quality of electric-furnace steel, and that we are just beginning to realize the importance of electric refining of steel.

Electric-Steel Castings.

Electric-steel castings are not to be confused with steel castings that are used in the manufacture of electrical machinery.

They are product of the electric furnace and take their name from the process by which the steel is made, just as open-hearth, tropenas and crucible-steel castings take their names from the respective processes by which they are made.

Electric steel castings are cast directly from the refined product of the electric furnace.

The Treadwell Engineering Company designed and built complete the electric furnace which it uses. This furnace is an arc furnace of the Heroult type. It was put in operation on August 14, 1911, and is, as far as we know, the first electric furnace installed in the United States for the sole purpose of producing steel castings as a commercial product.

This furnace is of two-ton capacity per heat, and can make three to four heats per day of 24 hours.

The electric energy is purchased and is alternating, three-phase, 60 cycle, and delivered to the plant at 11,000 volts. It is transformed for use in the furnace to about 80 to 85 volts, 2,500 amperes.

The raw material used in the furnace consists of about equal quantities of heads and gates from castings of previous heats and steel scrap purchased in the open market. The furnace is basic lined with magnesite brick.

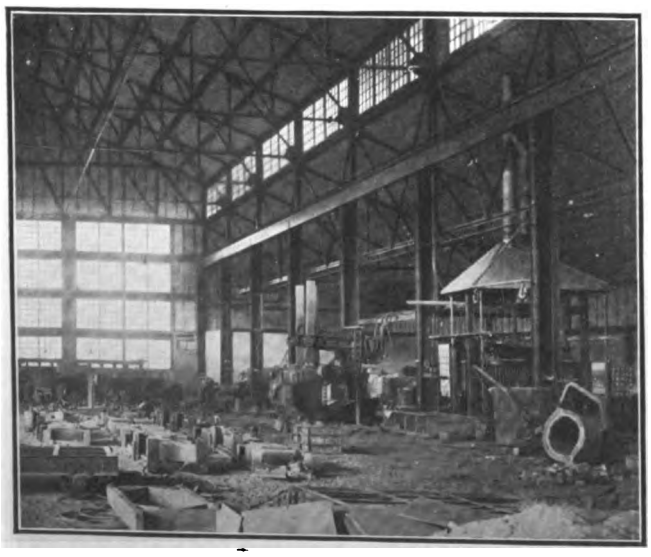

Fig. 4.—View of Furnace and Transformer Installation.

The reactions in the furnace are all very similar to that in the basic open hearth, with the exception of the period of deoxidation.

Once the charge is melted, an oxidation or refining by oxidation takes place, which results in the removal of the carbon,

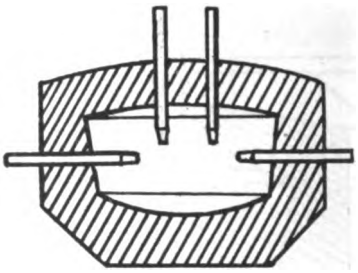

Fig. 5.—Diagram of Two-Phase Furnace.

manganese, silicon and phosphorus, together with a small part of the sulphur. The slag formed in this first period is removed by tilting the furnace.

Charcoal is then added for re-carbonizing, together with lime, fluorspar and ferro-silicon, to produce the deoxidizing and desulphuring slag.

Ferro-manganese and ferro-silicon are added to the bath to give proper contents of manganese and silicon.

The current is turned off, and the furnace tilted to an angle of forty-five degrees from the horizontal and the contents teemed into a puring ladle, from which the castings are either poured directly or by means of small ladles and shanks.

The Henry Souther Engineering Company made one-half dozen tests on some of the specimens, with the following results:

Revolutions.	Load, Pounds.	Fiber Stress per Square Inch, Pounds.	Deflection, Inches.	Revolutions.
12,557,500	80	28,700	0.03	12,557,500
6,211,700	110	38,870	0.05	10,001,600
(Broke)	140	49,470	0.07	3,019,700 (Broke)

Chemical Analysis.

With the electric furnace it is possible to remove all but traces of phosphorus and sulphur, but this is not general practice.

The analyses given below are typical of steel entering into castings:

Silicon	0.44	0.58	0.29	0.44	0.29
Manganese	0.48	0.22	0.43	0.58	0.66
Phosphorus	0.017	0.015	0.023	0.022	0.017
Sulphur	0.012	0.014	0.015	0.015	0.012
Carbon	0.22	0.11	0.19	0.19	0.21

The low phosphorus and sulphur is rather noteworthy, in view of the fact that no special care is required in the selection of the raw material. The carbon is purposely maintained low to insure the easy machining of and ductility in the castings.

The following physical tests are in every way characteristic of the steel produced by electric furnace.

The carbon ranges from 0.16 to 0.23 per cent.

TESTS OF UNANNEALED STEEL.

Maximum Strength Pounds per Square Inch.	Elastic Limit Pounds per Square Inch.	Reduction of Area, per cent.	Elongation in 2 inches per cent.
66,500	36,300	43.8	28.0
66,300	36,200	48.9	31.5
65,800	44,900	51.0	29.5
Three following tests are of the same bars when annealed:			
70,500	56,200	24.0	21.5
71,400	52,000	40.8	25.0
66,800	50,000	34.2	27.0
The following test is of 0.40 carbon annealed steel:			
88,600	62,600	15.1	16.5

Faribault Packing House to Use Electricity.

The Northern States Power Company, at Faribault, Minn., has secured a five-year contract with the Faribault Packing & Provision Company, covering electrical power for the operation of the new plant which is being erected in Faribault. The power load will be approximately 360 horsepower.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING FOR SERIES LIGHTING CIRCUITS.

By Terrell Croft.

In constant-current series lighting systems the lighting devices are all connected in series or tandem, as shown in Fig. 1. The current in such a series circuit may be impelled by either a direct-current series lighting generator, or by an alternating-current constant-current regulator. Series lighting circuits are used extensively for exterior lighting. Modern installations are almost invariably alternating current, which means that, in most cases, the series lighting circuit is fed through a constant-current regulator. Either a constant-current regulator or a series lighting generator has the property of maintaining the current in the series circuit which it serves practically constant.

For example, many series lighting circuits operate at 6.6 amperes, that is, the regulator or generator which feeds this circuit is so designed that it will, within the range of its operation, maintain the current in the circuit at 6.6 amperes, regardless of the number of lamps connected in series in the circuit. Obviously then, as more lamps are connected into the series circuit, the voltage impressed by the regulator or generator on the circuit is increased. As the number of lamps connected to the circuit is decreased, the voltage impressed by the regulator or generator decreases correspondingly. It is apparent then, that the voltage impressed on a circuit by a constant-current generator or regulator may be very high. For example, the drop across an ordinary series arc lamp is in the neighborhood of 50 volts. Hence if 100 such lamps are connected in series in a circuit and current is impelled through them by a generator or regulator, the generator or regulator must impress 5,000 volts on the circuit.

The currents used in constant-current lighting circuits have been standardized in this country. The following currents are used: 4.0, 5.5, 6.6, 7.5 and 10.0 amperes. Probably a current of 6.6 amperes is used more extensively than the others. By 6.6-ampere circuit is meant one, the current in which is at all times (within the limits of its capacity) maintained at an intensity of 6.6 amperes by the regulator or generator serving it.

The disadvantages of constant-current systems for inside installations are that the voltages involved may be, and usually are, excessively high, which engenders excessive fire risk and constitutes serious life hazard.

Constant-current systems are seldom used for interior illumination. A number of years ago series arc lamps and series incandescent lamps were applied for inside lighting, but multiple arc lamps superseded the series arc lamps and multiple incandescent lamps have now largely superseded multiple arc lamps, so that the application of series or constant-current circuits for interior wiring is limited. Occasionally series tungsten incandescent lamps are used for interior illumination, but inasmuch as, on the whole, results as economical and satisfactory and involving less fire risk, can be obtained by using multiple or constant-potential tungsten lamps, the series system is now seldom applied for inside service except in special cases.

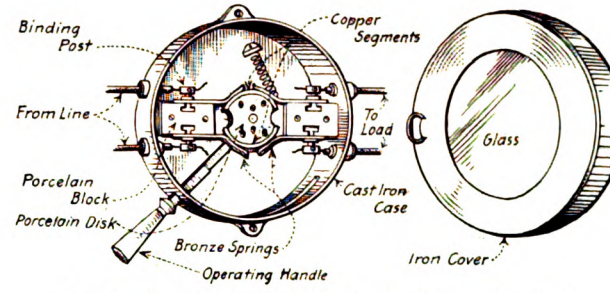

Fig. 2.—A Series-Circuit Service Switch or Cut-Out.

Approved rubber insulation is required on interior conductors in constant-current systems for the reason suggested above, namely, that the voltage between the conductors of a constant-current system and ground may be very high, which renders it imperative that the most effective insulation obtainable should be applied. Code rule 50 outlines the specifications for approved rubber-insulated conductors for different operating voltages.

To cut a series lighting device out of circuit, a shunt is arranged around the device. For example, if the series lighting circuit of Fig. 1 is in operation and it is desired to extinguish the incandescent lamp L, the closing of the switch S would effect the desired result. The resistance of the circuit through the switch would be so very much less than that of the circuit through the lamp, that, with the switch closed, nearly all of the current in the circuit would pass through it, and practically none would pass through the lamp. Then, to again illuminate lamp L, switch S would be opened. When lamp L was shunted out of the circuit the total resistance of the series circuit is decreased by the amount of the resistance of lamp L and consequently a smaller voltage at the constant-current regulator or generator would be needed to maintain the constant current, on which the circuit operates (for example, 6.6 amperes); hence, when lamp L was shunted out the voltage impressed by the regulator or generator would decrease just enough so that the current in the circuit would be maintained at 6.6 amperes. By closing the switch S_1 the five incandescent lamps and the one arc lamp contained in the

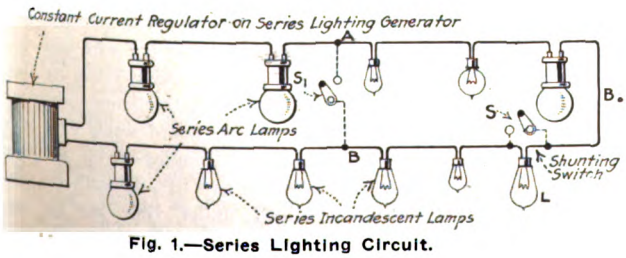

Fig. 1.—Series Lighting Circuit.

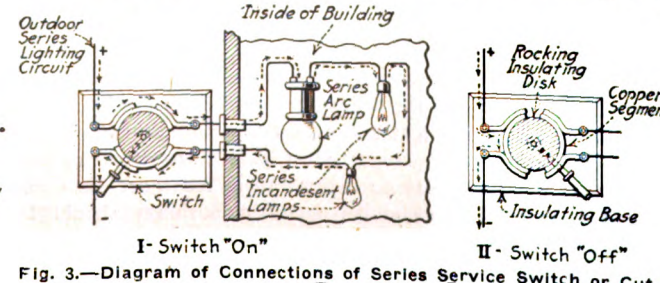

Fig. 3.—Diagram of Connections of Series Service Switch or Cut-Out.

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portion of the circuit *A B C* would be shunted out. Obviously a series circuit cannot be opened to extinguish any one lighting device in it, because if the circuit is opened *all* of the lamps in the circuit would be extinguished.

A double-contact service switch should be provided at every

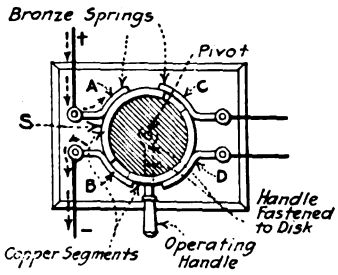

Fig. 4.—Intermediate Position of Series Service Switch.

point where a constant-current circuit enters a building. Such a switch has the same function as any service switch, that is, by its operation, the wiring system in the building will be entirely disconnected from the source of voltage. It is of great importance that devices be provided whereby firemen can disconnect all wiring within a building from the outside circuits in case of a conflagration.

A double-contact series-circuit service switch is illustrated in Fig. 2. The principle of its operation is illustrated in Figs. 3 and 4. These diagrams show only one particular type of switch, but indicate the general principle involved in all types. As outlined above, a constant-current regulator or generator tends to maintain the current in the circuit which it is feeding, constant under all conditions, hence if a series circuit is opened, the regulator or generator serving it will tend to drive the normal current of the circuit (for example, 6.6 amperes) through the excessively high resistance open. Thereby a very high voltage, probably several thousand volts, will be impressed across the open. When this occurs, a vicious persistent arc results. It is obvious that, because of this, series-circuit service switches must be arranged so that they disconnect the wiring inside of the building without opening the circuit. Fig. 3, *I*, shows the switch of Fig. 2 in such a position that the current from the outdoor-series-lighting circuit flows through the arc lamp and the two incandescent lamps in the building as shown by the dotted arrows. Now if the switch is thrown to the position of *II*, then no current passes through the building—it flows through the copper segment on the rocking disk as shown by the arrows. Note, from Fig. 4, that as the switch is thrown from the position of *I* to that of *II* the series circuit is at no time open, because the copper segment, *S*, forms a shunt between springs *A* and *B*, thus making a complete shunt around the interior wiring, before springs *C* and *D* are disconnected from the outside series circuit.

Constant-current circuit wires should, in general, not be con-

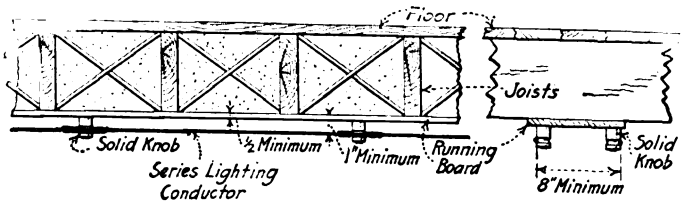

Fig. 5.—Arrangement of Running Board for Series Lighting Circuit.

cealed. The voltages impressed on these circuits may be and are often so high that the conductors should always, insofar as possible, be in plain sight and subect to continual supervision.

Obviously where the wires must pass through floors and partitions it is necessary to conceal them for short distances. In such locations substantial porcelain bushings should be placed around the wires.

Constant-current circuit wiring is usually supported on porcelain insulators, which give clearances between the wire and the surface wired over of at least one inch, as shown in Fig. 5. In the United States it is the almost universal practice to use No. 6 wire for both interior and outside series lighting circuits, because smaller wires, although they might carry the current in accordance with the tables of Rule 18 without excessive heating and without excessive drop, would be mechanically weak and unsafe. The No. 6 wires are usually tied to solid knobs with tie wires. Sometimes cleats are used. While wires in low-potential systems may be carried as specified in Rule 26*h* as close together as 2.5 inches and one-half inch from the surface wired over, experience has shown that it is desirable, because of the high voltages involved, to carry constant-current system wires no closer together than 8 inches and at least one inch away from the surface wired over. Where the knobs are supported on a plaster wall, it is always desirable to place under them wooden blocks or cleats as shown at *A* and *A*, Fig. 6, to prevent a side strain on a knob from forcing one side of it down into the plaster, which would, par-

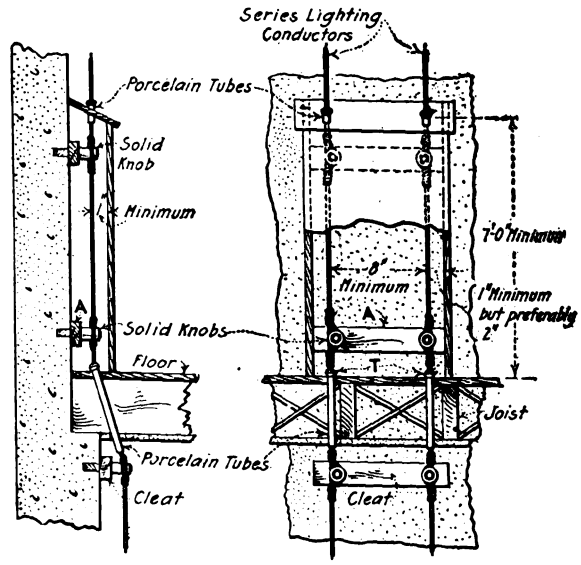

Fig. 6.—Protective Boxing for Series Lighting Conductors.

ticularly if the knob is located at a corner, permit the wire to sag.

Boxing on side walls for series circuit conductors may be arranged about as shown in Fig. 6. Such a protective casing should always be provided where it is necessary to carry these conductors through or near the floor on the interior of a building. Note that the top of the box is inclined so that dust and rubbish will not collect thereon. Frequently it is desirable to raise the heads of the tubes *T* a couple of inches above the surface of the floor by inserting blocking under them or by other means, to prevent the possibility of moisture entering them.

Running-boards or guard strips for constant-current circuit conductors should always be provided where the conductors are carried across floor timbers. Fig. 5 shows the arrangement of a running-board for this service. While the Code specifies a minimum thickness of one-half inch for these running-boards, they should not be less than seven-eighths inch thick. (In Rule 16*b* it is specified that a screw or nail holding a knob must penetrate the wood a distance equal to one-half the height of the knob. It is apparent that to provide the one-inch separation required between one of these wires and the surface, the knob for supporting the wire must have a height greater than one inch; in fact, such knobs are about 1.25 inches high, hence to provide the minimum penetration specified under Rule 16*b* the running-board would have to be at least five-eighths inch thick.) Running-boards for these constant-current circuit conductors are of practically the same construction as those described under Rule 26*e* for low-potential multiple circuits, except that a greater clearance between wires and between each wire and the surface wired

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over is necessary with the series circuit wires. Guard strips for series-circuit conductors can be made as described under Rule 26*e* for low-potential circuits, except that for the constant-current conductors, the greater clearances which are specified above are necessary.

Incandescent lamps on constant-current circuits, as hereinbefore suggested, are sometimes applied for inside illumination. In modern series-circuit installations, gas-filled tungsten lamps are almost universally used. The series vacuum tungsten lamps

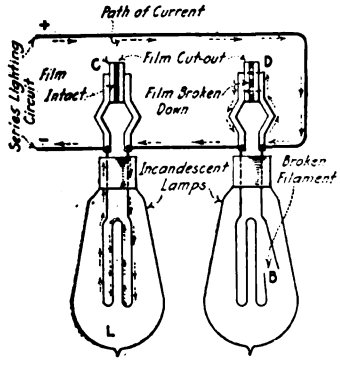

Fig. 7.—Operation of Film Cutout.

have been almost entirely superseded and the carbon series lamps which were once extensively applied are no longer manufactured.

Each incandescent lamp must be provided with an automatic cutout. While this rule applies specifically to interior lighting installations, it is also the universal practice to provide every incandescent lamp in a series lighting system with an automatic cutout or an equivalent arrangement.

The function of the automatic cutout is to prevent an excessive rise in voltage and a destructive arc across the terminals of the lamp when its filament breaks. As intimated above, an extremely high voltage is impressed across an open in a series circuit. Therefore, if the filament of a lamp, which is in service, breaks, a great difference of potential is impressed across the break, creating an arc which is likely to originate a fire. The cutout also prevents interruption of service to other lamps on the circuit.

The operation of the automatic cutout can be understood from a consideration of Fig. 7, which shows a portion of a series circuit containing two lamps. The cutout itself (*C*, Fig. 7, and *IV*, Fig. 8) consists of two aluminum disks separated

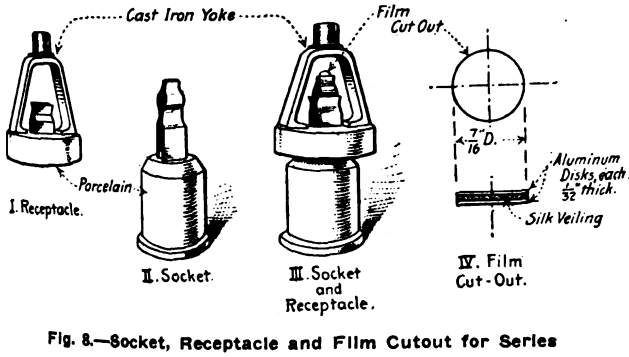

Fig. 8.—Socket, Receptacle and Film Cutout for Series Incandescent Lamp.

from one another by a leaf of thin silk or similar insulating material. One cutout is provided for each lamp, as shown at *C*, Fig. 7, and is inserted between a couple of spring clips with which each lamp is fitted, so that the silk insulating film is in shunt across the lamp terminals. Normally, no current passes through the film cutout. The current passes through the lamp, which is in shunt with the cutout, as shown at *L*, Fig. 7. However, if the filament of a lamp breaks (*B*, Fig. 7) a very high voltage is then impressed across the thin film of silk in the cutout and the silk breaks down (is punctured by the high voltage) as shown at *D*. The arc that forms through the silk at the instant of the breakdown melts a little of the metal of the disks, which bridges the minute gap, thus completing the circuit. The lamp *B* (Fig. 7) is thereby shunted out of the circuit, but all of the other lamps on the circuit burn.

The details of an automatic cutout device are shown in Figs. 8 and 9, which indicate the construction used by the General Electric Company. The silk veiling used for the film (*IV*, Fig. 8) is very thin, less than 0.01 inch thick probably. Its thickness has been exaggerated in the illustration. The veiling is cemented in place between the two aluminum disks with insulating varnish.

Note (Figs. 8 and 9) that the arrangement of the contact springs is such that the series circuit is never opened when

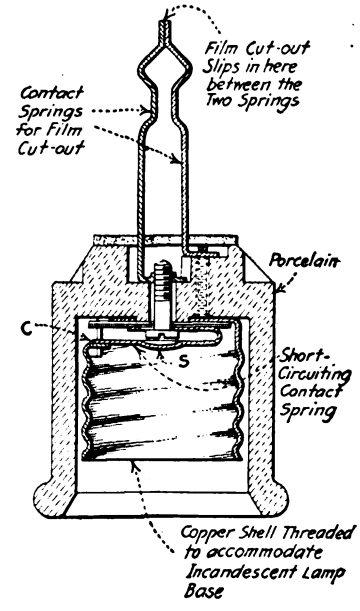

Fig. 9.—Socket for Series Incandescent Lamp.

a lamp is being removed or replaced. Hence a lamp can be removed from a receptacle and a film cutout placed in its clips while the circuit is in operation. Furthermore, note from Fig. 9 that an incandescent lamp can be unscrewed from a socket without opening the circuit because as the lamp is unscrewed, the spring *S* follows it down and closes the circuit at *C* before the lamp base is entirely out of the shell. The film cutouts are usually designed so that they will break down when a difference of potential of 150 to 200 volts is impressed across them.

Interior series incandescent lamps should be supported by a stem or tube, that is, they should be held up by a sort of a fixture arranged from a hanger board. The fixture should be so constructed that the entire weight of the lamp socket and accessories will be assumed by the stem. Then no appreciable stress will be imposed on the binding posts or lead wires. This provides insurance against breakage. Furthermore, the conductors to the lamp should be carried inside of the stem, which protects them from interference.

Electromagnetic switching devices and multiple-series or series-multiple lighting systems fed from constant-current circuits should not be used because experience has shown that they not only are unreliable in operation, but that they may be the source of great fire hazard.

Series incandescent lamps should not be attached to gas fixtures, because of the great liability to accident that would result. Gas fixtures are always grounded on the gas pipes connecting to them. Furthermore, there is usually a considerable difference of potential between a constant-current lighting system and ground. Because of this, an arc is liable to occur if a charged series-lighting-circuit wire contacts with a ground pipe. On a gas fixture, such an arc might melt a hole in the pipe and ignite the gas.

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Organization from the Manager's Standpoint

By George W. Hill

In this article, which is the fourth of a series dealing with matters of deep business interest to electrical contractors, Mr. Hill points out some of the most important features that the business manager must consider in laying out his own work and organizing his staff of subordinate employees. The suggestions made for a successful business organization are of value to the small contractor as well as to the large contracting firm. Another article by Mr. Hill on "Direct-Method Job Cost" will appear in an early issue.

Too much detail makes a clerk out of an executive. The lack of ability to organize forces and to truly supervise seems to be the stumbling block of many men who would otherwise be truly great in the business world. No man is worth more than a dollar and a half from his collar down.

Those seemingly very busy men who never have time to stop and listen to a proposition or perhaps do not find time to look up to see whether the caller is black or white, usually surround themselves with an abundance of help and then seemingly either, for the purpose of showing their employees who's the boss, or to impress others with their importance or "busyness," insist upon looking after 90 per cent of the details of the business.

These men are not great in the eyes of the truly great, but are looked upon as being more or less of the four-flusher type, even though this may not be true. The writer believes in the four basic factors in business, which are: have a perfect understanding of yourself, of your patrons, of your business or proposition, and apply this knowledge to the point of producing sales and rendering service. Men may know their business without handling all of the details connected with it. The writer believes that every business man should know his business thoroughly, to the extent of being able to surround himself, from a study of human nature and his business, with employees who may direct and perform the duties of the different departments. I have known some men in business who have worked hard from early morning until late at night, yes, even come down to their office after supper and work way into the night, who never have a moment to spend with their family, never are seen at any social gathering, haven't time to attend the club, much less become a member, who have never been known to take a vacation, yet with all their hard work, they never get anywhere in the business world. The answer is easy. These men are doing the work which should have been done by a clerk, and overlooking many important propositions due to the lack of time to consider them. These very busy men waste a tremendous amount of energy and disobey so many of the laws of nature that they pay the penalty in poor health and oftentimes failure in business. There are thousands of men who are digging their graves with their teeth or wearing away the tissue by nervously attempting to do too much.

We find that the men who are really doing the great things in the commercial world are those who seem to have their desks "cleared for action" and are like the man who sits back in an easy chair in a calm and collected manner and after greeting the caller, leisurely lights a cigar and says, "Well, sir? What can I do for you today?" This man is in a frame of mind to pass good judgment on any proposition and usually lets you do the most of the talking. He is in a position to view your proposition from every angle, and determine the value of it as applied to his business. Outside of the private office of this man of apparent leisure you usually find any amount of activity. He is using his brains in finding something for others to do which will not only make employment for others but money for himself.

How can we bring about that condition in our institution? In the first place, if our business is a large one, we must have it divided into departments. Then employ a thoroughly competent specialist in each department to direct it, making the department head responsible for results in his department. In this way your business becomes several small businesses and each is placed more or less upon a competitive basis as to results produced.

Too many seemingly busy men have the idea of making money so imprinted on their brains, and can see the dollar they are after just now so plainly that they overlook many in the distance. How many men really look upon themselves as being in business purely for the purpose of rendering a service to their patrons?

Service is the great principle underlying all human endeavor. Reward (money) is the result of service rendered. If men are to render true service to their patrons, they must, in the case of a good-sized concern, surround themselves with competent assistants, then instill into the minds of the employees that their future welfare and the welfare of the institution depends upon the quality of the service rendered. The rewards will depend absolutely upon the quality, amount and manner of service. In order to build great institutions which will render service we must surround ourselves with those who are capable of rendering service, which is the sustaining power of satisfaction, the support upon which rests confidence, the foundation of all business institutions.

We must look carefully to the quality, amount and manner of our service. If we have these three elements in our business right, the business will require less direction and consequently this lessens the details to be looked after by the manager.

There is a vast difference between the definition of the words supervision and direction. The overworked manager that is the day-and-night fellow burning the candle at both ends has not yet discovered the difference between these words.

To Insure Neat Work in Wiring Old Houses.

In looking over the work done by electricians in wiring or rewiring old houses, I have been surprised to find that many are not acquainted with the following simple practice.

Before replacing moldings, baseboards, etc., that have been removed to permit the running of wires in wiring old houses, the nails should be cut off flush with the back of the moldings or baseboards and new finishing nails of small diameter used to refasten the baseboards or moldings. If the old nails are driven out, they generally check or mar the finish of the baseboard or molding, which is eliminated by letting them remain and using new ones.

R. F. Cooke.

Filing Copper.

The electrician is frequently called upon to file copper connections, in wiring switchboards particularly. When using a file on copper the teeth easily become filled or choked, making the file ineffective in a short time. There are two ways of preventing this. One is by using a little chalk on the file teeth; this prevents the copper filings from adhering and choking up the teeth. Another method is to use backward strokes of the file for the finishing touches.

Robert Oster.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

SUGGESTIONS FOR TURNING SURPLUS STOCKS OF APPLIANCES INTO CASH.

Methods of Interesting and Educating the Public to the Usefullness of Electrical Devices.

Electrical devices that are "slow sellers" are found in every salesroom. For good and sufficient reasons these articles do not move. As a general rule it is not the article itself that determines its non-sale; usually its usefulness is not being properly presented, or in some cases a large field for the application of a certain device is lacking, perhaps due to local conditions that cannot be circumvented. The appearance of some appliances makes their usefulness readily noticeable, and their application easily understood. The difficulties met with in displaying these devices is not so great, but to insistently flag the attention of the public to a device that is not easily understood by the layman, and to make its application clearly apparent requires ingenuity.

Suppose, for instance, some jobbers' salesman has illuminated to you the merits and application of an immersion heater. The article is neat, compact, does its work quickly, cleanly and well, and you, understanding it perfectly, are led to believe its use should become almost universal among those who use electrical devices and you see no reason why you should not assist in the distribution, with accompanying profit to yourself. You order a stock, not a great many—just enough, you think at the time. The heaters arrive and you include one or a number in your window display, properly marked "Electric Immersion Heaters," and priced. What does the pedestrian that is attracted to your window see? A nicely polished, nickel-plated tube with an arrangement for connecting it to a lamp socket or wall outlet. What does he know about it? He reads, "Electric Immersion Heater, Price ——." He probably knows what the dictionary meaning of those words are, and he knows just how much money the figures represent. But what will the device heat, how quickly will it heat, what will it cost to operate, and what are the particular uses to which he could apply the article? Does that shiny tube lying there broaden his imagination to include these things and make enough appeal to him to make him step into the store, knowing an inquiry to a salesman about the article will mean that he will place himself under some obligation to buy, even if the heater does not entirely come up to his expectations? Can he, without some suggestion, think of the place in his home where a heater of that sort would be handy? Not unless Mr. Interested Party has a knowledge of, or has been a user of, a number of other electrical devices. Even then he is in no position to make capable judgment of the merit of the heater.

The purpose of display is, first, to attract the attention to your business; second, to let the public know what you have for sale, and, third, to sell goods. The latter includes indirectly the first two purposes. But between the second and third purposes is a wide field for thought, for reason, for ingenuity. It is not so hard to attract attention these days. Anything out of the ordinary accomplishes that purpose. Attracting people to your window shows them some of the stock you have for sale, but the hardest step to get the public to make is the one inside your door. That's the minute the sale begins, if there is to be any. If you are able to make an appeal to the attracted person so strong that he puts his foot inside your door, your display window is working for you. It matters not just what the nature of that appeal is, whether it is to his sense of usefulness, his curiosity, or his pocketbook, just so long as it moves him. Many windows fail of their purpose, simply because the invitation to enter the store is not cordial. No matter how appropriately and carefully some windows are dressed, they convey the impression that the visitor will be "taken in" when he enters the store. The air of stiffness should be dispensed for one of cordiality.

Now, back to immersion heaters and "slow sellers." The stock you had did not move. Your salesmen succeeded in disposing of a few as by-products of other sales, just because they had a chance to explain its usefulness. How to turn them into cash? Suppose you spend some morning in arranging a window display featuring immersion heaters. Not a pile of them in your window, "marked down." But, as an appeal to the usefulness and application of immersion heaters, make a display showing one in actual operation, boiling water for instance. As a novelty, this would attract people. And when you have them there, let them read a card briefly stating the heater's many applications, its first cost and maintenance cost, its length of life, and anything else you think would interest the prospect. But state it briefly and understandingly.

Or, if you wish to trade on the well known sense of curiosity possessed by the public, show the work of a heater, but conceal in some way best suited to your window an actual view of the heater itself. And state on a card the exhibit is being operated by an electrical device which will be explained by your salesmen.

The foregoing are but a few suggestions for a display of heaters. Many more could be made that would draw people to your windows and attention to the device, with the view of turning your stock into cash. And still no hint of saving to the pocketbook of the public, which involves the much used method of disposing of stock by price-cutting means.

The principle, which applies to all "slow movers," including immersion heaters, is to explain the electrical appliances that are not so easily understood, so that anyone who stops at your window may, besides seeing, understand the functions of the numerous devices, and know that the invitation to enter the store is cordial and does not carry an obligation to buy.

Electrical Industries in Spain.

According to the latest statistics published by the General Direction of Contributions in Spain, there are in that country 992 plants producing electric light for the public and 978 such plants for private use; 125 electric plants produce motor power. There are 6 electric lamp factories, while 4 factories are devoted to the manufacture of other electric supplies. The number of electricians registered for the installation of material and apparatus is 361.

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Attention-Attracting Novelties in Window Display.

It has long been demonstrated by successful merchants that light and motion in a window display attract much more attention from passersby than a stationary or unlighted display. Still more attention-compelling is the psychological desire to see novel or mysterious effects. An object suspended in midair without visible means of support, a lamp lighted without wires and similar marvelous phenomena always draw a spell-bound crowd. The merchant who produces a novel effect without direct relation to his particular line of business loses an important element in the drawing power of the display, however.

The electrical dealer, especially if he is also a contractor, has a decided advantage in this regard. In the first place, he can make use of a great variety of electrical phenomena that are interesting and mysterious. In the second place, by producing striking and unique electrical effects he secures not only the attention of curiosity seekers but the appreciation by the public of his demonstrated originality. This has exceptional advertising power in that it shows he can be entrusted with the solution of unusual electrical problems and therefore can most certainly be depended on for the proper execution of the ordinary as well as the more intricate electrical contracting jobs. In other words, it inspires confidence, a most valuable business asset.

A contractor-dealer that has been carrying out these ideas with much success is the Freeman-Sweet Company, 608 South Dearborn Street, Chicago. One of the clever window-display "stunts" recently put on by this firm was described in our issue of February 5, 1916. During last week another unique effect was produced which drew large crowds of interested spectators. This consisted of an opal arc-lamp globe practically full of water in which an incandescent lamp floated tip up. At short intervals the lamp would light up brilliantly and at the same time submerge itself in a very mysterious way. After a few seconds it would again bob up and its light practically fade out. This cycle was continued indefinitely. The only apparent (although really misleading) explanation seemed to be in some wires with bared ends projecting over the edge of the globe, thus giving the idea that the peculiar action of the lamp was due to wireless, or inductive influence.

For the benefit of those readers interested the true explanation is shown in the accompanying diagram. A field coil from an old dismantled motor was placed in a box and within was put an iron core; a small iron pulley that just happened to fit the coil was actually used for this. An iron bolt was put through the box cover into the center of the core and the wires for feeding the lamp run through the cover alongside the bolt. The lamp was connected in series with the coil; the wires were soldered to the lamp base and well protected by rubber tape. To seal the bottom of the globe it was put on a rubber sheet and a layer of sealing compound filled in; an electric soldering iron was used to work the compound well around the edge and about the bolt head to make a water-tight seal. Fastened to the lamp base by a loop over the tape was an iron wire with the lower part arranged in spiral form; this was of just the right weight to keep the lamp about half submerged when the current was off. Connected into the circuit was a Thermoblink flasher which periodically cut the current in the lamp and coil circuit down to a low value. As the current was restored to full value, the coil was energized and the iron spiral with the lamp was pulled down toward the bolt head, a sheet of tinfoil over the latter preventing actual magnetic contact and sticking due to residual magnetism when the current was again cut down to its low value.

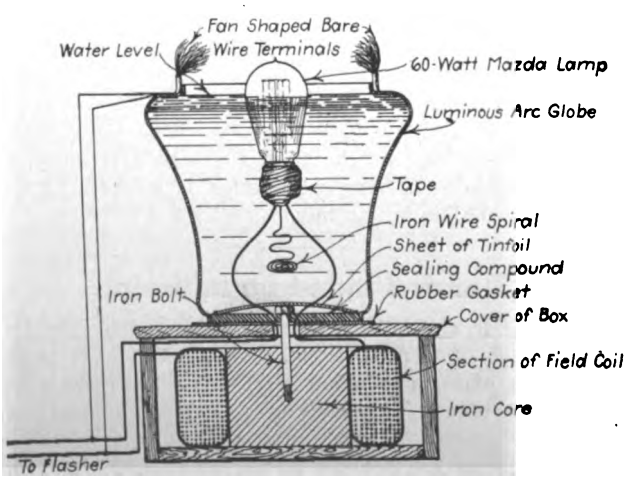

Diagram Showing Principle of Operation of Mysterious Window Display.

The box on which the globe was placed and the wires really leading to the coil and lamp were covered by a cloth, leaving very conspicuous, however, the wires on the outside of the globe to the antenna-like ends. This little display aroused no end of inquiries and incidentally stimulated the sales of all kinds of electrical goods, which was its primary object.

A Method of Interesting the Public in Pedestals and Portable Lamps.

Here is a suggestion for a way to secure some free newspaper advertising, and to create considerable interest in your fixture display room among the people of your community.

It is very well known that a portable lamp loses nearly all of its beauty and individuality when shown among other lamps on a table or counter or in the show window, but when shown by itself a very ordinary lamp appears beautiful and attractive, and gives the prospective customer a very concise idea of how the lamp would appear in a living room or parlor.

J. T. Marron, who is president and general manager of the Electric Construction & Machinery Company, of Rock Island, Ill., has conceived the idea of using individual pedestals for showing portable lamps, and employed the students of the manual training department of the high school to make them.

This scheme can be used as a nucleus around which a clever advertising proposition might be built. A merchant could interest the principal of the high school to the extent of securing certain boys to make pedestals at a very reasonable cost to the merchant. The local papers would publish the facts, giving the name of the merchant, his place of business, as well as the names and addresses of the boys, and make such other comments as would seem interesting. When the pedestals were completed and delivered the merchant could arrange an opening evening, for which special decorations could be made, and he could show the pedestals with a lamp on each and a neatly printed car attached, giving the name and address of the young man who made it. Invitations could be issued to parents to inspect the handiwork of their sons, and also to others who would be interested in the work of the young men.

The local newspapers would probably give considerable publicity to the event, and the merchant would receive benefit in the way of attracting the attention of the public to his place of business.

Free Maintenance of Electrical Appliances.—The Holyoke (Mass.) Gas and Electricity Department has inaugurated free maintenance service, by which minor repairs to lighting and domestic apparatus will be made gratis between 8 a. m. and midnight.

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National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
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Executive Committee
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"LET THE CODE DECIDE."

Secretary's Message.

At the January meeting of the Western New England Section, which was held in the assembly room of the Insurance Institute, at Hartford, Conn., and which was called to order at 10 a. m. by Vice-President Hopkins, of Springfield, 17 members were present. Several representatives of the Massachusetts and Connecticut Electrical Contractors' Association were present as guests. A paper was read by Thomas H. Day which will be referred to later. Section President G. W. Perry resigned his office and Allan W. Hopkins, of Springfield, Mass., was elected president for the balance of the term. L. H. Heebner, of South Manchester, Conn., was chosen vice-president to succeed Mr. Hopkins, and A. H. Soper, of Hartford, replaced Mr. Heebner on the Executive Commmittee as chairman. Lunch was served at the Hartford City Club and the afternoon session, beginning at 2 o'clock, was devoted to the Question Box.

The Eastern Massachusetts Section held its regular monthly meeting on Friday, February 11, at Young's Hotel, Boston, 30 members out of a total of 39 being present. Thomas H. Day, of Hartford, was present as a guest and repeated the paper on "Concentric Wiring" previously read at the Western New England Section.

Mr. Day had with him a large assortment of English and all available American fittings, with other illustrative matter obtained by him from Europe. The paper, which is given below, was exceedingly interesting and precipitated a considerable discussion, participated in by Commissioner Cole, of Boston; Commissioner Fuller, of Somerville; Supervisor Knight, of Worcester; Messrs. LeBaron, of Arlington; Briggs, of New Bedford; Davis, of Brookline; Smith, of Concord; O'Hearn, of Cambridge, and others.

Dinner was served before the business session, and all enjoyed the meeting extremely.

The following gentlemen were elected to membership at this or the previous meeting: Joseph Couilliard, of the New England Insurance Exchange; S. J. Haskell, inspector of wires, city of Leominster, Mass.; C. W. Hanscom, inspector of wire, Quincy, Mass.; A. L. Holbrook, city electrician, Waltham, Mass.; O. J. Welch, inspector of wire, city of Newburyport, Mass.; A. G. Sias, inspector of wires, Reading, Mass.; W. E. Cade, chief of fire department, Wakefield, Mass.; J. B. Warner, inspector of wires, Milford, Mass.; H. E. Small, city electrician, Haverhill, Mass.; George Jason, inspector of wires, Cohasset, Mass.; H. S. Weeden, City Hall, Fall River, Mass.

On account of the length of this paper by ex-President Day, which it does not seem advisable to break into two parts, no questions are printed this week. The Secretary has, however, two very interesting ones which will appear in the next issue of this department, one dealing with protection of a five-wire, quarter-phase star circuit, and the other involving the question of grounding of service conduit as called for in the 1915 Code. This latter matter apparently has not been everywhere correctly interpreted, since up to date the Secretary has received what is practically the same question in different wording from five different inquirers.

CONCENTRIC WIRING.[1]

By Thomas H. Day.

When we approach tomorrow, with its uncertain problems, we should be guided, somewhat, by the experiences of yesterday. By way of approach to our subject, that of "Concentric Wiring," I should like to begin with yesterday and engage for a little while in a little history.

Some of you gentlemen can doubtless recall the introduction of electricity for interior illumination. It began after I began my working life. Its introduction was soon followed, in 1881, by a number of fires. This experience was not localized but was general, having followed the introduction of a new art, which has since developed into a science. At that time there were 65 installations of electric lighting in mills insured by one class of fire insurance companies in New England. In six months 23 fires from electrical causes occurred among the 65 installations. This experience was expensive and excited comment and attention, and presented a hazardous and alarming condition of affairs.

The fire underwriting interests did not attempt to discourage the use of electricity, but endeavored to safeguard this new science. The New York Board of Fire Underwriters in 1881 issued the first rules for the installation and use of electricity, other fire underwriting associations following with added rules as new experience was gained. This somewhat independent method of issuing rules resulted in a very short time in confusion and conflicts of opinion. What was demanded in one place was frequently prohibited in another. Frequently requirements specified supplies which were not on the general market, but interested parties had framed them in some local rules promulgated near to the place of their manufacture.

On October 20, 1881, or one day later than the action of the New York Board of Fire Underwriters, a circular was sent out by the Boston Mutual Manufacturers' Fire Insurance Company, which called attention to the new hazard. In January, 1882, the New York Board of Fire Underwiters issued a very brief circular containing rules for the installation of electric lights, and at about the same time the Boston Mutual Manufacturers' Insurance Company issued circulars on the same subject. These rules pertained to arc-light installations only.

It was not until May, 1882, that the National Board of Fire Underwriters issued its first rules for the installation and use of electric lights. These rules were later adopted by the Boston Board of Fire Underwriters. We find that the New England Insurance Exchange issued its first rules in August, 1885. From this time to the early part of 1892 rules were issued by a number of interests, even an organization of salesmen was actually formed for the purpose of formulating rules. You can now see, in part, the confusion which these rules frequently conflicting created.

In 1892 an effort was made by a number of representatives

1 A paper read before the Western New England and Eastern Massachusetts Sections of the National Association of Electrical Inspectors, Hartford, Conn., January 12, 1916, and Boston, Mass., February 11, 1916.

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from various underwriting boards to create an electrical standard. This was through the efforts of C. M. Goddard, secretary of the New England Insurance Exchange. From this effort grew the Electrical Committee of the Underwriters' National Electrical Association. In 1897 there was held the first national conference of delegates from a number of organizations, including engineering and underwriting, and in that year the first edition of the National Electrical Code was issued.

At its meetings the Electrical Committee has been careful to invite representatives of national associations, engineers, inspectors and others interested in the use, installation and application of electricity and has allowed these representatives to take part in the discussions, that the National Electrical Code might always represent the progress made in the art and science of electricity.

With a mind almost prophetic, Mr. Goddard, in 1911, suggested that the work of the Electrical Committee be transferred to the National Fire Protection Association, and the edition of the Code issued in that year was prepared by a committee from that association.

The membership of the Electrical Committee of the National Fire Protection Association is representative and includes representatives from the American Institute of Electrical Engineers, the American Electric Railway Assosociation, National Association of Electrical Inspectors, National Electrical Contractors' Association, National Electric Light Association, Electrical Jobbers, and in addition the chief electrical inspector of the city of Chicago and the electrical engineer of the city of New York, also an electrical engineer of the United States Bureau of Standards, thus giving recognition, in the making of the National Electrical Code to all interested in the application and installation of electricity, that it may not prove a menace to life and property. Under such method of creation all interested can accept its rules with the full assurance that no personal ends are being served, only the interest of the user being protected. So, in our approach toward tomorrow, especially as it concerns any new system of wiring, we can turn with safety toward yesterday and feel assured that those who frame the National Electrical Code, because of the manner in which past problems have been considered, will give calm and careful consideration to the problems of today and tomorrow, and that we can be guided by their findings and conclusions, whatever they may be. I am unfamiliar with a single instance wherein the progress of the art and science of electricity has been retarded because of the National Electrical Code.

Ralph Sweetland, secretary of the Electrical Committee, in the Bulletin of its twentieth annual meeting said: "It has always been the endeavor of our Electrical Committee to make only such changes in the Code as are made necessary by progress in the art or such as have been shown by some field experience to be necessary to safeguard against hazard, and we believe this course meets with the approval of the electric lighting and contracting interests, as changes in the Code, even if necessary, cause more or less confusion and trouble."

I have spoken rather intimately concerning the creation of the National Electrical Code. I cannot speak with equal intimacy concerning the "Wiring Rules" now in use in England. What I have been able to gather, however, I will relate to you.

The Wiring Rules for Great Britain are adopted by the Institution of Electrical Engineers and are recognized as the Standard Wiring Rules of the United Kingdom. In the revision of the rules (I have the revision of 1911 before me) the Institution of Electrical Engineers had the co-operation and assistance of representatives of some fire companies, the Municipal Electrical Association, the Electrical Contractors' Association, the National Physical Laboratory and the Engineering Standards Committee, the last named including representatives of the Board of Trade, Home Office and other British government departments, as well as representatives of the Institution of Civil Engineers, of the Electrical Manufacturers' Association, and other important interests. So in the creation of the Wiring Rules, the Council corresponds to the Electrical Committee in its relation to our National Electrical Code.

While time does not permit of a general comparison of the rules in the two Codes, I should like to bring to your attention several rules in the English standard, so that we will the better understand the rules for concentric wiring. Our Code does not make mandatory the grounding of systems greater than of 150 volts.

Rule 1, of the English Code, is as follows:

"These rules embody the requirements and precautions which the Institution of Electrical Engineers has framed to secure satisfactory results with a supply of electrical energy at low pressures, not exceeding 250 volts."

Rule 27 is somewhat different from our Rule No. 15:

"Earthing conductors (earth wires) must be of copper of a sectional area not less than that of No. 14 S. W. G., suitably protected against mechanical injury, and they must be efficiently and permanently connected with earth. One such conductor for every 50 amperes of working current or part thereof, or a conductor of equivalent section, must be provided. Where an efficient earth or earths cannot otherwise be obtained a metal plate or bar of large surface must be buried, preferably in a damp situation."

Our Code requires the use of No. 6 B. & S. gauge as a ground wire. Rule 28, of the English Code, says:

"Gas pipes must not be used to obtain an earth connection."

Under our standard we may ground conduit, armored cable and metal molding systems to the gas pipe, providing such grounding is on the street side of the meter.

The English standard, in Rule 32, is somewhat more liberal than our standard, in that the minimum size of copper conductor must not be less than No. 18, S. W. G., whereas we are limited to No. 14, B. & S. gauge. This I believe to be due to the 250-volt systems in use, rather than the 110-volt system in general use in this country. It is interesting to note that "all covered copper conductors having a greater area than that of a No. 14, S. W. G. wire must be stranded." Our Code is without such requirement. These comparisons now bring us to a consideration of our subject, "Concentric Wiring."

Last May I sent the following questions to some authorities in England:

Is the concentric system used on both direct-current and alternating-current systems?

What are the wattage limitations on the branch or tap circuits?

Have there been lower percentages of fires, from electrical causes, in concentric installations than in installations of other forms?

Where the concentric system passes through the floor to the ceiling below, is there any reinforcing of the outer conductor?

What is the largest-sized conductor used in concentric systems?

When installed in metal fixtures, either combination or electric, is an insulating joint used?

Is the metal stem of the fixture attached or connected to the outer conductor of the system?

Is the concentric system used for concealed work?

In answer to the above I will quote from a letter received from an electrical engineer of high standing, he being the general manager of an electric supply:

"The difference in potential, as far as I am aware, is 250

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volts. Concentric system is used on both direct-current and alternating-current systems. For incandescent lighting no final sub-circuit shall carry more than 3 amperes from 125 to 250 volts, and the maximum number of points on any sub-circuit must not exceed 10. The sub-circuits for small heaters must not carry more than 15 amperes up to 125 volts, or more than 10 amperes from 125 to 250 volts. I cannot say that there has been any difference in a lower percentage of fires, from electrical causes, in concentric systems than in installations of other forms. There is no reinforcing of the concentric system where it passes through the floor to the ceiling below. (In this statement the gentleman is mistaken, as I shall show you later.) As to the largest-sized conductor used in concentric systems, I cannot say. I do not think there is any limit."

To my question concerning the installation of fixtures, insulating joints, etc., he replied: "Special fixture connections are generally adopted." An affirmative reply was made to the question: "Is the concentric system used for concealed work?"

I received another reply from an electrical engineer who is in the employ of a large manufacturer of electrical fittings and material. He also sent me a number of samples of the product used in England, where it is called Stannos wire. I ask you to examine these samples, and you will then feel that Stannos is its proper name, Stannos meaning "tinned." This gentleman's reply to my questions will aid us in understanding the English standard for concentric systems of wiring. In part, he replied:

"In reply to your question we must says that 'Stannos' concentric wiring is extensively installed as a concealed system. It has been found that 'Stannos' wires may be generally buried with impunity beneath plaster of any description, as it has been found in practice that all the building plasters in general use act as a preservative; the only materials that attack them, and likewise all conduits, are the lithic compositions made from the compounds of chloride of magnesia, etc., mingled with wood dust to form wood-cement floors. This material has been found to attack all metal fixed beneath it.

"Where wires run over the skirting, or in places where they may be subjected to excessive mechanical injury we recommend that they should be covered by a piece of protective steel covering.

"With regard to the size of conductors used on concentric systems we find that 1/18s or 3/22s S. W. G. are chiefly used for ordinary circuit wires, the larger sizes being used for power circuits, mains or sub-mains.

"In this country concentric wiring may be employed under the following conditions: (1) Where there is a private generating plant. (2) Where a double-wound transformer is used on an alternating-current public supply. (3) Where a motor-generator is used on a direct-current public supply. (4) Where earthing at the consumers' premises has been approved by the Board of Trade."

A word concerning the origin of the system, from our European brothers' point of view may be of interest: "It has been recognized for some years by the electricity supply authorities that any further increase in new connections was greatly restricted by the cost of wiring, and that, on this account, it was almost hopeless, with existing methods, to obtain the custom of small consumers, who by reason of their number, contribute so largely to the revenues of the gas companies. In many localities "free" wiring had been adopted; but it did not prove a universal panacea, as the cost of wiring plus depreciation had to be paid for, in the long run, by the consumers (or ratepayers). Although the advent of the metallic-filament lamp brought the cost of electric lighting within the reach of all, yet many were unable to avail themselves of its advantages, owing to the high cost of a reliable system of wiring, so that the demand for an inexpensive, efficient and durable wiring system came to the fore suddenly and forcibly, and was discussed in the technical press at great length."

This corresponds with the plea made for its use in this country. All I have been able to gather from those interested in its use in this country has been the economic consideration of installation expense. Quoting still further from my English adviser, I find:

"The wiring systems which have been most extensively employed were wood casing and iron (or steel) conduit. The former, if carried out properly, is expensive, cumbrous and useless in damp positions. The latter, after many years of experience, has been shown to possess certain disadvantages, of which the most serious are: (1) The difficulty of obtaining reliable electrical continuity with the slip-joint pattern, even with the use of special devices. (2) The short life of thin slip-joint conduit, which has been put on the market to meet the demand for something cheap. (3) Accumulations of moisture in both slip-joint and screwed conduit and fittings."

The following claims are made for the Stannos system of wiring:

"Stannos wires are intended for use in any situation, for surface or concealed wiring, with wood blocks or ordinary accessories. Owing to their small diameter they are particularly suitable for situations where value is attached to neat appearance. Then can also be used as an addition to other systems of wiring, by branching off from lights and switches.

"Apart from the more general applications of wiring (i. e., the interiors of private dwellings and other premises), Stannos wires are specially suitable, in the larger sizes, for wiring to motors and for other main circuits. In this connection it is possible to dispense with large-size tubing and thus obtain a neater and less expensive job.

"It is of importance to note that Stannos wires (being sheathed with tinned copper, which is the most durable metal known for outdoor work) can be employed as service wires along fronts of houses and for other outdoor purposes. By employing this method the heavy cost of excavating and reinstating the pavements of side streets can be avoided. When used for such work it is advisable to give the wire a coat of paint as a further protection."

All of this is extremely favorable to the concentric system. Why should it not be? Please remember I have been presenting the side of our English brothers, a brief prepared by them, not by me, presenting it because they are absent.

What is an earthed concentric system? And how is it installed? To answer these two questions I will read verbatim from the Wiring Rules referred to in the earlier part of this paper, beginning to read at Rule 58, which is the definition of "Earthed Concentric Systems":

"An earthed concentric system is one in which one of the conductors, known as the external conductor, continuously surrounds the other, which is known as the internal conductor. The external conductor, which is generally uninsulated, must necessarily be efficiently connected to earth, and must not be of soft or easily corrodible metal.

Where Permitted.

"59. Earthed concentric wiring may only be used when connected to systems:

"a. Supplied through double-wound transformers so as not to be in metallic connection with the general system of supply; or

"b. In which the use of earthed concentric wiring has been approved by the Board of Trade; or

"c. Having their own independent generating plant; or

"d. Where a motor-generator is used on a direct-current public supply.

Switches and Fuses.

"60. Every system must be protected by a single-pole switch or switch-fuse under the control of the consumer, and it must be easily accessible, and placed as near the

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generator or point of entry of the supply as circumstances permit.

Drop in Volts.

"61. Subject to paragraph 33a the drop in volts on the external conductor from the point of earthing to the farthest lamp must not exceed 7 volts when the maximum current is in use.

Place of Earthing.

"62. The earthing shall take place at the point where the earthed concentric system begins, that is to say, at the main switch or switchboard. (See paragraph 19.)

"(Where one of the main conductors of a system of supply is earthed, no interruption of the current is permitted at any point in a conductor connected to the earthed main, unless a simultaneous break is effected on the non-earthed conductor. No switch or switch fuse not linked to another switch or switch fuse on the non-earthed conductor may be inserted in any conductor connected to an earthed main. This rule does not prohibit the use of a link for testing purposes or a switch for use in connecting a generator.)

Fittings and Flexible Cord.

"63. From the point where the system is earthed the concentric system of wiring must be employed throughout up to the fixed outlet points for fittings. Twin flexibles may be used beyond this point.

Joints.

"64. All joints in the external conductors must be of such a nature that the conductivity of the conductor is not reduced.

Control and Protection.

"65. Transformers, motors, arc lamps, and all consuming devices must be controlled and protected as in two-wire systems, but only on the internal conductor. Only single-pole switches and fuses may be used, and no switches, fuses, or circuit-breakers may be placed in the external conductor.

"All ceiling roses, switches, plug connectors and outlet points must be so mounted that the external conductor is interposed between the internal conductor and the surface upon which the fitting is mounted. This does not prevent the ordinary wooden block being interposed between a metal plate and the ceiling rose, switch, or plug connector.

Fittings.

"66. Ordinary connectors, lamp-holders, and ceiling roses may be used. If screw-socket lamp-holders are used, the center contact of the lamp-holder must be connected to the internal conductor.

Lamp Fittings.

"67. Fittings supporting lamps may be wired with two wires, one wire being insulated and connected to the internal conductor. The metal work of the fitting must be electrically connected to the external conductor.

Fuse Boards.

"68. The fuse board must be provided with either:

"a. A metal case to which the external conductors leaving the board must be connected; or

"b. A metal bar or wires connected to the external conductors, the whole being connected to a sheet of metal of the same size as the board, which is to be interposed between the board and the wall or surface on which it is to be mounted."

These are the rules under which our English brethren are, and have been, installing concentric systems of wiring. The rules are from the 1911 issue, which rules I have been informed are now going through the process of revision. Their terms differ, in several particulars, from ours. The conditions under which the concentric systems are installed are somewhat restricted.

In a letter dated May 8, 1915, from an electrical engineer in England, I find the following:

"It is now six years since Stannos concentric system was first brought out, and from the manufacturers' returns this system must be rapidly gaining in favor, as the yearly increase in the output of Stannos material is very great."

I have endeavored to prepare and deliver this paper with an open mind. Such facts as I have been able to secure I have given to you. There is one fact, however, I did not procure; I wanted to come with an open mind. Three installations have been made with concentric wire in New England. These have been installed under special permission. I have had an opportunity to inspect at least one of these installations, but have refrained lest my mind would discontinue to remain open on the subject. I have a great accumulation of articles, some for and others against the proposed use of the system in this country, in my files, and I confess it has been difficult to refrain from expressing an opinion. As an inspector I recognize the importance of refraining from forming an opinion when a matter continues unsettled. On the other side it is used for lighting and power installations under some restrictions.

Our standard has brought us to a great degree of perfection in installations. Appearances count for a great deal. When talking with a gentleman who stands very high in the electrical world (to mention his name anywhere in this country would be to secure attention and respect for his judgment—he is a man whom men listen to) he said: "I fear its appearance will condemn it." A few days ago I was in conversation with one of the most ardent advocates of concentric wiring. He had seen the three installations. He told me that "its appearance was an objection." Under date of December 28, I received a letter from an electrical engineer in London. In it he wrote:

"With regard to 'concentric wiring' some owners of buildings object to wiring work of any description appearing on the surface, while others have no objection to surface wiring work, providing it is neatly carried out. This point, therefore, comes down to the individual taste of the owner."

It is not an unusual thing to see gas pipes, generally one-quarter-inch lead pipes, exposed in dwellings in Europe. This is the exception in this country. Where it is the general rule there could be no just criticism against the use of concentric wiring from the standpoint of appearance. The question of appearance is one of personal judgment. True, on the other side, it is installed concealed. Such possibility has not been suggested for this country, but, if approved for exposed work, the next appeal will be for its general use.

The chief plea for its use has been that of economic consideration. In this particular I should like to quote from a letter of a very prominent electrical engineer on the other side of the Atlantic Ocean:

"As regards cost, a concentric installation with grounded outer is less costly than any other system of wiring, excluding, of course, shoddy work, such as cheap wiring cleated to the wall or unprotected rubber wire. It is also cheaper than slip-joint tubing or wood casing. The lower-grade lead-covering systems are probably as cheap as concentric, but they are not so safe or durable.

"One of the principal economies permitted by the use of concentric wiring is the saving in cutting plaster and woodwork, and in making repairs. Concentric wiring is so unobtrusive that it can be run on moldings, and in many cases even mounted directly on the surface without being unsightly. This feature presents the great advantage that houses already built but not wired can be wired with concentric conductors at very low cost, a good reliable job being insured at the same time."

As a contrasting statement to the above, in relation to the economic side of the plea, I would ask your patience as I quote from another English letter:

"One large contractor, who uses a considerable quantity of concentric wiring, states that even if both wires have to be insulated, as on three-wire direct-current distribution systems, the cost of concentric construction is only about 10 per cent greater than wood molding, and is even 20 per cent cheaper than screwed tubing."

I have been advised that "screwed tubing" corresponds to our term "conduit." This being the case, I leave the statement, "the cost of concentric construction is only about 10 per cent greater than wood molding, and is even 20 per cent cheaper than screwed tubing," with you as you endeavor to

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harmonize the economic plea for its use, with it.

I am still of an open mind, so should you inspectors be. Collate such experience as you can, study the problem which is before us, then when the solution appears we can intelligently vote for or against its use, as the rules may be before us at some future meeting of the Electrical Committee.

At the beginning I suggested that we should consider the experiences of yesterday as we approached the problems of tomorrow. The Electrical Committee has never stood, within my recollection, in the way of progress in the art and application of electricity. We may well afford to leave this with the committee, await its advice with patience, and then reject or accept it, as our judgment may suggest, exercising care that our judgment has been gained through an impartial study of the problem.

A member of the Electrical Committee, a gentleman whom men also listen to, whose advice on matters electrical is frequently sought and whose judgments are given the highest possible respect and consideration, recently said to a body of electrical engineers:

"If we accept the statements that the fire hazard by the use of electricity as usually found is not severe, and that the requirements of the Code are stringent, the question might properly be asked: 'Should we let down in the requirements that the cost of installations may be reduced and the use of electricity extended?' My answer is 'No.'

"When electricity was first considered for light and power underwriters welcomed its use. Our earlier installations, however, principally for lack of knowledge of the hazards, proved unfortunate and many fires resulted. We then had a period when electricity was not considered as safe as gas. Today electricity is considered the safer, but our margin is not sufficient to justify any considerable modification of the requirements. I think we can expect that if any rule proves to be severe and if it can be shown that some cheaper method of construction is as suitable, then the Code will be amended to permit this cheaper method."

Bill to Give Commission Greater Powers.

House Bill 808, now being considered by the Massachusett Legislature, seeks to make the Gas and Electric Light Commissioners the final board of arbitration on questions of price of street lighting, when petitioned to by either the municipal authorities or the officers of a company. The city or town is authorized to substitute the decision of the Commission for that of the local authority; and the action of a board of directors may be likewise set aside on motion of its president.

W. R. Peabody, representing the Turner's Falls Power & Electric Company, and S. E. Wardwell, for the Massachusetts Electric and Gas Association, opposed the bill. It was pointed out that the Commissioners at present act as arbitrators of public lighting rates, in their capacity as private citizens, though not officially.

E. F. Dwelley, of Lynn, petitioner for the bill, suggested that if the Commissioners are to arbitrate such cases they should be clothed with authority.

Positions for Electricians in the Navy.

The Navy Department, United States Government, is offering positions to several electricians for the Charleston (Mass.) Navy Yard. At least two years' experience as a journeyman electrician, one of which must have been on work of a marine electrical character, is required. There is also a vacancy in the office of the inspector of machinery at the Fore River Shipyards, Quincy, Mass., for which a special mechanic who is qualified as an electrician is sought. The pay is $4 a day. Applications should be made to the office of United States Civil Service Commission.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 331.—Small Lifting Magnet.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

No. 332.—Electric Belts.—Does any recognized authority on electrotherapeutics find any curative value from the use of the so-called electric belts? Has their sale or exploitation ever been prohibited?—J. S. C., Dayton, O.

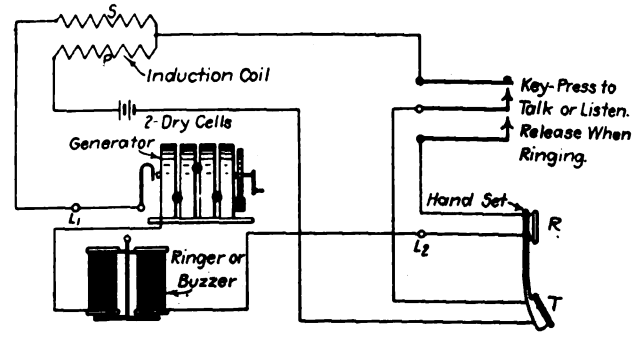
No. 333.—Electric Car Heating.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

No. 336.—Visual and Audible Signal.—I should like to know whether it is possible (and if so, how) to wire a simple but positive signal system which will indicate at the same instant at the sending and receiving points by means of lighting red lamps and ringing large gongs for perhaps half a minute. That is, the man at the sending end must know positively by the lighting of his lamp and ringing of his gong that the combined signal was properly actuated at the receiving end without a special answer-back signal.—G. S. C., Joplin, Mo.

Answers.

No. 329.—Telephone Test Set.—Could an ordinary test magneto of 50,000 ohms be used for a telephone test set? If so, give description of plan for use and wiring diagram for attaching a head-type receiver and transmitter or a microphone set to the magneto to use in telephoning, also the batteries for the current. My idea was to use this temporary rig for use in testing transmission-line troubles on a small line of eight to ten miles in extent without a regular telephone system, the company not buying anything as expensive as a regular test set. Could it be used for talking to power house over one wire of transmission line (line dead), using a grounded return for six or eight miles?—C. D., Glenwood, Minn.

Using a magneto testing set as proposed is at best a very crude method. It is a fair method for telephone practice, where it originated, but when used on a transmission line I do not believe that the method is accurate and reliable enough to warrant the expense, small as it may be, to convert a 50,000-ohm magneto set to a telephone testing apparatus. A good bridge would be much better, or even a galvanometer, a set of batteries, and a graphite resistance rod is much to be preferred to a magneto set. However, the sketch below shows the connections for such a magneto test set. The connections



No. 329.—Wiring for Telephone Test Set.

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are self-explanatory. Would recommend that the key be of the non-locking type of push-button style. The induction coil should not be of the high-resistance type (150 to 750 ohms) as is usually sold by the electrical stores. A good coil can be made having a core 0.25 inch in diameter by 3.25 inches long, with a winding space 2.5 inches long, 0.375 inch inside diameter, and 0.5 inch diameter. Primary resistance 1 to 2 ohms; secondary resistance 18 to 20 ohms.

Using a power wire as a telephone line is not only bad practice, but risky business. A ground return may or may not operate successfully, depending on the ground connection available (good or bad), the proximity of other wires (either power or telephone and telegraph) and the presence of earth currents.

It will be necessary to rebuild the magneto box to accommodate the key, induction coil and batteries. Would advise using a hand set or combination receiver and transmitter, so that when holding the receiver to the ear the transmitter would be held properly in front of the mouth. This would also permit holding the box with the knees and turning the crank with the right hand. The usual 50,000-ohm testing magneto will ring the bell faintly through a line which is open if the capacity of the line is 0.1 microfarad or less. The higher the capacity, the louder the ring. For this reason it is not a reliable testing method.—H. E. W., Chicago, Ill.

No. 334.—Locked Cutout Cabinets.—In a large drafting room lighted by adjustable drop lamps over each drawing table considerable trouble has been caused by a rule keeping the cutout cabinet locked with only the electrician in charge of the key. When a fuse blows due to trouble on any drop lamp, the circuit for several tables is dead until the electrician can be found in some remote part of the factory. What is the best solution for the difficulty without violating the rule?—N. L. P., Milwaukee, Wis.

The lighting of drafting rooms is a steady load and the blowing of fuses should be an uncommon occurrence. In the present case the fixtures appear to be unreliable or at least unfitted for the purpose for which they are used. The remedy to remove the trouble seems to be to change the form of lamp sockets or drop cords now used, or else maintain them in better condition. The present state of affairs is, besides being a rather costly annoyance, a danger as regards fire.

By rearranging the existing wiring the trouble might be more localized. Doing this might well be more costly than adopting other fittings. Where neither of these suggestions is feasible it might be possible to keep a key to the cutout cabinet in charge of the chief draftsman or other responsible person. On the other hand, if the trouble that is being experienced is really due to defective lamp cords and sockets, the work of clearing and remedying the trouble is clearly one that belongs to the electrician, and he might rightly object to interference by others.

If there is no way of overcoming the trouble, the only thing that remains is to reduce to a minimum the time that elapses from the cessation of lighting until it comes on again. The most obvious way to do that is to call the electrician with the least loss of time. This may be done by utilizing some form of call or signaling system, in this way informing the electrician wherever he be that his services are needed urgently. Some form of call system may already be in vogue for the use of department heads, shop foremen, and others, in which case attempt should be made to use the existing system. If no system exists already it may be necessary to install some such system. Whether or not the cost of doing this is justified depends upon the cost of installing and maintaining the call system and the extent of the pecuniary loss chargeable to the interruption of light in the drafting room. For the expense incident to making the installation to be justified, the cost of installing and maintaining must balance or be less than the loss due to decreased output resulting from the absence of light.

Before considering such a radical step it should be ascertained beyond all doubt that everything possible has been done to make the fittings and cords reliable. It should be remembered that the present state of affairs is not only a nuisance but it constitutes a danger, which the use of a call system will not eliminate but only mask.—K. R., Chicago, Ill.

No. 335.—Ground Detector for Transmission Line.—I would like to have data and sketch of a ground detector that is suitable for use on an 11,000 volt, three-phase, power transmission line that is six miles long. I wish to construct this detector myself.—R. F. C., Minersville, Cal.

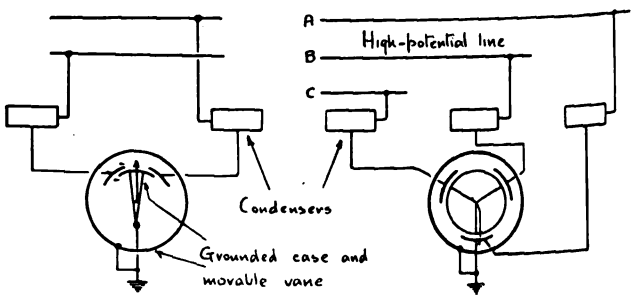
Either electrostatic instruments or electromagnetic instruments may be used as ground detectors. The electromagnetic instrument is a differentially wound voltmeter and is extremely delicate; it is practically out of the question for the average layman to make it unless he has all the parts. The electrostatic type of ground detector is by far the more simple to make, hence it only will be considered here.

The electrostatic detector consists of two parts, the instrument and the condensers for energizing it. The instrument contains two or more stationary vanes and one movable vane in close proximity to the fixed vanes. The movable vane is connected to earth and the stationary vanes are connected to condensers which are, in turn, connected to the high-potential line. So long as the latter is clear of grounds the electrostatic capacity between the stationary vanes and the movable one is balanced, but as soon as a ground occurs the balance no longer exists and the movable vane is forced over, repelled by the one and attracted by the other stationary vane. The movable element is very delicate and must be carefully balanced and calibrated by a spring. Calibrating and balancing are both tiresome proceedings, even for those skilled in meter work and who know all the tricks of the trade.

The condensers for operating the instrument are the most simple item. They consist of a brass or metallic tube upon which is wrapped a covering of insulating material (it must be of sufficient dielectric strength to withstand about 30,000 volts, taking into consideration the factor of safety) and on this is slipped another metallic sleeve. The inner tube is connected to the high-potential line while the outer sleeve is connected to the stationary vanes, or one of them, according to whether the instrument is single phase or three phase. A condenser for the problem in hand would measure about 20 inches in length and about 3 inches in diameter. For a single-phase instrument two condensers would be required; for a three-phase instrument two or three, one in each phase wire.

Unless querist is familiar with meter work, and has parts of meters available from which he may build up his ground detector he will find it far more satisfactory to purchase his instrument from a reliable manufacturer than to attempt to build it himself. Making such an instrument, as well as designing it, will be a very slow and tedious undertaking, and when finished it will not be as accurate nor of as pleasing an appearance as the purchased article. Nor will it in all probability be as sensitive. A single-phase meter may be purchased in the open market for about $80, while a three-phase instrument will cost in the neighborhood of $130.

Querist will find a description of the ground detector and an explanation of its working in the various books on meters. He might, further, read the circulars issued by the manufacturers of these instruments. Making an instrument oneself will most probably lead to disappointment in the end, and will cost most in the long run.—K. R., Chicago, Ill.



No. 335.—Arrangement of Electrostatic Ground Detector.

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NEW APPLIANCES

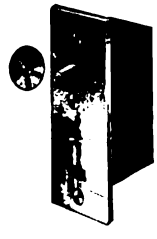
A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Door Switch with Frictionless Tip.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., is putting on the market a door switch with a revolving button in the tip of the plunger.

When the door is closed, the striking plate slides across the top of the plunger while pressing the plunger down. Before this frictionless tip was designed, the sidewise thrust was a very great strain on the mechanism, and decreased materially the life of the switch.

This switch is designed with a compensating mechanism so that a considerable shrinking or swelling of the woodwork will not affect the working of the switch.



Improved Door Switch.

Mogul Shurlok Socket.

Mogul Shurlok Sockets.

For a long time there has existed demand for a mogul-base socket from which it is impossible for an unauthorized person to remove the lamp. This demand has been met by Pass & Seymour, Incorporated, Solvay, N. Y. This new socket is fitted with the double Shurlok device, which holds the lamp base rigidly without in any way distorting the base of the lamp, thus the lamp remains straight. The ease with which the lamp may be locked or removed by the proper person is the talking point in favor of the installation of these sockets wherever a high-efficiency unit is desired to be permanently located. It is not only the loss of the lamp itself, but also the fact that the space to be illuminated would be left in darkness should the lamp be removed or stolen.

Paul Electric Water-Supply Systems for Residences and Institutions.

One of the greatest necessities of modern life is a good and plentiful supply of water. In suburban or country homes, as well as private and public institutions this matter deserves careful provision. For this purpose the Fort Wayne Engineering & Manufacturing Company, Fort Wayne, Ind., has added to its line of water-supply pumping outfits two new electrically driven equipments especially adapted to meet the requirements.

Of these the one shown in Fig. 1 is a compact, self-contained set for pumping from shallow wells, such as abound in rural districts. The pump is of the vertical, differential-plunger, double-reduction-drive type, built for a maximum suction lift of 20 to 25 feet and in two sizes having respective capacities of 150 and 300 gallons per hour. This pump is of special design, but simple construction; it is mounted on the outside of the frame where it

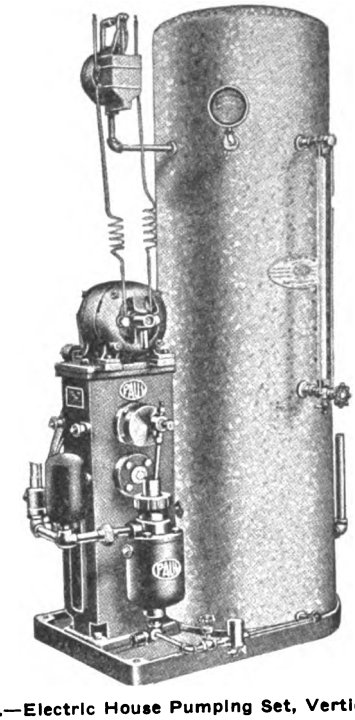


Fig. 1.—Electric House Pumping Set, Vertical Type.

is readily accessible. The drive from the motor is by means of a silent, combined belt and spur-gear reduction. A patented hydropneumatic air-charging and priming device is furnished, as also an automatic controller for the motor. In the equipment shown, which includes a pneumatic pressure tank, this controller starts the motor and pump when the pressure drops to 30 pounds and stops it when the pressure has risen to 50 pounds. Several sizes of tanks are available. The driving motor is one-fourth or one-half horsepower, depending on the capacity of the pump. These sets are also made for use with elevated open tanks, in which case an automatic float controller is used.

Another type of equipment shown in Fig. 2 is also made. It is driven by a one-sixth-horsepower motor connected by belt to the pulley; from this the plunger pump is driven by connecting rod. The pump can be used for a vertical suction lift from well, cistern, spring or lake of as high

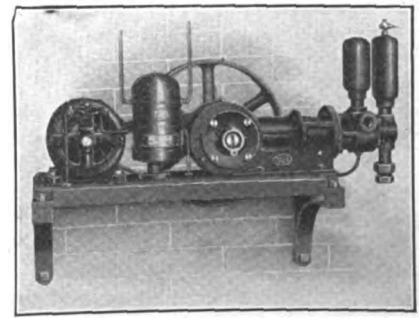


Fig. 2.—Electric Pumping Set, Horizontal Type.

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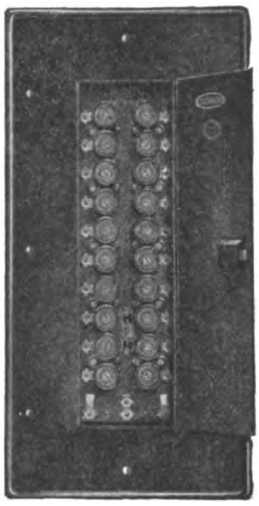
as 25 feet; for lifts below 20 feet no priming is required. The entire outfit is mounted on a horizontal engine-type frame with either floor or bracket mounting. The pump overhangs the end of the frame so as to make the valves more readily accessible. Mounted on the frame between the pump and motor is an automatic controller for the latter; it is connected to the pump by a small copper tube and starts the outfit automatically when the pressure drops to 20 pounds, again stopping the set when the pressure reaches 40 pounds.

Columbia Steel Cabinets for Starrett Panelboards.

A full line of steel cabinets especially designed for Starrett panelboards has recently been added to the products of the Columbia Metal Box Company, 226 East 144th Street, New York City. Five different styles of these cabinets are made and there is a cabinet for each of the 258 different Starrett panels. The latter were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of July 25, 1914.



Steel Cabinet for Starrett Panelboard.

A very novel though simple way of listing the Starrett panel numbers and the corresponding Columbia cabinet numbers is used in a new Columbia catalog on these products; this enables very quick ordering of the proper cabinet. In the accompanying illustration is shown a Starrett panel No. 260 in a Columbia cabinet No. 45SC.

Modern Electric Washer.

Several novel features are claimed for the clean-cut electric washing machine shown in the accompanying illustration. The manufacturer, the Modern Laundry Machine Company, Kansas City, Mo., has overcome many defects found in other machines.

Metal construction throughout makes it extremely strong and rigid, light in weight, easy to clean, perfectly sanitary and insures long life. The tank is made of heavy sheet metal, double-seamed and soldered, and is water-tight and rustproof. There is no wood to warp, shrink, rot or cause mildew. The cylinder is made of extra-heavy galvanized steel and the frame of steel angles, rigidly braced and double-riveted.

A standard Westinghouse small motor operates both the washer and the wringer. It provides more flexibility than direct gear drive. All gears in the operating mechanism of the washer and between the washer and the wringer run at slow speed in hard oil contained in greaseproof cases. A gas burner under the tank allows the water to be kept hot for a long time.

Motor-Driven Washing Machine.

All operations are controlled by two small levers at the side of the machine. A safety device on the wringer safeguards the operator and the mechanism from injury. The capacity of the cylinder is sufficient to care for the needs of the ordinary family.

Stoneware Electric Stoves.

A line of electric stoves of unique construction is being placed on the market by the Stoneware Electric Stove Works, 136 Liberty Street, New York City. The body of these stoves is made of a stoneware composition consisting of asbestos and soapstone; this compound can be made up in several colors, such as white, black, red, green or blue. This material is a very effective heat insulator and therefore reflects the heat upward against the dishes placed on top.

These stoves are made in several types, of which one shown in Fig. 1 is a casserole-type heater; it has a handsomely embossed nickel-plated frame with a removable nickel-plated top. A two-heat push-button switch is connected in the cord for readily controlling the amount of heat desired. This appliance takes six amperes at full heat and makes a very ornamental as well as useful device

Fig. 1.—Stoneware Casserole Type of Electric Stove.

Fig. 2.—Stoneware Cube Type Electric Stove.

Fig. 3.—Stoneware Octagon-Shaped Electric Stove.

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for the dining room, kitchen, bed room, etc. Although designed primarily for cooking or boiling purposes, it also can be used for heating moderately sized rooms. This stove is 7 inches in diameter and 4 inches high; its net weight is four pounds.

Another type of these heater stoves is shown in Fig. 2. This stove is made in three different ways, of which one provides four heats with 6 amperes maximum; another provides two heats taking 3 or 6 amperes, respectively, and the third is a single-heat 5.5-ampere appliance. This outfit is practically a cube a little over four inches on the side; its weight is three pounds.

Still another type of these heaters is shown in Fig. 3. This is an octagon type with an extreme width of 8 inches and a height of 4.5 inches, its weight is eight pounds and it is arranged for either four, two, or single-heat supply, with six amperes maximum in either case. Thus each of these appliances can be used on the ordinary lighting circuit. Any type of cooking utensil may be placed on the top directly beneath which the heating coils are located.

Mirrored Glass Reflectors for Large Gas-Filled Lamps.

In buildings having very high interiors of large floor area the most economical lighting is obtained by high mounting of

Glass Reflector for Large Type C Lamps.

efficient lamps equipped with efficient reflectors. This practically means use of the large gas-filled tungsten lamps and reflectors having as nearly as possible the efficiency of a perfect mirror.

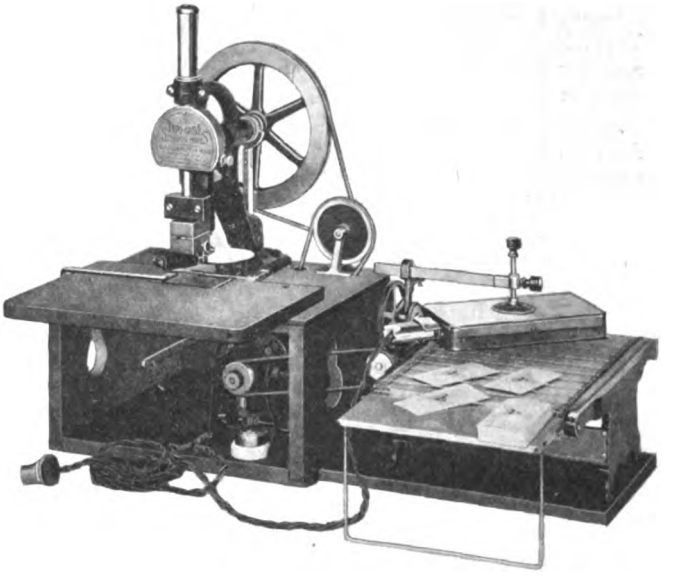
Such a reflector is now available in the new "Jumbo" mirrored glass reflector just placed on the market by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, Ill. It is especially designed for use with 500, 750 or 1,000-watt gas-filled or type C lamps. The reflector is 16.5 inches in diameter and 13.375 inches high; from this large size it derives its trade name. A special holder is supplied with the reflector which has an adjustable feature that makes it possible to obtain two or three degrees of spread to the light from this unit.

These reflectors have a general deep-bowl shape that gives the desired distribution of light and incidentally effectively conceals the brilliant lamp filament. These characteristics make these reflectors especially suitable for use in high and large exhibition buildings, armories, gymnasiums, erecting shops, etc. The first installation of these reflectors was in the new armory building of the University of Illinois, Urbana, Ill. This structure covers a ground area of 200 by 400 feet and is about 100 feet high. There are installed 42 of the Jumbo units suspended at heights ranging from 65 to 85 feet above the floor of the armory.

Electrically Driven Stamping Press.

A machine wholly dependent upon electrical energy for its operation is shown in the accompanying illustration. It is called a "typo-grave" stamping press, its function being to deliver printed matter closely resembling that done by an embossing machine, and is designed for printing stationery, such as writing material and cards. The press itself prints from type or dies. Upon the printed paper is sprinkled a granular chemical, which adheres to the ink, which after drying, presents an appearance nearly identical to the embossed letter.

The press is driven by a 0.02-horsepower motor, running at 2,200 revolutions per minute, and manufactured by the Bodine Electric Company, Chicago, Ill. The drying is accomplished by passing the printed matter under an electrical heater by means of a conveyor driven by the motor. The heating process dissolves the chemical and printing ink and then dries it, giving a higher class of work than secured by natural drying. A saving in time and operating space is also made. The heating unit for the press is manufactured by the Hotpoint Electric Heating Company.



Electric "Typo-Grave" Stamping Press.

The press is patented and manufactured by S. B. Feuerstein & Company, 542 West Jackson Boulevard, Chicago, Ill.

The Electric Storage Battery Company, Philadelphia, Pa., which initiated a plan of instruction for the officers and men operating the submarines of the United States Navy, has received a very gratifying letter from the Secretary of the Navy commending the work of the company. Over 100 men were given instruction in storage-battery design, operation and shop methods. The letter says:

"During the months of November and December, 40 officers and 86 enlisted men took the courses outlined by them, which were wholly prepared, the work outlined, and lectures delivered by officers of the companies mentioned. Undoubtedly these companies must have been to considerable expense and more or less inconvenience in giving up so much time to the instruction of officers and men, but it was done with much interest on their parts, and resulted in great benefit to the submarine service. Such patriotic spirit is highly commendable, and the Department wishes to take this opportunity of expressing to you its appreciation of the valuable course of instruction received by the officers and men of the submarine service."

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INDUSTRY ACTIVITIES

The Splitdorf Electrical Company, Philadelphia, Pa., is making plans for the erection of a five-story manufacturing building.

The Robbins & Myers Company, Springfield, O., has prepared a folder in which reproductions of the company's advertisements in leading magazines are given.

Continental Electric & Manufacturing Company, 136 Liberty Street, New York, N. Y., has prepared a price list for its line of binding posts, connectors and brass products.

D. & W. Fuse Company, Providence, R. I., have issued a new catalog describing the company's line of Deltabeston wires in insulating materials. Prices and descriptions are given.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued the fifth number of the booklet called "The Output." Several interesting articles on illumination are included within its covers.

Cosmos Electric Company, 136 Liberty Street, New York, N. Y., manufacturer of electrical devices, has issued a folder describing its line of storage batteries and lighting systems for automobiles and motor boats.

Belden Manufacturing Company, 2304 South Western Avenue, Chicago, Ill., manufacturer of wire, cable and cordage, is distributing Bulletin No. 172, which gives discounts and base prices, effective February 15. It is supplementary to the company's catalog.

The Lost Creek Cedar Company, Ione, Wash., which sells red cedar poles from the Pend Oreille district, in northeastern Washington, is distributing a booklet which gives views of that district, and brings out the good points of red cedar for transmission line poles.

The Globe Stove & Range Company, Kokomo, Ind., is distributing a set of five leaflets containing data on the "B" series of Globe electric ranges. The leaflets are illustrated, give the current consumption of the various heating units, and a description of the construction.

The Ward Leonard Electric Company, Bronxville, N. Y., manufacturer of electrical devices, has appointed the John B. Sebring Company, Euclid Avenue and Baum Boulevard, Pittsburgh, Pa., as district sales agent. Mr. Sebring is very well known in the Pittsburgh territory.

Moloney Electric Company, St. Louis, Mo., manufacturer of transformers, has opened a New York office at 50 Church Street, Hudson Terminal Building. The office will be under the management of C. H. Abbott, who has been with the company the past five years. All business in the New England states will be handled from the new office.

The General Electric Company's Pittsfield (Mass.) plant is reported to be in receipt of large orders for electric ranges, and for transformers and other electrical machinery for the Russian government. About 4,700 employees are at work at the Pittsfield plant, with the prospect of an increase in the number of over 5,000 by the end of February.

The Haynes Stellite Company, Kokomo, Ind., has ready for distribution a booklet on Stellite, its new alloy for high-speed cutting tools. The characteristics and advantages of this interesting product are pointed out. Aside from its use in machine tools this alloy will probably also come into use for electrical purposes, on account of its valuable electrical properties.

The K. & B. Company, manufacturer of special electrical devices, Philadelphia, Pa., of which Richard L. Binder is president, has closed arrangements to represent the Electrical Chemical Company, of Dayton, Ohio, manufacturers of electrolytic bleaching equipment. Contracts have been closed with some of the largest textile plants in the Philadelphia district for the installation of this equipment, which is said to provide a means of overcoming the increased cost of bleaching brought about by the scarcity of chemicals due to the war.

How to Figure Illumination.—A new edition, the sixth, of the little handbook "How to Figure Ilumination," is ready for distribution. It contains tables and illuminating data, also illustrates and describes with complete characteristics all the various sizes and styles of Sunbeam Mazda lamps. The information contained in this booklet is sufficiently complete to enable one to lay out nearly any illumination plan. A copy of this booklet will be mailed to anyone writing for it to the Western Electric Company at Chicago, New York, or any of its distributing houses throughout the United States.

Walker Vehicle Company, Chicago, Ill., has issued a 24-page booklet entitled "Walker Balance Drive Electric Vehicles." The booklet, which was prepared by Dana Howard, advertising manager of the Commonwealth Edison Company, Chicago, shows illustrations of a large number of Walker Electrics now in service. Illustrations also are given of a typical chassis and the balanced drive used on these vehicles. General specifications are included. The company has its general offices and factory at Thirty-ninth and Wallace Streets, and its Chicago salesroom at 2700 Michigan Avenue.

The Electrical Engineering & Equipment Company, 522-5 Wells Building, Milwaukee, Wis., through its president and general manager, Philip Grossman, has taken the entire output of the Roberson Electrical Appliance Company, manufacturers of the "Roberson Emergency Connector" and "Meter Attachment." The connectors were described in the February 5 issue on pages 256-257. Mr. Grossman's experiences with the installation and operation of central-station and isolated-plant equipment places him in a position to properly judge the merits of the Roberson connectors from the practical point of view of all power users. After many years of careful study of factory conditions and central-station requirements, Lewis C. Roberson designed and invented the connectors, keeping in mind the many emergency and temporary connections necessary in the various power installations to which the connectors can be applied without disturbing any circuits and eliminating any possible interruption to service. After a thorough and exhaustive investigation of these facts, the Electrical Engineering & Equipment Company has decided that the connectors will provide and fill a long felt want among central stations and power users. The very many temporary and emergency connections which come up from day to day are too numerous to be mentioned but all are well known to every man in the central-station or isolated power plant business. Suffice it to say that the connectors will provide the simplest and most inexpensive means to take care of break-down connections, temporary auxiliary application, meter and other instrument readings of power input to any and all apparatus. In fact there is absolutely no temporary or emergency connection that confronts the electrical world in capacity ranging from 0 to 400 amperes that these connectors will not take care of. The Electrical Engineering & Equipment Company desires to get in touch with representative sales organizations throughout the country to assign such territory as is still open.

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PERSONAL AND BIOGRAPHICAL

MR. CHARLES J. DOHERTY was re-elected president of the Louisville Heating Company, at the annual meeting of this company which was one of the predecessors of the Louisville Gas & Electric Company.

MR. G. W. HUBLEY, of the electrical department of the Jones & Laughlin Steel Company, Pittsburgh, Pa., was recently made an honorary member of the Louisville (Ky.) Engineers and Architects' Club.

MR. B. R. HINES, formerly electrical examiner at Knoxville, Tenn., has been appointed electrical examiner and supervisor at Chattanooga, Tenn Mr. Hines is a graduate of the college of electrical engineering of the University of Tennessee.

MR. C. M. BREWER, manager Western States Gas & Electric Company, Richmond, Cal., has been appointed a member of the Waterways and Commerce and the Finance Committees of the reorganized Richmond Chamber of Commerce.

MR. EDWARD A. HANFF, who has been in the engineering department of the Westinghouse Electric & Manufacturing Company, has accepted the position of chief engineer with the Pennsylvania Electrical & Manufacturing Company, Irwin, Pa.

MR. JOHN R. HART has resigned as general manager of the Hailey (Idaho) Electric Company, and has been succeeded by MR. E. W. RISING, formerly connected with the Great Shoshone & Twin Falls Power Company of Twin Falls, Idaho.

MR. HOWARD WALKER, who has been district superintendent of the Ohio Service Company, recently was appointed general superintendent and will have charge of the company's properties in the state of Ohio. He will act as assistant to MR. C. H. HOWELL, manager of the Ohio Service Company.

MR. J. R. WILSON, sales manager and second vice-president of the Crocker-Wheeler Company, Ampere, N. J., resigned his position February 10 to take up activities in other fields. Mr. Wilson has been associated with the Crocker-Wheeler Company for 16 years, being placed in charge of sales operations in 1910.

MR. G. W. ROOSA, who has for several years been connected with the lighting department of the Westinghouse Electric & Manufacturing Company, on February 1 became associated with the Holophane Glass Company of Newark, O., where he will have charge of the sales of Holophane glassware in New York, Ohio and Western Pennsylvania.

MR. ALFRED CRAVEN, chief engineer of the Public Service Commission for the First District, New York, has gone South to recuperate from the after effects of an attack of grip. Mr. Craven went back to his official duties before he had fully recovered, with the result that he had a relapse, and his physician has now ordered a change of climate to insure his recovery.

MR. CHANNING R. DOOLEY, who has for some years been in charge of the Westinghouse Electric & Manufacturing Company's educational activities, has recently been appointed manager of an educational department formed by the company. Mr. Dooley graduated from Purdue University in 1900, and for two years was instructor in engineering at that institution. In 1902 he entered the employ of the Westinghouse Electric & Manufacturing Company, being employed in the testing department. In 1904 he became associated with the *Electric Journal* as assistant manager, also doing considerable editorial work in connection with his other duties. Mr. Dooley became associated with the power engineering department of the Westinghouse Company in 1905, devoting himself particularly to rotary converter and alternating-current generator work. While engaged in this work he was appointed an instructor in electrical engineering of the Casino Technical Night School, and in 1906 was elected president of this school, a position he now holds.

C. R. Dooley.

Mr. Dooley is an active member of the Society for Promotion of Engineering Education; American Institute of Electrical Engineers, of which he is a member of the educational committee, and of the executive board of the Association of Corporation Schools.

MR. D. P. ABERCROMBIE, JR., who was recently elected vice-president and general manager of the Connecticut Valley Street Railway, the Northern Massachusetts Street Railway and the Concord, Maynard & Hudson Street Railway, is a graduate of Massachusetts Institute of Technology, class of 1897. Since his graduation Mr. Abercrombie has been an important factor in the progress of New England traction facilities.

MR. PETER JUNKERSFELD, assistant to the first vice-president, Commonwealth Edison Company, Chicago, Ill., spoke before the Monday Luncheon Club of the Chicago Telephone Company, February 14, on "Electric Service in Chicago." The keynote of Mr. Junkersfeld's remarks was the desirability of co-operation of utility companies in serving the public. Stereopticon views showing some of the principal features of the Commonwealth Edison Company's physical system were given.

MR. JOSEPH H. TRACY, assistant chief engineer of the Electric Storage Battery Company, Philadelphia, Pa., was the principal speaker at the meeting of the New York Section of the Electric Vehicle Association held February 23. Mr. Tracy's subject was "High-Rate Discharging and Charging of Lead-Acid Batteries," one to which he has given a great deal of time in perfecting methods for efficient operation. Invitations were extended to many garage and battery men and a very interesting meeting resulted.

OBITUARY.

MR. BRADLEY D. BUELL, a member of the distribution department of the Commonwealth Edison Company, Chicago, Ill., for 18 years, died February 11, aged 40 years.

MR. THOMAS DUSENBURY, who was connected with the New York Telephone Company for nearly 30 years, died February 15 at his home in Passaic, N. J., in his fifty-eighth year.

MR. G. E. HINMAN, 67 years old, for 35 years in the employ of the Postal Telegraph Cable Company and one of the fastest operators in the service, died recently at his home in Brooklyn, N. Y.

MR. BEE MORRISON, manager of the Pocahontas (Ark.) Light & Power Company, was a victim of the Mississippi River flood February 5. Mr. Morrison was on a business trip to Black Rock when he was drowned. He was 30 years of age.

MR. STEVENSON TOWLE, consulting engineer of New York City, died on February 14 at the age of 79 years. Mr. Towle was a member of the first Rapid Transit Commission, and was consulting engineer to several municipal departments. He was a member of the American Society of Civil Engineers.

MR. JESSE S. VILES, who built the first hydroelectric plant in Vermont and was the pioneer in supplying electric light and power to the cities of Barre and Montpelier, died in Boston, Mass., February 9, aged 55 years. He was a native of Weston, Vt. In 1896 he purchased a large farm and water privileges on the Winooski River, where he constructed a dam across a natural gorge and built a power plant, which he conducted until 1907, when it was sold to a syndicate. The pioneer plant built by Mr. Viles stimulated similar undertakings in the state until today Vermont is one of the foremost states in New England for hydroelectric development.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

ROCKLAND, ME.—The Islands Electric Company has been organized here by H. S. Hitchborn, A. S. Hitchborn and others, of New York City. The company proposes to generate and supply electrical energy for light and power in the cities of Vinalhaven and North Harbor.

LANCASTER, N. H.—The Jones & Linscott Electric Company has purchased the property of the Lancaster & Jefferson Electric Company. The plants will be consolidated.

NORWICH, CONN.—Improvements for the municipal electric lighting plant, of which S. J. Kehoe is superintendent, are being recommended by the Commissioners and citizens of Norwich.

BRIDGEPORT, MASS.—The light committee of Common Council will recommend at the next meeting of Council that the contract for the 500 or more street lamps be awarded to the United Illuminating Company of this city.

CHICOPEE, MASS.—The municipal electric light department plans to renew lines and make considerable extensions of its system, and also to build a garage to house its motor vehicles. It is also proposed to install an industrial railway for handling coal to the boiler room. The 1915 report shows an operating profit of $5,740 and a balance on profit and loss of $12,789, which is a considerable increase over 1914.

NORTH ATTLEBORO, MASS.—A second transmission line to this city is being planned by the Union Electric Company, of which B. H. Clarke is manager.

WESTFIELD, MASS.—The sum of $11,500 has been voted for a reserve cable to be placed in Elm Street by the Municipal Light Department. Considerable trouble with underground cables has been experienced, due to electrolytic corrosion, and repairs are now being made.

CHURUBUSCO, N. Y.—B. W. Lord, P. E. Poupare and Alexander Silver, of this city, have formed the Clinton Light, Heat & Power Company and will operate an electric power plant here.

POTSDAM, N. Y.—S. Nicolette proposes the establishment of an electric lighting plant here.

SKANEATELES, N. Y.—A resolution passed the Town Board to install lights on the road from the north of the village to the town line of Elbridge, a distance of five miles.

ATLANTIC CITY, N. J.—A franchise has been granted to the Atlantic City Electric Company giving that company the right to construct a portion of a transmission line to Ocean City. The company recently purchased the holdings of the Ocean City Electric Company and the two plants will be connected by the line.

GUTTENBERG, N. J.—Plans for a new lighting system and a white way on Bergenline Avenue are being considered by the Council. Energy will be secured from the Public Service Corporation.

LANSDALE, PA.—Preparations are being made to double the capacity of the municipal electric lighting plant here.

NEW BETHLEHEM, PA.—Fire completely destroyed the Red Bank Milling Company's plant, which housed the city electric lighting system. Plans are now under way to secure electric service.

NORRISTOWN, PA.—The Reading Transit Company, which operates from Chestnut Hill to Pottstown, Pa., and from Norristown to Conshohocken, Pa., has signed a contract with the Counties Gas & Electric Company, of Norristown, to supply the electric power for operating its cars, commencing May 1, 1916. At present power is transmitted from stations in Collegeville and Shawmont, Pa. These two plants will be discontinued.

PHILADELPHIA, PA.—Bids will be asked in a few days for a brick, steel and concrete power house for Rafleigh & Company, at American and Somerset Streets, here. W. E. Dyer, of Philadelphia, is the engineer in charge.

SHIRLEYSBURG, PA.—The Shirleysburg Light, Heat & Power Company has been formed by J. E. Zimmerman and others of Philadelphia. The company will furnish service to Shirleysburg and will have offices in Mount Union, Pa.

THORNBURY, PA.—Charters have been granted to the Thornbury Light Company to operate in Thornbury Township, Chester County, and in Towamencin Township, Montgomery County. The incorporators are W. H. Badger, Wayne, Pa., and others, and the company will have offices in Philadelphia.

CUMBERLAND, MD.—The City Engineering Department is surveying North Center Street with the view to extending the white way system on that thoroughfare.

WINCHESTER, VA.—The Common Council has decided to abandon the use of arc lamps for street lighting and to install the newest makes of the nitrogen-filled lamps. An ordinance appropriating $6,000 for the installation of a white way in the business sections of the city and on certain residential streets has been passed.

MARTINSBURG, W. VA.—The Martinsburg Power Company has been adjudicated a bankrupt on the petition of stock holders who took this means of securing the liquidation of the company's business with a view to forming a new company. The new company, it is understood, is to be capitalized at $1,000,000 and will take over the three plants now operating, extending the transmission lines and otherwise arranging to handle more business. The company's present assets are fixed at $592,000, with a value as a going concern estimated at nearly as much more. Liabilities are $621,000.

COLUMBUS, GA.—The city has secured the services of an engineer to furnish information in regard to the establishment of a municipal lighting plant. The Board of Aldermen will decide whether the issuance of bonds will be submitted to the voters.

NORTH CENTRAL STATES.

CANTON, O.—The Canton Electric Company is having a survey of the city's street-lighting requirements made by experts in order to determine the best system for the proposed new construction. As soon as this can be determined upon the Council will authorize the work.

CINCINNATI, O.—Bids will be received by the clerk of the Board of Education until noon, February 28, for the work involved in remodeling the Whittier School, including the electrical work, bids on which may be made separately. C. W. Handman, business manager, has plans and specifications.

CRESTLINE, O.—The Crawford County Gas & Electric Company's power plant here has been purchased by the Cleveland, Southwestern & Columbus Railway Company. Improvements and changes will be made.

DAYTON, O.—The Dayton Power & Light Company has purchased from the General Electric Company two 17,500-horsepower steam turbines for installation in its new power plant at Miller's Ford, the ultimate capacity of which is to be 150,000 horsepower. Work on the plant will begin at once, with a view to having it in operation by December 1.

DAYTON, O.—The Domestic Engineering Company, incorporated by Edward A. Deeds, R. H. Grant and R. D. Funkhouser with a capital stock of $800,000, will take over the "Delco" lighting business now handled by the Dayton Engineering Laboratories Company, manufacturing farm and small town lighting systems. A large plant, surrounded by a model industrial community, will be constructed by the new company at Oakwood, near Dayton, a large tract of land having been acquired for this purpose.

LONDON, O.—It was stated at a meeting of the Board of Works, of which N. Speasmake is chairman, that $30,000 is required to place the electric lighting plant in good condition.

COLUMBIA, IND.—Bids are being asked for proposed improvements to the municipal lighting system.

ELKHART, IND.—The contract for city lighting has been signed by city officials and F. A. Bryan, president and general manager of the Indiana & Michigan Electric Company. The work of installing the new lighting system will be started by the lighting company as soon as weather conditions will permit.

ELKHART, IND.—The Hawks Electric Company has made a proposition to the County Commissioners for an extension of its transmission lines to the county institution at Dunlaps. If an agreement is reached the contract for wiring and fixtures for the county building will be let by competitive bidding.

FORT WAYNE, IND.—The municipal lighting department, of which Frank Dix is superintendent, will install a coal and ash-handling conveyor at the power house and will also install several new systems of the new nitrogen lamps to replace old overhead arc lights.

FORT WAYNE, IND.—The Ft. Wayne & Decatur Traction Company has been incorporated by William J. Vesey, Edward X. Ehinger and G. M. Leslie, with a capital of $200,000. The company will construct an electric traction line from Ft. Wayne to the Indiana-Ohio line.

CHILLICOTHE, ILL.—The Santa Fe Railway Company has plans made for a power plant to be erected here. The cost will be approximately $15,000.

CHILLICOTHE, ILL.—The municipal boards of Chillocothe and North Chillicothe will be presented ordinances granting permission to the Peoria and Chillicothe electric line to lay and operate railway tracks over the streets of the two towns.

GALESBURG, ILL.—An ornamental lighting system is being urged by citizens of the north side residence district. John Walsh, superintendent of the Electric Department, favors the movement.

HANOVER, ILL.—Bonds have been voted for the installation of an electric lighting system here.

OGDEN, ILL.—A company has been organized to install an electric light system here.

HANCOCK, MICH.—The Houghton County Traction Company is planning to extend its trolley line from Hancock to Dollar Bay.

MARQUETTE, MICH.—The Michigan State Telephone Company will extend its telephone line to Copper Harbor, Keweenaw County, the outermost port on Keweenaw point, during the coming summer.

MONROE, MICH.—Bids will be received for supplying this city with electrical service for a period of five or ten years. The voters at a recent election decided not to erect a new municipal plant and the capacity of the present one is not equal to the demand.

MUSKEGON, MICH.—The Muskegon Traction & Lighting Company, of which Henry E. Morton is a director, is planning to make extensions and improvements this year costing $35,000.

VERMONTVILLE, MICH.—Vermontville has voted to have electric lights, service to be furnished by the Thornapple Gas & Electric Company of Hastings.

APPLETON, WIS.—The matter of providing a modern electric lighting system for this city is being discussed by city officials.

CHIPPEWA FALLS, WIS.—The proposition to establish a white way system on the principal business streets has been passed by the City Council. City Engineer Thompson was authorized to draw up plans for the system, the installation of which will cost about $8,000.

MILWAUKEE, WIS.—An increase of $1,250,000 in the capital stock of the Milwaukee Western Electric Railway Company was voted at the annual meeting,

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making the total stock issue $2,250,000. The action was taken to prepare the company for future extensions and the building of branches. The following officers were re-elected: President, Alvin P. Kletzsch, Milwaukee; first vice-president, Richard Roll, Hustisford; second vice-president, Otto J. Schoenleber, Milwaukee; treasurer, H. J. Janzer, Milwaukee; secretary and assistant general manager, J. W. Barber, Milwaukee; general manager, W. D. Chapman.

VAN DYNE, WIS.—The Eastern Wisconsin Railway & Light Company, of Fond du Lac, is planning to build a line to this village to furnish energy for light and power.

PRESTON, MINN.—The board of directors of the Root River Power & Light Company has decided to erect an auxiliary power plant here to cost about $25,000.

AINSWORTH, IOWA.—An electric lighting system will be installed here within the next few months. Marr Brothers will be the owners and operators of the new plant.

AMES, IOWA.—The Iowa Public Service Company, which has recently gone through a process of reorganization, has made an announcement that a new $35,000 plant will be built here during the year.

AUDUBON, IOWA.—The Federal Light & Power Company has purchased the Audubon County Electric Light & Power Company's plant here, which furnishes light for Audubon, Exira and Hamlin. The former company owns lighting plants at Grinnell, Brooklyn, Storm Lake, Sac City, Carroll and several other towns in Iowa. It is said the company will build a modern plant here and extend its lines to Manning, where the Federal Company recently purchased the lighting plant. Service would then be furnished to the towns of Ross and Gray.

LEON, IOWA.—David G. Fisher & Company, of Davenport, has purchased the power plant and holdings of the Leon Electric Company and probably will make improvements.

ORANGE CITY, IOWA.—F. W. Michel has sold the Orange City electric lighting plant to an eastern syndicate. It is understood that plants at Le Mars, Sheldon, Rock Valley, Sioux Center, Remsen and several other towns have been purchased by the syndicate, and that a power plant will be established to furnish light and power for these towns and for the intervening territory.

ORIENT, IOWA.—Bonds in the sum of $10,000, have been voted for the purpose of securing an electric lighting system.

SHEFFIELD, IOWA.—Plans are under consideration for the installation of an electric lighting plant here.

SIBLEY, IOWA.—Bonds have been voted for an electric lighting plant for this city.

BRANSON, MO.—H. A. Larson and W. E. Myers, who own an ice plant here, have been granted a 20-year franchise to furnish electric light and power. Work on a new power plant will be commenced immediately. Rates of 10 cents per kilowatt-hour for residence lighting and 2 to 6 cents for power purposes have been agreed upon.

LUCERNE, MO.—The Lucerne Electric Light Company has been incorporated by S. L. Prough, O. E. Snyder and A. M. Boland. The company proposes to furnish energy to the community for power and lighting.

ST. LOUIS, MO.—City officials and various committees are working on plans for a proposed trolley line in Forest Park, estimated to cost from $70,000 to $230,000, to be operated by the United Railways Company.

WINDSOR, MO.—The Windsor Light & Power Company has been incorporated with a capital of $18,000 by J. C. Roberts, R. F. Williams and R. Roberts.

EDNA, KANS.—C. E. Page has asked for a franchise to supply Edna and vicinity with electrical energy for power and lighting purposes.

EUDORA, KANS.—At the city election to be held March 8, a proposition to issue $10,000 in bonds for the purpose of securing electrical service for the city will be voted on. For some months negotiations have been in progress with the Lawrence Railway & Light Company to secure energy from Lawrence. Another source of supply is from the Heim interurban line which operates near here. Power will be secured from one of the two sources.

GARDEN CITY, KANS.—The Sugar Company is arranging to install another 1,000-kilowatt unit to their power plant here.

DATES AHEAD.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 8 and 9. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Building, Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

KANSAS CITY, KANS.—Five bids for a 3,000-kilowatt generator for the municipal electric light plant were opened by the Kansas City commissioners. The contract for installation will be let later.

MORLAND, KANS.—Contracts will soon be awarded for construction of an $8,000 electric lighting plant.

NORCATUR, KANS.—The municipality of Norcatur is planning the installation of a distributing system, electrical energy to be obtained from either Norton or Oberlin.

OSBORNE, KANS.—The Council is planning to issue $7,000 bonds to buy additional equipment for the lighting plant, or will make arrangements to secure energy from some outside source.

SPEARVILLE, KANS.—Citizens here are in favor of the purchase by the city of the electric lighting plant. Extensions would be necessary under the plan.

TOPEKA, KANS.—Investigation of the Kaw River for a site for a hydro-electric development is being made by E. B. Murray, of Kansas City, consulting engineer of the Kaw Valley Drainage Board, at the instance of W. J. Rickenbacher, one of the backers of the project. The Topeka Commercial Club has been given permission by federal authorities to construct a dam at this point, and Mr. Rickenbacher has an option on this authority.

BRADLEY, S. D.—The Bradley Electric Light Company has purchased the holdings of the Garden City Light & Power Company. The local company will run the two plants for the present, and eventually a transmission line will be built to Garden City; the system there to be furnished power by the Bradley plant. The lines probably will be extended to Wallace from the Bradley plant, with the possibility that the town of Lily also will be served.

BUSHNELL, S. D.—Ways and means for securing an electric lighting system are being discussed by city officials.

EUREKA, S. D.—Arrangements are being made to provide Eureka with an electric lighting system. Outside capitalists have offered a proposition to install a system costing about $12,000. Business men here have indorsed the proposition, and the plant probably will be built this spring.

FREDERICK, S. D.—There is a strong agitation here for the securing of electric power in Frederick, either from Ellendale, N. D., or from some other source, this power being greatly needed not only for lighting the city but for commercial purposes.

BINFORD, N. D.—Ways and means are being considered for the installation of an electric light system here. H. B. Hanson is interested in the proposition.

GRAND FORKS, N. D.—The transmission line to St. Hilaire, Minn., has been completed and the Red River Power Company is now furnishing that city with electric light and power.

WERNER, N. D.—A new white way system will be installed in this city in the spring. D. A. Hulett is in charge of the plans.

SOUTH CENTRAL STATES.

CAMDEN, TENN.—The Camden Electric Light Company, Wade Lowry and John D. Rice, proprietors, has begun operations. The town has been without service for a year.

CHARLESTON, TENN.—The Hiwassee Light & Power Company, with a capital of $5,000, was organized following a meeting here recently between prominent business men of Calhoun and Charleston. This company will furnish the two towns with electric lights, the energy to be secured from the Tennessee Light & Power Company. New buildings will be erected and the proper equipment will be installed immediately.

MARYVILLE, TENN.—Prices are asked by the Dreamland Amusement Company, for a direct-current generator, 15-kilowatts and 220 volts, direct connected to a kerosene engine.

NASHVILLE, TENN.—In submitting his yearly report, J. W. Pentecost, superintendent of the city lighting plant, makes a recommendation for additional lighting equipment.

PORTLAND, TENN.—The South Kentucky Power Company will build transmission lines to this city.

RUSKIN, TENN.—The electric light plant of Ruskin-Cave College was destroyed by fire recently. It will be rebuilt, the cost being estimated at $10,000. Prof. R. E. Smith is president of the College.

BIRMINGHAM, ALA.—The Alabama Power Company has completed arrangements to extend its lines into Walker County and also from Decatur to Hartselle. F. H. Chamberlain is general manager of the company.

MONTGOMERY, ALA.—The Louisville & Nashville Railroad is making plans to install a block signal system between Montgomery and Calera.

BATESVILLE, ARK.—Work incident to ascertaining the amount of power that could be derived from the development of Locks No. 2 and 3 on the White River is being carried on by Engineer Lord, of Detroit, Mich., who is in the employ of a company which contemplates the utilization of power from these sources and the establishment of smelters for the extraction of manganese from ore found in this section.

GRAVETTE, ARK.—The City Council has purchased a new engine and boiler for the municipal lighting plant.

PRESCOTT, ARK.—The Water and Light Committee have purchased a new engine, generator and switchboard for the city lighting plant. The cost was $3,200.

SHAMROCK, OKLA.—A large number of power plants for pumping at the oil wells in the Layton sand pool, south of Shamrock, are being installed at the present time by several of the companies operating in that territory. Among the operators are the Eastern Oil, the Prairie, the McMann and the Gypsy Companies.

PADEN, OKLA.—The Paden Light & Power Company has been incorporated by A. G. Rogers, W. E. Davis and W. G. Botts with a capital of $10,000 for the purpose of building and operating an electric lighting plant here.

BATSON, TEX.—The electric light and machine shop owned by Thompson & Beitrich, which was recently destroyed by fire, will be rebuilt. The new plant will cost more than $50,000.

CLAUDE, TEX.—A contract has been awarded to Nelson & Smalley of this city for the installation of an electric lighting plant here within the next few months.

DALLAS, TEX.—The Electrified Water Company has been organized here for the purpose of installing a water supply plant. E. W. Rose is interested in the project.

NIXON, TEX.—J. F. Woods, Jr., and associates will build an electric light and power plant here.

WESTERN STATES.

TERRY, MONT.—The City Council has closed a contract with the Terry Electric Light & Power Company, whereby the business streets and residence sections will be lighted by the power company. It is reported active construction on installa-

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tion will begin as soon as the weather permits.

DENVER, COLO.—The City Council is considering a petition for an ornamental lighting system on Stout Street.

DOUGLAS, ARIZ.—City officials have under consideration plans for new street lights. The cost of the proposed system is estimated at $12,000.

PHOENIX, ARIZ.—The contract for extensions to the underground lighting system has been awarded to the New State Electric Supply Company on its bid of $18,300.

SALT LAKE CITY, UTAH.—Stockholders of the Mountain States Telephone Company have voted $3,950,000 for extensions and betterments of the system to be made during the year.

SALT LAKE CITY, UTAH.—Plans and specifications for special lighting district No. 2, which includes Main Street between South Temple and Fifth Streets, have been prepared and bids will soon be advertised for the construction work.

ABERDEEN, IDAHO.—This city has granted to the Southern Idaho Water Power Company, a 50-year franchise and a substantial lighting contract. The power company will soon commence the installation of the system.

GOODING, IDAHO.—The substitution of the present lighting system for a system of series lighting is being considered by the City Council, following the offer of R. B. King, superintendent of the Great Shoshone Power Company. Mr. King proposes to substitute 60 incandescent lights of 400, 250 and 100-candlepower in place of the arc and incandescent lights now in use. The power company will make the installation.

OAK HARBOR, WASH.—A franchise for the installation of a lighting and water system here has been granted by the City Council to the Whidby Island Electric & Power Company, which maintains headquarters at Langley, where the company operates a lighting plant. The franchise is for 25 years, the city retaining the right to purchase after five years. The franchise contains the stipulation that active construction must begin within six months and the plant in operation within a year.

SPOKANE, WASH.—It is reported that property owners of Riverside have launched a plan for completion of the ornamental lighting system on that thoroughfare.

SPOKANE, WASH.—If the council will grant a temporary permit for the construction of four blocks of railway on Madella Street from Trent to Boone Avenue the Spokane Traction Company will at once build this line and transform its stub car service into a loop.

EUGENE, ORE.—The City Council has taken possession of the Oregon Electric Company's distribution system in this city and the commercial and lighting business will be handled by the city. The city agrees to pay $150,000 for the system, and has already paid $50,000, the balance of the total to be paid at the rate of $1,250 per month.

ARBUCKLE, CAL.—A new electric lighting system is to be installed in this city in the near future.

CHICO, CAL.—A new proposal for an efficient street lighting system in the business district is being vigorously urged by Trustee S. A. Reynolds. He declares that at but little additional expense to the city for maintenance and more for installation there can be installed a modern and adequate system.

ORANGE, CAL.—Bids have been received for the installation of an ornamental lighting system, consisting of 44 posts with 400-candlepower lamps, and the advisory committee has recommended the use of marbelite posts.

PASADENA, CAL.—The City Council has passed a resolution ordering the installation of ornamental cast-iron posts and conduit for lighting Bellevue Drive.

PORTERVILLE, CAL.—The Mt. Whitney Power & Electric Company plans to erect a substation here this spring.

REDDING, CAL.—The question of erecting a municipal lighting plant will be submitted to the voters at the April election.

RIVERBANK, CAL.—A petition has been presented to the Supervisors asking for the formation of a lighting district to include the section west of Riverbank.

SAN BERNARDINO, CAL.—W. W. Brison, district manager, and H. N. Siegfriend, commercial agent of the Southern Sierras Power Company, have been in Banning and the Dale country looking over the field with a view of extending the company's lines.

Proposals

BATTERIES.—Sealed proposals will be received at the office of the Signal Corps, United States Army, War Department, Washington, D. C., until March 6, for furnishing dry batteries.

ELECTRIC WIRING.—Bids will be received by the Board of Administration, Capitol Building, Springfield, Ill., until March 7, for the electric wiring of a school building at the Lincoln State School. Plans and specifications may be obtained from J. B. Dibelka, state architect, 130 North Fifth Avenue, Chicago.

LIGHTING FIXTURES.—Sealed proposals will be received by the Harbor and Subway Commission, March 3, at Room 2001, City Hall Square Building, 139 N. Clark Street, Chicago, Ill., for the furnishing and installing of electric lighting fixtures on Pier No. 2, Harbor District, according to plans and specifications on file in the office of the Harbor and Subway Commission, of which E. C. Shankland is chairman.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, for furnishing supplies at the following naval stations: Schedule 9318—Brooklyn, N. Y., 150,000 feet flexible double conductor, 280,000 feet bell wire, 45,000 feet telephone wire. Schedule 9322—Newport, R. I., clear, uncut mica sheets, 15,000 feet ebonite tubing. Bidders desiring to submit proposals should make application for schedules to the Bureau or any Navy Purchasing Office.

LIGHTING FIXTURES.—Sealed proposals will be opened in the Supervising Architect's Office, Washington, D. C., at 3 p. m., March 1, for furnishing and installing lighting fixtures in the United States post office at Concord, N. H., in accordance with drawings and specifications, copies of which may be had at the Supervising Architect's office. Proposals are desired only from those qualified to produce work of the highest grade, both artistically and mechanically, and the right is reserved to refuse to send the drawings and specifications or to receive proposals from anyone who, in the opinion of the Supervising Architect, is not so qualified.

New Incorporations

CINCINNATI, O.—The Factory Power Company has increased its capital stock from $200,000 to $300,000.

DEFIANCE, O.—The Defiance Gas & Electric Company has increased its capital stock from $300,000 to $850,000.

CHICAGO, ILL.—Anderson Electric Specialty Company. Capital, $50,000. Incorporators: W. L. Hall, C. E. Burnap and C. R. Shervey.

NEW YORK, N. Y.—American Electric Products Company. Capital, $50,000. Incorporators: J. E. Mautner, A. L. Ohse and M. E. Kaplan.

CHICAGO, ILL.—The Fullerton Taling Electric Sign Company. Capital, $70,000. Incorporators: A. O. Olson, J. J. Leahy and L. M. Betts.

PHOENIX, ARIZ.—Burns Electric Company. Capital, $1,000,000. Incorporators: Herbert Harper, P. H. Schmidt and M. A. Burns, all of Evansville, Ind.

NEW YORK, N. Y.—Auth Electrical Specialty Company. Capital, $25,000. Incorporators: Charles Auth, Edward Auth and A. H. Stiehl, Brooklyn, N. Y.

INDIANAPOLIS, IND.—D. & M. Manufacturing Company. Capital, $12,000. Manufacture electrical appliances. Incorporators: Oscar Dietz, C. E. Mills and W. D. Jones.

NEW YORK, N. Y.—Williamson Electric Company, Inc. Capital, $150,000. Manufacture electrical devices. Incorporators: L. A. Williamson, G. S. Hice and S. B. McNeill.

CHICAGO, ILL.—Lamson Electrical Manufacturing Company. Capital, $5,000. Manufacture electrical specialties. Incorporators: Walter Bachrach, S. W. David and A. H. Marshall.

NEW YORK, N. Y.—X-Ray Reflector Company. Capital, $35,000. Manufacture electrical appliances. Incorporators: A. D. Curtis and E. L. Haines, Chicago, Ill., and R. B. Corby, New York, N. Y.

BISMARCK, N. D.—The Northwest Public Service Corporation. Capital, $50,000. Contracting and deal in electrical supplies. Incorporators: W. G. Woodruff, C. T. Staley, H. F. O'Hare and P. A. Wessel.

WILMINGTON, DEL.—The Western Electric Company, Inc. Capital, $500,000. Manufacture electrical and other instruments. Incorporators: W. M. Pyle, G. G. Stiegler and W. F. O'Keefe, all of Wilmington.

AUGUSTA, ME.—The Star Instrument Company. Capital, $100,000. Manufacture electrical and mechanical appliances. Incorporators: M. E. Hegarty, Winthrop, Me.; G. K. Bassett, Winslow, Me.; and R. H. Montgomery, Boston, Mass.

Financial Notes

United Railways & Electric Company, of Baltimore, has called for payment March 13 at par and interest its $1,000,000 two-year five-per-cent collateral trust notes due Jan. 1, 1916. Funds for the payment of these notes were secured from the sale of $2,750,000 five-year five-per-cent notes dated February 1, 1916.

The Electrical Securities Corporation is asking tenders until February 28, through the Guaranty Trust Company, of New York, of as many of its fourth series of five-per-cent collateral trust bonds as may be purchased for $61,001 and as many of its twelfth series five-per-cent collateral trust bonds as may be purchased with $100,000. Accepted bonds will be paid for March 1.

Denver Gas & Electric Light Company, a subsidiary of Cities Service Company, will call for redemption at 101 and interest, on October 1, 1916, its outstanding $3,500,000 six-per-cent collateral trust notes, due April 1, 1917. Funds for the payment of these notes will be secured from the proceeds of $4,000,000 Denver Gas & Electric Light Company first and refunding five-per-cent bonds, due 1951, now being offered at 92 and interest.

American Power & Light Company is arranging to offer to holders of its preferred stock and of its voting trust certificates and option warrants for its common stock of record of February 21, the privilege to subscribe to an issue of six-per-cent gold debenture bonds, with the right to receive, upon payment, option warrants giving the right to purchase at par common stock at any time prior to March 1, 1931, and after March 1, 1918, to pay for such common stock with the debenture bonds at par.

The Michigan Light Company, a subsidiary of the Commonwealth Power Railway & Light Company, has sold to bankers $1,125,000 first and refunding five-per-cent bonds, dated March 1, 1916, due March 1, 1946. The new bonds are subject to $1,959,000 underlying issues. The reproduction value of the properties of the company has been appraised by the Mich-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EX-
. CHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 21	Feb. 14
American Tel. and Tel. (New York)	127¼	127⅝
Commonwealth Edison (Chicago)	144	144¼
Edison Electric Illuminating (Boston)	248	246
Electric Storage Battery common (Philadelphia)	66	65⅝
Electric Storage Battery preferred (Philadelphia)	66	65⅝
General Electric (New York)	171	171⅜
Kings County Electric (New York)	129	128
Massachusetts Electric common (Boston)	7¼	7½
Massachusetts Electric preferred (Boston)	37	40
National Carbon common (Chicago)	182	182
National Carbon preferred (Chicago)	122	122
New England Telephone (Boston)	136½	137
Philadelphia Electric (Philadelphia)	28	27⅞
Postal Telegraph and Cables common (New York)	80¾	87¾
Postal Telegraph and Cables preferred (New York)	67½	67½
Western Union (New York)	88⅝	89¼
Westinghouse common (New York)	66½	67⅝
Westinghouse preferred (New York)	76	77

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igan Railroad Commission as being in excess of all outstanding bonds and preferred stock.

New York and Chicago bankers are offering $4,500,000 Middle West Utilities Company ten-year six-per-cent collateral bonds at 96.625, or on a 6.50 per cent basis. The proceeds of this sale will reimburse the company's treasury for expenditures made on sudsidiary properties and also retire the $2,652,300 three-year six-per-cent collateral notes due June 1, 1916, making the $6,500,000 ten-year bonds outstanding the only funded obligations of Middle West Utilities. Gross earnings of the Middle West Utilities Company for the fiscal year ended April 30, 1916, are estimated at $1,573,193, with net of $1,265,663 to provide for annual interest charges of $390,000.

Dividends.

	Term	Rate	Payable
Blackstone Val. Gas & Elec.	Q	$2.00	Mar. 1
Cities Service, pf.	M	0.5 %	Mar. 1
Conn. Pw., pf.	Q	1.5 %	Mar. 1
Interstate Elec., pf.	—	1.75%	Mar. 1
Mackay Companies, com.	Q	1.25%	Mar. 1
Mackay Companies, pf.	Q	1 %	Mar. 1
N. Y. & Q. Elec. Lt. & Pw., pg.	Q	1 %	.....
No. Ohio Trac. & Lt., com.	Q	1.25%	Mar. 15
Penn. Water & Pw.	Q	1 %	Apr. 1
Rochester Ry. & Lt., pf.	Q	1.25%	Mar. 1
Southwest Pw. & Lt., pf.	Q	1.75%	Mar. 1

Reports of Earnings.

NASHVILLE RAILWAY & LIGHT.

	1915	1914
December gross	$ 204,364	$ 197,278
Net after taxes	87,483	86,223
Surplus after charges	44,537	55,144
Twelve months' gross	2,143,903	2,240,308
Net after taxes	825,069	886,576
Surplus after charges	314,482	386,905

LAKE SHORE ELECTRIC.

	1915	1914
Gross earnings	$1,387,143	$1,427,957
Expenditures and taxes	898,136	890,813
Net earnings	489,007	537,144
Interest	433,203	426,659
Surplus	55,804	110,485

KINGS COUNTY ELECTRIC LIGHT.

The Kings County Electric Light & Power Company has issued its report for the year ended December 31, 1915. The combined income account compares as follows:

	1915	1914
Gross	$6,928,115	$6,244,385
Net after taxes	3,636,830	3,211,282
Depreciation	1,278,246	974,497
Balance	2,358,584	2,236,785
Other income	72,700	72,504
Total income	2,431,285	2,309,289
Bond discount	20,269	20,269
Fixed charges	843,515	844,186
Surplus	*1,567,501	1,444,834
Dividends	1,072,270	1,057,228
Surplus	495,231	387,606
†Payment	78,468	66,596
Surplus	416,763	321,010
‡Previous surplus	2,180,677	1,859,147
Principal and interest surplus	2,597,440	2,180,157

*Equal to 11.66 per cent on $13,436,000 stock, compared with 10.85 per cent on $13,308,100 in previous year.

†Payment to Brooklyn Edison investment fund in accordance with employees' profit-sharing plan.

‡After miscellaneous adjustments.

COLUMBUS RAILWAY, POWER & LIGHT.

	1915	1914
December gross	$ 300,315	$ 278,561
Net after taxes	135,788	127,134
Surplus after charges	94,599	87,086
Twelve months' gross	3,113,175	3,066,298
Net after taxes	1,266,738	1,179,552
Surplus after charges	790,457	700,092

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20042. DYNAMOS.—An American consular officer in Spain reports that a man in his district desires to represent American manufacturers of machinery. At present he has urgent orders for one 3-phase alternator and one 80-horsepower 3-phase motor. Detailed information relative to this opportunity may be had on application to the Bureau or its district offices.

NO. 20098. ELECTRIC MOTOR.—A firm in Canada informs an American consular officer that it desires to purchase an electric motor, 125 horsepower, 550 volts, direct current. Quotations are desired c. i. f. destination, but f. o. b. quotations will be considered.

NO. 20100. ELECTRICAL SUPPLIES.—A man in Italy writes that he desires to receive quotations from American manufacturers of electrical supplies used in electric-light installations.

NO. 20137. HYDROELECTRIC MACHINERY.—A commercial organization in the United States transmits an inquiry from a man in Bolivia who desires to receive catalogs, prices and full information from American manufacturers of turbines, pelton wheels, etc., for a fall of water about 115 feet and a capacity of about 11 gallons per second; electric generating machinery to furnish light and electric power, in proportion to the power developed by fall of water referred to, and electric motors. Correspondence and catalogs should be in Spanish.

Electrical Patents Issued February 15, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,171,405. Liquid-Level Electrical Indicator. D. Ablon, Dallas, Tex. Float-operated dimmer and extinguisher for lamp in alternating circuit.

1,171,414. Charging and Discharging Apparatus. H. A. Carpenter, R. L. Hibbard and A. W. Warner, assignors to Riter-Conley Mfg. Co., Pittsburgh, Pa. Motor system for gas retorts.

1,171,415. Selecting System. O. A. Danielson, assignor to Western Electric Co., New York, N. Y. System of selecting relays for telephone lines.

1,171,426. Train-Stop System. L. A. Gladding and J. H. Sullivan, Newport, R. I. Has electromagnetically controlled engine throttle.

1,171,429. Telephone Exchange System. C. H. Goodrum, assignor to Western Electric Co. Automatic, with talking circuit divided into inductively united sections.

1,171,457. Air Controller for Explosive Engines. W. H. Oldham, Elkton, Ky. Air valve, spark and throttle controlling devices interrelated to open air valve when other devices are advanced.

1,171,460. Telephone Transmitter. S. C. Porter, New York, N. Y. Arrangement of transmitter in casing acting as resonator.

1,171,471. Incandescent Lamp Socket. M. V. Smith, assignor to J. E. Hamilton, Simsbury, Conn. Comprises clamp for conductors and plungers forced into contact therewith by insertion of lamp.

1,171,480. Electrical Fluid Pressure Indicator. F. J. Troll, assignor to Loadometer Co., Baltimore, Md. Reactance in alternating indicator circuit, contained in casing immersed in fluid and varied according to pressure thereof.

1,171,488. Electric Search Lamp. R. H. Welles, assignor to Badger Brass Mfg. Co., Kenosha, Wis. Has co-operating connector and lamp sockets respectively in casing and reflector.

1,171,492. Socket Cover and Shade-Holder. H. R. Yardley, Chicago, Ill. Has special arrangement of spring clip.

1,171,494. Cutout for an Electric Signal. G. L. Barrett, Springfield, Ohio. Contact arrangements in compact, unitary structure.

1,171,509. Electric Lighting Device. E. Essich, Stuttgart, Germany. Vacuum, heat-insulating envelope for incandescent lamp.

1,171,518. Safety Control System for Elevator Cars. H. G. Hillman, and S. M. Ward, Jr., assignors to J. T. Clarke, New York, N. Y. Door latch and car controller electrically interlocked.

1,171,520. Calling Device. H. Hovland, assignor to Western Electric Co. Impulse sender for telephone station of automatic system.

1,171,533. Driving Means for Clocks. C. E. O'Keenan, Paris, France. Mechanism for giving constant degree of motion by variably driven motor.

1,171,540. Mooring Winch. A. T. Prescott, assignor to G. H. Frothingham, Co., New York, N. Y. Reversible motor control with high resistance in circuit in one direction to give low torque and permit stalling without injury.

1,171,564. Thermally Operated Means for Automatically Disrupting Electric Alarm Circuits, etc. H. S. Turner, San Diego, Cal. Conducting strand for alarm circuits formed of spring sections connected by fusible material.

1,171,576 and 1,171,577. Interrupter. T. Abtmeter, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. First patent: Details of contact mounting and operation in rotary mechanical device. Second patent: Modification.

1,171,586. Meter Switch. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. For connecting meter with secondaries of series transformers in polyphase system and short-circuiting Secondaries when meter is cut out.

1,171,587. Switch for Meters. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. For connecting ammeter into any one of several circuits.

1,171,588. Metering Switch. H. W. Brown, assignor to Westinghouse Electric & Mfg. Co. For connecting voltmeter across any one of several circuits.

1,171,591. Coil for Electrical Apparatus. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Manner of securing terminal to conductor.

1,171,594. Spark Advancer. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Contacts operated by rotary member have uniform period of contact at varying speeds.

1,171,595. Vehicle Lighting System. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. System for supplying head, tail and side lights.

1,171,596. Interrupter. F. Conrad and T. Abtmeyer, assisgnors to Westinghouse Electric & Mfg. Co. Contacts operated by rotary cam with lost-motion connections.

1,171,597. Storage-Battery Separator. J. N. Davis, Denver, Colo. Details of plate envelope.

1,171,598. Spark Gap for Radiotone Wireless Telegraph Systems. L. DeForest, assignor to Radio Telephone & Telegraph Co., New York, N. Y. For producing powerful electrical oscillations; electrodes are superposed metal disks with air-tight spaces between.

1,171,600. Electric Locomotive. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Structure of side frame.

1,171,609. Apparatus for Manufacturing Insulation. E. Haefely, assignor to Westinghouse Electric & Mfg. Co. Machine for making tubular bodies of strip fabric.

1,171,629. Circuit-Closer. S. Myers, Tower, Mich. Adjustable rotary contact device.

1,171,630. Brush Connection. J. Naydor, assignor to National Carbon Co., Cleveland, O. Attachment of pig tail to carbon brush.

1,171,633. Sound-Absorbing Device. E. Osborn and J. J. Nolan, Albany, N. Y. Telephone transmitter has diaphragm absorbing fugitive sounds.

1,171,635. Starting Synchronous Electric Machines. A. B. Owen, Ridgway, Pa. Started as induction motor with fields polarized by direct current.

1,171,637. Process of Working Clad Metals. W. M. Page, Philadelphia, and W. Tassin, Chester, Pa., assignors to Duplex Metallic Co. Highly conductive wire is produced from copper clad billet.

1,171,649. Dynamo Suspension. W. F. Richards, Buffalo, N. Y., assignor to Gould Coupler Co. Manner of suspending from car truck, dynamo belt-driven from axle.

1,171,668. Pianoforte Control. M. L. Severy, and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. Electro-

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magnetically operated; controls timbre and loudness.

1,171,710. Attaching Device for Connecting Electric Lamps to Current-Carrying Conductors. M. H. Freixas, New York, N. Y. For clamping to insulated conductors; has prongs for penetrating insulation.

1,171,719. Process of Producing Ferrosilicon. H. C. Harrison, assignor to Electro Metallurgical Co., Niagara Falls, N. Y. Agglomerates containing silica and carbon in excess of that required to reduce silica are electrically smelted in presence of iron.

1,171,725. Coated Article. W. B. Jones, assignor to General Bakelite Co., New York, N. Y. Coating containing polymerized phenolic condensation product secured to metallic base by intermediate varnish.

1,171,745. Telephone Attachment. G. P. Mundy, Washington, D. C. Spring reel in base of instrument for cord from bell box.

1,171,751. Means for Securing Junction Boxes in Ceilings and Walls. W. E. Sands, Fanwood, N. J. Junction box adjustable on yoke secured to floor or wall beams.

1,171,756. Lock Circuit Closer. L. Soulliere, Detroit, Mich., assignor of one-half to F. A. Raubolt, Wyandott, Mich. Contacts controlled by key-operated bolt.

1,171,770. Signal Apparatus. R. B. Carter, assignor of one-half to T. J. Louden, Bloomington, Ind. Fire and burglar alarms combined with telephone circuit.

1,171,782. Method for the Hydroelectrolytic Treatment of Ores. R. R. Goodrich, Tucson, Ariz. Manner of circulation of electrolyte in series of cells for electrodeposition of metal.

1,171,785. Safety Controlling Mechanism for Electrically Propelled Vehicles. H. B. Creig, Galion, O. Pedal controlled interlocked motor and brake control.

1,171,799. Collection and Delivery Apparatus. J. F. Montine, Nevinville, Iowa. Telpherage system.

1,171,813 and 1,171,814. Multiplex Telegraphy. F. K. Vreeland, assignor to Vreeland Apparatus Co., New York, N. Y. First patent: by alternating currents of different frequencies. Second patent: modification.

1,171,818. Process of Forming Jigs or Fixtures. B. M. Walpole, assignors to Builders Iron Foundry, Providence, R. I. Manner of constructing jig or fixture for an electric chuck.

1,171,822. Autographic Telegraphy. E. H. Widegren and K. A. Widegren, Alby, Sweden. For producing diplex effect in actuating electric apparatus at a distance by pulsating currents of alternating polarity obtained from direct current.

1,171,831. Adjustable Electric Fixture. N. I. Berger, New York, N. Y. Adapted to receive bowls of different diameters.

1,171,832. Method of Treating Metals. F. L. Bishop, Pittsburgh, Pa. Molecular structure of solid metal altered by subjecting to alternating magnetic field, it being protected against oxidation.

1,171,850. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Special, long, narrow structure adapted to be plugged into complementary receptacle.

1,171,851 and 1,171,852. Attachment Plug for Electrical Conductors. C. J. Klein, Milwaukee, Wis. First patent: Has longitudinally divided base held together by screw shell locked against unscrewing. Second patent: modification.

1,171,860. Process of Making Insulating Joints. L. McCarty, Boston, Mass. Relates to article of patent No. 1,170,920.

1,171,864. Electric Switch. E. B. Merriam, assignor to General Electric Co., Schenectady, N. Y. Oil switch has enveloping hood outside casing for directing vented gases or liquid downwardly.

1,171,867. Electric Engine Starter. M. P. Mitchell, Eaton, Ohio. Relates to gearing.

1,171,889. Electrically Actuated Taximeter for Cabs and Like Vehicles. C. Robinson, Dunoon, Scotland. Indicating and totalizing pointers are electrically synchronized.

1,171,890. Contactor. J. J. Ruddick, Newton, Mass. Operated by pressure of passing trolley wheel.

1,171,907. Electrical Measuring Instrument. H. E. Trent, Wilkinsburg, Pa. Details of ohmmeter.

1,171,914. Receptacle and Plug. G. Wright, assignor to General Electric Co. Flush receptacle and plug therefor.

1,171,915. Electric Train-Bulletin Board. C. E. Abernethy, Hickory, N. C. Master clock electromagnetically effects individual control of display clocks.

1,171,917. Illuminating Apparatus. C. M. Axford, assignor to General Electric Co. For illuminating flag; shifts with flag as wind changes.

1,171,929. Water Heater. A. S. Cubitt, assignor to General Electric Co. Electric heater has water passage varied according to temperature of water.

1,171,936. Means for Preventing Corona Losses. G. Faccioli, assignor to General Electric Co. Wire has metal disks spaced along it to raise the critical voltage above that of the wire.

1,171,945. Regulating Mechanism for Arc Lamps. J. J. Hall, assignor to General Electric Co. Regulation of motor-feeding electrodes.

1,171,948. Self-Starter for Engines. R. H. Hassler, assignor to Nordyke & Marmon Co., Indianapolis, Ind. Compact structure of dynamoelectric machine and clutch, armature being outside and commutator and clutch inside field.

1,171,958. Combined Adjustable Bowl Hanger and Lamp Socket Support for Lighting Fixtures. W. R. Kahns, assignor to J. H. White Mfg. Co., Brooklyn, N. Y. Details of hanger with adjustable bowl-securing and socket-supporting devices.

1,171,964. Electric Motor. N. O. Lindstrom, assignor to A. B. See, Brooklyn, N. Y. Compact structure of hoisting motor and drum.

1,171,969. Electrolytic Rectifier. R. D. Mershon, New York, N. Y. Method of depolarizing the electrodes.

1,171,972. Magnetic Means for Moving Miniature Boats. L. E. Myers, Chicago, Ill. Boat moved about in water receptacle by magnet beneath receptacle bottom.

1,171,981. Locking Device. W. H. Rooney, New York, N. Y. Series of boxes electrically connected so that when door of one is opened all others are locked.

1,171,986. Well Pumping System. W. M. Stephenson, Dallas, Tex. For oil wells; hydrostatic pressure of oil in receptacle at bottom of well electromagnetically controls connection of pneumatic pumping apparatus with receptacle.

1,171,987. Rotary Snap-Switch. J. S. Stewart, New York, N. Y. For pull socket.

1,171,997. Electric Burglar-Alarm System. J. P. Williams, New York, N. Y. assignor to Electric Bank Protection Co. Alarm circuits connected with casing plates of protected structure.

1,172,006. Circuit Reversing Drum for Signal Mechanism. R. Cairns and J. W. Cairns, Watertown, Wis. Detailed arrangement of contact plates and brushes.

1,172,015. Interrupter. J. B. Dyer, assignor to Westinghouse Electric & Mfg. Co. Modification of patent No. 1,171,576.

1,172,017. Method of Transmitting Energy by Electromagnetic Waves. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. The source of energy is mechanically commutated at same frequency as waves to be produced.

1,172,018. Electromagnetic Indicator. R. A. Fessenden, assignor to S. M. Kinter and H. M. Barrett. Galvanometer for high-frequency currents.

1,172,019. Safety Switch Panel. A. E. Griswold, Seattle, Wash. For push-button-operated switches; safety plate inside casing covers live connections.

1,172,024. Electrically Heated Laundry Iron and Like Apparatus. J. G. Homan, assignor to Scientific Products Co., New Cumberland, W. Va. Has invertible, two-circuit heating element.

1,172,025. Electric Heating Device. J. G. Homan, assignor to Scientific Products Co. Metallic heat-distributer covers individual electrically connected heating elements, each having metallic cover.

1,172,080. Means for Closing and Opening Electric Circuits. H. Voight, assignor to Siemens & Halske, A. G., Berlin, Germany. Clock-controlled switching mechanism for automatically controlling electric circuits at predetermined times.

1,172,083. Warning Signal Means for Garages. T. D. Warner, Jonesboro, Ark. Electrically operated signal at door of garage indicates when automobile is coming out.

1,172,084. Electrically Operated Warning Signal Means for Garages. T. D. Warner. Modification of above.

1,172,104. Signal for Vehicles. W. Black, New Orleans, La. Special provision for lighting automobile-direction signal.

1,172,131. Device for Removing or placing Transformer Fuse-Plugs. L. V. Gaffrey, Gaffrey, S. C. Plug grip on end of pole for reaching receptacle.

1,172,134. Sad-Iron Cord Support. W. H. Harold, Walla Walla, Wash. Cord supporting arm on standard which may be placed on ironing board.

1,172,137. Circuit-Breaker. F. F. Hudson, Memphis, Tenn. Structure and mounting of shoes on locomotive truck for engaging contact rail.

1,172,147. Protecting Device for Electric Conductors. M. H. Loughridge, New York, N. Y. Structure for protecting outlets of underground tubular conduits.

1,172,159. Spark Plug. F. Moench, Rushville, Ill. Insulator soldered to nut or casing.

1,172,168. Electric Spark Disclosing Means for Internal Combustion Engines. H. A. Schade, East Cleveland, and F. N. Richardson, Cleveland, Ohio. Comprises a transparent vacuum tube.

1,172,169. Electrically Operated Tool. F. Schneider, assignor to Van Dorn Dutton Co., Cleveland, Ohio. Details of motor-operated breast drill.

1,172,173. Timer for Internal-Combustion Engines. T. B. Shryock, Lawrenceburg, Ky. Simple and compact device adjustable to time spark.

1,172,178. Switch for Electroliers. T. C. Strout, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Push-button-operated snap-switch closing main line circuit and controlling device for selectively controlling branch circuits.

1,172,194. Spark Plug. H. J. Butler and L. P. Casper, Louisville, Ky. Has movable non-conducting member for cleaning electrodes.

1,172,195. Electrically Operated Cash Register and Money Changing Device. E. E. Carter and E. Lightfoot, Los Angeles, Cal., assignor of three-eighths to C. F. Holland, Los Angeles, Cal. Circuits of magnets controlling coin ejectors jointly controlled by coins and keys.

1,172,199. Alarm Apparatus. W. H. Dana and T. F. Broderick, Lawrence, Mass. Electric alarm circuit controlled by pressure in fire sprinkler system.

1,172,203. Magnetic Lock. P. Wheaton, assignor to A. B. Tenney, Lexington, Mass. Key reduces air gap of magnet in one of lock members whereupon the tumbler is magnetically operated.

1,172,221. System of Electrical Distribution and Control. F. B. MacNab, assignor to Dayton Engineering Laboratories Co., Dayton, O. Engine starting system also supplies different types of ignition.

1,172,229. Electric Fixture. J. G. Turnbull, assignor to Turnbull Engineering Co. New York, N. Y. Structure of outlet block and manner of securing to outlet box.

Reissue 14,062. Alternating-Current motor. D. M. Bliss, assignor to T. A. Edison, West Orange, N. J., original number 1,126,363, Jan. 26, 1915. Synchronous motor has stator with primary winding and rotor with secondary windings comprising special arrangement of short-circuited and commutated windings.

PATENTS EXPIRED.

The following United States electrical patents expired on February 21, 1916:

619,733 to 619,735. Electric Meters. T. Duncan, Fort Wayne, Ind.

619,760. Electrical Apparatus. T. B. Kinraide, Boston, Mass.

619,761. Dynamo-Electric Machine. T. B. Kinraide, Boston, Mass.

619,771. Secondary Electric Clock. J. O. Lyman, Waterbury, Conn.

619,829. Protective Device for Incandescent Electric Lamps. R. Kaes, Vienna, Austria.

619,868. Coin Controlled and Registering Telephone Apparatus. R. D. Cranston and S. M. Williams, San Francisco, Cal.

619,885. Voltaic Battery. H. C. Hamilton, New York, N. Y.

619,890. Railway-Signal System. T. B. Keeler, Rahway, N. J.

619,896. Insulating Caster. H. S. Lee, Tecumseh, Mich.

619,900. Electric Switch. A. H. Miller, Central City, Utah.

619,927. Electric-Railway Trolley. E. M. Bentley, New York, N. Y.

619,942. Annunciator for Telephone Exchanges. W. R. Cole, Detroit, Mich.

619,965. Route-Indicating Lamp for Street Cars. J. A. Lakin, Westfield, Mass.

619,974. Rail Insulator. C. B. Martin, New York, N. Y.

620,002. Switchboard Connecting Cord Circuit. G. K. Thompson, Malden, Mass.

620,004. Telephone Switchboard Circuit. T. C. Wales, Jr., Newton, Mass.

620,009. Electric Railway. W. R. Woodward, New York, N. Y., and F. S. Woodward, Granite City, Mo.

620,027. Induction Coil. M. E. Fuld, Baltimore, Md.

620,031. Constructing and Bonding Rails of Electric Railways. S. H. Harrington, New York, N. Y.

620,042. Telephone-Call Register. B. Krausse, Wilmersdorf, Germany.

620,056. Process of Tanning Hides or Skins. F. P. Sadtler, Philadelphia, Pa.

620,086. Electric Heater. L. Casper, Chicago, Ill.

Reissue 11,718. Electrical Controlling Apparatus. O. H. and A. F. Pieper, Rochester, N. Y.

Reissue 11,719. Telephone. J. T. Gent, A. W. Staveley and I. H. Parsons, Leicester, England.

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ELECTRICAL REVIEW

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EDITORIALS

EXTENSIONS OF SERVICE.

Policies with respect to extensions of service by central-station companies differ quite widely in different parts of the country. Extensions are usually made without question upon requests for service from points within the thickly populated district which is included in the area covered by a franchise. Accretions of load usually follow rapidly in such territory and there is no question as to the propriety of extensions as a matter either of finance or of policy. If the district be not thickly settled, it is not so obvious that the company should make an extension and in many jurisdictions this is not done unless the prospective consumer is willing to bear at least a portion of the expense. In some states the public utilities commissions have adopted definite rules with regard to the conditions under which extensions are to be made at the expense of the company, and under which conditions the customer shall be required to pay for the installation.

Where the consumer pays for an extension it is usually regarded as a temporary investment upon his part. Ultimately the title to such extension should come to be vested in the utility. There are various methods of repaying the customer for his initial investment, the ultimate aim being to repay the total amount by the time sufficient load is secured upon the extended line to warrant the company in making the extension. In some cases a certain fraction of the cost is credited each year against the bills of the consumer; in others he receives a refund of a certain portion as each new customer becomes connected to the same line; in others a lump sum may be paid when the load has developed to the required point. The Railroad Commission of California has adopted a rule according to which payments made by the consumers in that state to secure extensions are regarded as loans to the utility company and must eventually be repaid with interest computed at six per cent per annum, under reasonable regulations.

Even where extensions are made by the utility company, it is not usually regarded as necessary that each extension should of itself be profitable to the company and that the latter should not decline to make an extension on this score alone. Franchise conditions, of course, have a bearing here, but in any case the prospect of future profit should be given consideration. The general attitude on this point, however, is of course subject to change and may be influenced by recent rulings of the United States Supreme Court. That tribunal in recent railroad rate cases has made it clear that in adjusting rates, a particular rate may not be lowered beyond the point where it ceases to be compensatory. In other words, the attitude is taken that each portion of the business of a utility should be self-sustaining, and that one class of customers should not be given a rate or a service at a loss, so that other classes are required to pay more than a reasonable amount in order to make up the deficit. While the question of rates, to which this principle has been directly applied, is not entirely analogous to the question of extensions, it may, nevertheless, have some bearing upon this matter. The idea is, however, not so much to make each individual consumer yield a profit as to secure equity between different classes of consumers.

WHY IS THE JOBBER?

The question as to the necessity for the existence of the middleman springs up perennially in nearly every line of trade. By many he is regarded as a parasite. This point of view has probably arisen from the existence, in certain lines of trade, such as perishable provisions, of the commission man who assumes no risk, carries no stock of his own, often fails to protect the interests of his clients, yet frequently pockets a large profit. The electrical jobber falls in a different class. He carries his own stock, does canvassing and publicity work, and offers to the dealer and contractor a service which cannot be secured in any other way.

The advantages to the manufacturer in handling trade through the jobber are well presented by Mr. J. W. Wooley in an interview which will be found on other pages of this issue. It is found that savings in the expense of handling orders, in freight, in traveling salesmen, and other items, more than compensate for the discount allowed to the jobber. In other words, the latter renders a service which is fully equal to the compensation collected by him, and he has justified his claim to a place in the chain of distribution.

Whether the manufacturer should confine his dealings to the jobber is, of course, another matter, and must depend to a certain extent upon the nature of the business. The firm which Mr. Wooley represents has found it advantageous to handle all of its business through the jobber. The greatest advantage to the manufacturer will probably be secured from the jobber's services when this policy is definitely adopted.

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THE POWER LOAD.

In the early days of the central-station industry, the lighting load constituted the principal output and the principal source of income. As the motor load developed and increased in importance, the lighting element, while still increasing, became of less comparative importance. This tendency was emphasized when the tungsten lamp appeared on the market, and the more recent advent of the gas-filled incandescent lamp, operating at approximately one-half watt per candle, has given it still greater emphasis. Today the lighting load still preponderates in some systems, while in others the motor load has outdistanced it.

We look forward to still greater developments in this direction. Electric energy is finding wider and ever wider applications in industry, and its demand for operating railroads will undoubtedly increase. Every advance in the efficiency of electric illuminants tends to lessen the importance of that element of consumption in comparison. The lighting needs of each individual are far less than the needs for power either in his own work, or in the work of others to supply his wants. As more and more of this work is done electrically, the saturated condition of electric supply must be one in which lighting is but a small element.

Since the supply of power was at first in the nature of a by-product, it was natural to expect the revenue from lighting to pay the fixed charges of the plant, and the rates per unit of energy were made lower for power applications. This was also necessary to get the business. With the consumption of power in large blocks, however, it is possible to pay all the costs on a low rate, owing to the superior load-factor and to the economies resulting from the diversity of different loads. This fact is not generally recognized by the public, and even some engineers claim that the lighting customers of a central station are helping to pay the costs of energy delivered to the power customers. They overlook the fact that it is the poor load-factor and the high cost of distribution which make the lighting rate so comparatively high. With the ultimate development of the power load it is probable that the bulk of the revenue will come from this business, and it will necessarily be self-supporting. When energy for lighting becomes little more than a by-product, the rate charged to the small lighting customer will be largely a matter of public policy, and it will be more feasible to serve this class at a flat rate, with the elimination of the cost of metering.

Recent experience in England has demonstrated the importance of the motor load, and its place in producing revenue. Enormous curtailment in the use of lighting has seriously embarrassed those central stations whose principal output was consumed in that way, while at the same time plants supplying large power loads are having the most successful year in their history. This results because industrial activity causes power consumption at a rate that more than overbalances any decrease of output for lighting. Finances are threatened only by the high price of coal.

ELECTRICAL PROSPERITY WEEK—THE RESULTS.

During the early days of the campaign incident to the holding of Electrical Prosperity Week, we prophesied that the industry would be entirely satisfied with the results. We believed at that time that there would be certain tangible returns apparent as a result of the propaganda, but we also made a mental reservation that the intangible results would be far greater than the apparent returns.

It appears that our most sanguine expectations were more than realized. The Society for Electrical Development, under whose auspices Electrical Prosperity Week was carried out, has wisely gathered together a fine collection of facts relating to the tangible evidences of the success of Electrical Prosperity Week. This has been published in a 48-page book entitled "The Story of the Week." If any student of publicity and co-ordinated industry effort were in need of a tonic "The Story of the Week" may be safely recommended as a palliative for a jaded mental attitude with regard to faith in human responsiveness.

The writers of "The Story of the Week" have not prepared dry statistics dealing with the tons of advertising secured and the numbers of electrical appliances sold or houses wired. They have all this, but in addition have garnered from the four corners of the country the personal testimony of the leaders of the industry who have been affected by the returns and know whereof they speak. Electrical Prosperity Week was a distinct and lasting success—"The Story of the Week" proves it.

Coming as it does just when we are beginning the campaign for the "Wire Your Home Month," March 15 to April 15, "The Story of the Week" will inspire confidence in those who have had, because of their lack of proper information, any doubt as to the effectiveness of an effort of this kind. And we sincerely hope that it will convert all who have remained outside of this concerted effort and bring them to the support of those now carrying on the work.

SINGLE-PHASE ELECTRIFICATION IN SWITZERLAND.

The announcement has been made that all of the Swiss steam railroads will be electrified in the near future, and now comes the news that the management has decided upon 16-cycle single-phase operation for all electrification hereafter made.

The first installations of the single-phase system were not very enthusiastically received, and for a long time there seemed to be doubts of its success. Of late, however, it has been increasing in favor, and this decision shows that the Swiss engineers feel satisfied that it will best meet their operating conditions. However, the question of systems is dwindling in importance, as it has been amply demonstrated that any one of the electric systems used for the purpose can be made to give satisfaction. Any

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one of them has advantages over steam for most conditions. Especially in a mountainous country like Switzerland, with heavy grades and ample water-power, there can be little excuse for postponement of the adoption of electric operation.

Countries like Norway and Sweden, whose physical characteristics resemble those of Switzerland, are already planning electric operation upon a large scale. Further developments of this kind in the mountainous regions of America should be no longer delayed.

MUNICIPAL OPERATION OF UTILITIES.

The paper which was presented by Prof. A. G. Christie at the midwinter convention of the American Institute of Electrical Engineers showed that it is possible to obtain satisfactory operation of public utilities which are municipally owned and operated. The cities dealt with in this paper are located in Western Canada, and a few equally creditable instances can be found in this country, but they are indeed few. It is of interest to compare conditions in the cities of the two countries, and to note why in the one, municipal operation is generally satisfactory whereas in the other it has been generally unsatisfactory.

In the first place there are some geographical considerations. In a new country of large opportunities there is less scramble for public office and hence less motive for political interference. The tax system of Western Canada is conducive to a continuation of these opportunities. There is also a better spirit among the citizens of co-operation for the general good, engendered by the necessity of meeting common problems and having few elements of competition among themselves.

As the plants are nearly all of recent date, the equipment is modern and efficient. Continuity in management has been the rule, with responsibility and authority centralized. The cost of generating power varies greatly with the availability of fuel, and prices for electric lighting show a wide range, but generally make a favorable comparison with cities in this country. Professor Christie points out that the principal effect of low rates has been to increase land values in the districts served. Depreciation and amortization of indebtedness have not always been properly cared for, and may make difficulties in the future, a situation which also exists in many privately owned corporations. Efficient management by competent executives predominates. Service has usually been good, but sometimes has suffered from the need of council approval for the purchase of new equipment. Accounting as a rule is carefully done, and utility finances kept separate from other accounts.

Turning to the conditions usually prevalent in this country, we find a great contrast. Accounting is usually such that it is not easy to ferret out the real condition since the accounts of the utility department are not completely segregated from other municipal departments. Efficient management is the exception, as there is usually no continuity in personnel, insufficient authority lodged in the executive, political interference with policies, purchases and payroll, and more or less application of the spoils system. Neglect of depreciation and provision for renewals is common, with likelihood of obsolete equipment continuing in service. Extensions usually require additional bond issues, which the voters may decline to approve, and in any case cannot be carried out without the sanction of the city council, which is often influenced by political considerations. Whether the growth of the commission form of government and the city manager plan will alter the conditions now usually prevalent, remains to be seen. Two great advantages from the economic standpoint accrue to municipal ownership: the possibility of lower fixed charges arising from a lesser rate of interest on securities, and from the absence of any element of intangible value in the capitalization. This is limited to the actual costs of creating the physical plant and the business.

Aside from charges for service, one of the principal reasons given for municipal ownership has been the participation in politics of those controlling privately owned plants. In certain cities this has been an undoubted evil, although often officials have found no other course open to them under the corrupt conditions already prevailing. Happily this state of things is disappearing, and with it this objection to private ownership of utilities. Regulation of utilities by state commissions is looked to by some to remove all objections to private ownership. Others claim that regulation has failed and public ownership is the only recourse. These should remember that public operation itself involves public regulation. Failure of government regulation connotes the failure of government ownership. The success of government regulation makes government operation unnecessary.

In conclusion it may be well to mention here the principles which Professor Christie would apply to municipally owned utilities. They should be self-supporting and subject to taxation; they should be financed by serial bonds, including extensions. Depreciation and emergency reserve funds should be set aside, and any surplus rebated to customers. The superintendent should hold office during good behavior and have a free hand to develop the utility without political interference. A public utility commission should supervise the finance, accounting, rates and administration of municipal as well as privately owned utilities. These are all good points, and if they could be generally adhered to, we should hear less of failures of municipal projects. But there seems to be no place in this country where all of these principles have been applied, and in many places all of them are lacking. To start a municipal plant without first preparing the soil is to invite disaster.

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Happenings in the Industry

Illinois Electric Association Discusses Electric Cooking—Exports Show Increase—Contractors Plan Important Convention in New York—Street Lighting Discussed in Chicago—Program for Boston Central-Station Convention—Texas City to Test Value of a Franchise—Important Hearing on Yosemite Power Case—Miscellaneous News Notes

ELECTRIC COOKING AS A LOAD BUILDER.

Discussion at Convention of Illinois State Electric Association Indicates Electric Cooking a Vital Question to Central Stations.

That the electric cooking load offers practically the only hope of materially increasing the earnings in towns where electric power load is not available was the prevailing thought expressed in a discussion of electric cooking by the Illinois State Electric Association in convention at Champaign, Ill., February 24 and 25. The importance of this class of business was brought forcibly to the attention of the Association in a paper by J. Hall Clayton of Mattoon, Ill., presented at the session on Thursday morning.

Mr. Clayton pointed out that there are about 625 towns in Illinois receiving electric service and of these only 225 are supplied with gas, leaving 400 towns where electric cooking can be successfully developed with electric rates low enough to make this form of cooking an economic success. It is estimated that in Illinois there are 80,000 residence customers now using electric light who have no gas available and who are therefore prospects for electric cooking. When it is considered that the average annual income from an electric range customer amounts to about $36 it is apparent that the total income from electric cooking, if every residence customer would be supplied, would amount to $2,880,000 per year.

The average energy requirements for electric cooking amount to about 100 kilowatt-hours per month. The company serving Mattoon has kept records of the monthly energy consumption of 150 cooking customers divided among 50 towns. The average consumption per customer by month for the last six months of 1915 was as follows:

	Kilowatt-hours
July	99.8
August	89.8
September	93.3
October	108.0
November	101.6
December	106.1

Mr. Clayton points out that in order to develop cooking to any large extent in Illinois, it is necessary to offer rates of from 3 cents to 4 cents per kilowatt-hour for residence cooking and less than 3 cents per kilowatt-hour for restaurants, hotels and other cooking customers using large amounts of energy.

The experience of the Mattoon company indicates that the average residence customer's demand is for a range costing from $35 to $50. In order to lessen the objection to the high initial cost of ranges, it is very essential that they be sold on deferred payments in the same way that gas ranges are generally sold. The initial price of the range should preferably include the cost of wiring necessary to connect up the range.

Cost of Serving Electric Ranges.

When the Central Illinois Public Service Company first started selling electric ranges, a very accurate record was kept of all expenditure necessary to serve each range. The total cost per range of connecting 30 ranges in 15 different towns was as follows:

Line extension (primaries and secondaries)	$5.26
Service drops	2.29
Transformers	6.12
Meters	7.91
Total additional expenditure per customer	$21.58

These figures are based on the prices of copper obtaining about a year ago. In connecting the above 30 customers it was necessary to increase the transformer capacity in only eight cases. The remaining 22 customers were served from the transformers already serving lighting customers in the immediate vicinity.

In order to make cooking by electricity successful, it is very necessary that the service to each range be carefully planned so that there is full voltage at the range. In one case the voltage on a group of ranges fell about 10 per cent below normal and the consumption of the ranges was very much increased from this cause, resulting in dissatisfaction from high bills.

The company at first found it very difficult to interest prospects in electric ranges and had to adopt the plan of installing them for a trial period 30 days. At least 90 per cent of the ranges so placed were subsequently sold. Efforts are made to introduce electric cooking in domestic science schools and at every opportunity an electric range is loaned to women's clubs, church societies, etc.

Mr. Clayton points out that the average residence customer pays about $18 per year for his lighting service, while the average range customer pays about $36 per year.

The paper was discussed rather fully, the consensus of opinion being that the electric-range business could be considered as off-peak and consequently a low rate could be offered. In regard to the attitude of the Public Service Commission relative to a three-cent or four-cent cooking rate where higher lighting and power rates are maintained, it was pointed out that the commission already recognizes class rates and central stations can justify a low cooking rate.

J. P. Ingle, of Keokuk, thought there would be some difficulty in justifying a three-cent cooking rate to customers who are paying a higher power or lighting rate and using service at the same time the range is in operation. He urged that instead of figuring on what rate it is possible to obtain cooking business, central stations had better figure on what rate energy can be sold for cooking purposes and a reasonable profit made.

K. A. Steinhauser, of Nashville, explained that electric cooking is entirely offpeak in his territory and therefore justifies a low rate. A three-cent rate is made for electric cooking and also for water heaters as the practice in Nashville has been to use electric ranges only during the months when heat was not required in the kitchen.

J. G. Learned, of Chicago, V. V. Parshall, of Pontiac, W. F. Corl, of Hillsboro, and Charles B. Yonts, of Dixon, also discussed this paper.

First Convention in Two Years.

That a lively interest is taken in association affairs, after a lapse of more than two years since the last meeting, was evident from an attendance of over 150 at the opening session of the convention. The meetings were held in the lecture room of the Physics Building at the University of Illinois, Urbana, and all were well attended. The headquarters were at the Hotel Beardsley.

In the absence of President James, of the University, David Kinley, vice-president, delivered the address of welcome in which he spoke of the relationship between the University and the electrical industry of Illinois. "The former," he said, "aims to keep in touch with the advancement in science, but also endeavors to contribute its share to scientific development." S. E.

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McDonald, of Hillsboro, president of the association, in his address called attention to the fact that since the last meeting, the Public Service Commission of Illinois has been established. He expressed the opinion that commission regulation will prove beneficial to the industry, but so far the tendency has been to curb development.

Boiler-Room Efficiency.

At the first session a paper entitled, "Some Aspects of Boiler Efficiency," was presented by H. J. Clotz, of Decatur, Ill., in which some of the economies that can be effected in steam electric plants were pointed out.

The discussion which was participated in by E. H. Negley, of Canton; H. E. Brandlie, of Mount Vernon; W. F. Corl, of Hillsboro; E. B. Carr, E. B. Paine, H. J. Pepper, of Champaign; R. S. Wallace, of Peoria, and E. D. Higgins, P. B. Juhnke, of Chicago, took the form of an experience meeting in which various boiler-room practices were enumerated.

Voltage Regulation.

At the session on Thursday morning, a paper entitled "Voltage Regulation of Distribution Circuits," was presented by E. B. Paine, of the University of Illinois. Professor Paine outlined the fundamental factors which influence voltage regulation and by means of stereopticon views illustrated various equipment that may be used to correct poor regulation.

The paper was discussed by Messrs. Owen, of Peoria; Galta, of Sparta; Theodore Blech, of Waukegan; E. B. Hillman, of Wyoming, and Prof. Morgan Brooks, of Urbana.

A paper entitled, "Are Steam Heating Plants Profitable?" by H. R. Wetherell, of Peoria, was presented in the absence of the author by J. A. Strachan, at the session Thursday afternoon. This paper considers communities of 10,000 population or less and discusses the following questions as being pertinent to the success of steam heating:

(1) Can a company afford to employ a man who has made a specialty of district heating to take charge of the department as superintendent?

(2) What kind of a rate can you secure?

(3) How much territory does your franchise require you to cover?

(4) What is the condition of the soil in the proposed heating district?

(5) In what condition is the sewerage system?

(6) What is the nature of the daily electric load and is the plant equipped with condensing or non-condensing electric units?

(7) What are the prices of fuel where your plant is located?

The paper was discussed by H. J. Pepper, of Champaign; Messrs. Marks, of Chicago; Hamilton, of Mattoon, and Brooks, of Urbana.

Rates.

The paper entitled "Rate Schedule for Towns of 2,500 or Less" was presented by Morgan Brooks, of the University of Illinois, at the closing session on Thursday afternoon. Professor Brooks discusses various phases of rate-making as applied to small utilities and proposes the following schedule:

(1) A fixed charge for every consumer of 40 cents, plus 20 cents for every 1,000 square feet of floor area in active use. This becomes a minimum charge when no current is used.

(2) A variable charge dependent on the meter reading, on the block scale, of 8 cents for the first 50 kilowatt-hours, followed by five cents for the next 450 kilowatt-hours and that followed by three cents for all above 500 kilowatt-hours.

(3) A discount of 10 per cent to be allowed for prompt payment.

The paper was discussed rather fully by J. G. Learned, of Chicago; P. B. Juhnke, of Chicago; W. F. Corl, of Hillsboro; H. J. Pepper, of Champaign; Merton James, of Chicago; Charles B. Yontz, of Dixon, and others.

R. S. Wallace, of Peoria, was elected president, H. O. Channon, of Quincy, vice-president and R. H. Abbott, of Petersburg, secretary-treasurer.

Electrical Exports for December and the Year 1915.

From the monthly summary of the foreign commerce of the United States for last December, just issued by the Bureau of Foreign and Domestic Commerce, it is evident that the electrical exports of that month totaled close to the average throughout the year, although much below the record total of November. For the four electrical classes for which the numbers of articles exported are given in the government report there were shipped last December the following: Electric fans, 1,340; arc lamps, 186; carbon-filament lamps, 208,901; metal-filament lamps, 674,913.

The detailed figures for last December and for the corresponding month of 1914 are as follows:

Articles.	Dec., 1915.	Dec., 1914.
Batteries	$ 110,164	$ 58,947
Dynamos or generators	116,383	262,325
Fans	20,308	13,784
Insulated wire and cable	174,886	92,146
Interior wiring supplies, etc. (including fixtures)	76,967	54,836
Lamps—		
Arc	3,392	742
Carbon-filament	23,945	3,962
Metal-filament	120,998	64,058
Meters and other measuring instruments	68,463	21,200
Motors	233,250	271,192
Telegraph instruments (including wireless apparatus)	14,201	2,118
Telephones	87,722	113,627
Transformers	50,477	62,097
All other	1,076,182	599,529
Total	$2,177,338	$1,620,563

In the following table are given the monthly totals for the electrical exports during 1915 and 1914:

Month.	Electrical Exports. 1915.	1914.
January	$1,773,938	$1,947,646
February	1,683,567	1,930,513
March	1,661,671	2,104,332
April	2,055,375	1,741,551
May	1,802,209	2,040,720
June	2,047,081	1,450,437
July	2,147,307	1,415,360
August	1,806,292	1,024,010
September	2,263,291	1,548,468
October	2,145,594	1,494,792
November	2,774,847	1,644,723
December	2,177,338	1,620,563

The totals for the last three years are given in the following table:

Year.	Electrical Exports.
1913	$28,197,363
1914	19,963,115
1915	24,308,510

New Water Power Association Formed.

Offices were opened in Washington, D. C., on February 28, by a new national association, which will launch a campaign of publicity designed to aid the administration in securing the passage of laws to encourage the development of water powers in the public domain and the navigable streams. The new organization, which calls itself the Waterpower Development Association, is composed of manufacturers of water wheels, hydraulic and electrical machinery, equipment and supplies, whose business has been seriously injured by the stagnation in hydroelectric construction work in the last few years, and who look forward to a revival of the industry and an increased business when the general dam act and the leasing bill for the power sites in the public domain, supported by the President and by Cabinet officers, are enacted into law.

In a statement issued by Marcus A. Beeman, secretary of the association, concerning its aims and purposes, it is asserted that the country has been greatly misinformed concerning the facts about the water-power industry and the legislative situation, and the new organization proposes to carry on a campaign of publicity which will present the facts.

"The purpose of the Waterpower Development Association," says Mr. Beeman, in his statement, "is to tell the truth about water powers and the water-power business.

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We intend to tell the American people the facts that have been kept from them as to why our water powers are allowed to flow to waste, while we burn coal at high prices to generate power. We propose to expose the crime that has been committed in locking these natural resources from use and keeping them locked from use, and the benefits that will accrue to the whole nation from development and use, as well as to make plain what kind of legislation is necessary to induce investment in water-power development.

"There seems to be a unanimity of opinion that legislation of some kind is needed. The President of the United States, Secretary of the Interior Franklin K. Lane, former Secretary of War Lindley M. Garrison, the Public Lands Committees and the Committees on Commerce of both the Senate and House, have all recommended legislation. The House of Representatives has passed bills to permit use of power sites, in both the public domain and the navigable streams. There are some differences of opinion as to the details of this proposed legislation, but we believe that all the persons named are disinterested and sincere in their recommendations, and that these differences of opinion are not vital.

"Our association is not committed to any particular bill or any particular plan or program of legislation. It desires only such legislation as will bring development and use of the water powers, and which will fully protect both the interests of the public and of investors in these enterprises."

The affairs of the Waterpower Development Association are in the hands of a committee made up of Harry W. Hand, vice-president of the I. P. Morris Company, Philadelphia, water-wheel builders; W. W. Nichols, of the Allis-Chalmers Manufacturing Company, Milwaukee, makers of water wheels and electrical apparatus; Chester W. Larner, of the Wellman-Seaver-Morgan Company, Cleveland, water-wheel manufacturers; J. E. Way, of R. Thomas & Sons Company, East Liverpool, Ohio, insulator manufacturers, and Calvert W. Townley, of the Westinghouse Electric & Manufacturing Company, Pittsburgh, manufacturers of electrical apparatus and supplies. Marcus A. Beeman, secretary of the association, has been assistant secretary of the Cleveland and the Buffalo Chambers of Commerce, and secretary of the New Jersey State Chamber of Commerce.

Plans for National Electrical Contractors' Convention.

Tentative plans for the sixteenth annual convention of the National Electrical Contractors' Association have been completed and it is the belief that the forthcoming meeting will be the most successful in the history of the organization.

Headquarters will be at the Hotel McAlpin, New York, N. Y., and all sessions will be held there. Following is a resume of the program:

Monday, July 17—10 a. m., meeting of the National Executive Committee.

Tuesday, July 18—10 a. m., meeting of National Board of Directors.

Wednesday, July 19—10 a. m., opening of convention. Session open to all. Speakers: Address of Welcome, Lewis H. Woods, president New York State Association; address by John R. Galloway, president the National Electrical Contractors' Association; address by Hon. John Purroy Mitchel, mayor of New York City; James H. McGraw, president of the McGraw Publishing Company, subject, "The Society for Electrical Development and Its Relation to Merchandising"; T. Commerford Martin, secretary National Electric Light Association; Arthur Williams, New York Edison Company; 2 p. m., business session, open to members only; 9 p. m., reception and dance in the blue and green room, Hotel McAlpin.

Thursday, July 20—10 a. m., business session, open to all in the electrical contracting business, whether members or not; 10:30 a. m., ladies to visit one or more department stores for parade of gowns, etc.; 2 p. m., business session for members only; 2:30 p. m., for ladies and guests, exhibition of Aeolian and new talking machine at Aeolian Hall; 7 p. m., automobile rides to Coney Island.

Friday, July 21—10 a. m., business session for members only; 3 p. m., special train on Long Island road, leaving Pennsylvania Station, to Hotel Trouville, Long Beach; 4 to 6:30 p. m., surf bathing, etc., at Long Beach; 6:30 p. m., dinner-dance and entertainment.

Saturday, July 22—9 a. m., organization meeting of the National Board of Directors; 10 a. m., organization meeting of the National Executive Committee; 11 a. m., leave hotel for special boat, "Seeing New York by Water," a complete circle of the city will be made and light lunch served on board, landing about 4 o'clock.

Open Session for Non-Member Contractors.

With a view of interesting electrical contractors who are not members of the National Electrical Contractors' Association the Executive Committee has decided to invite all electrical contractors to attend the morning business session on Thursday, July 20, at which time two very interesting subjects will be brought forward.

First—The report of Joseph A. Fowler of Memphis, Tenn., chairman of Insurance Committee on the National Plans for Joint Liability and Compensation Insurance, whereby a large saving in insurance premiums is effected for members. His report will be supplemented by an address by L. T. Block, manager of the Utilities Indemnity Exchange, of St. Louis.

Second—The report of E. McCleary of Detroit, chairman of the National Code Committee, who will give much valuable data on this interesting subject and who will give or designate someone to give the latest data regarding the much discussed "Concentric Wiring." Discussions on these subjects will take place, in which members and non-member contractors will be expected to join.

Symposium on Street Lighting.

A joint meeting was held in Chicago on the evening of February 28, by the Chicago Sections of the American Institute of Electrical Engineers and Illuminating Engineering Society, and the Electrical Section of the Western Society of Engineers. Three papers on street lighting were presented, the first one by J. R. Cravath, on the subject "Recent Street-Lighting Problems and Developments." This paper reviewed the improvements in illuminants and showed that the gas-filled tungsten lamp and the luminous arc lamp with the recently perfected high-efficiency electrodes are the best units in modern electric practice. Referring to the rating of lamps in street-lighting contracts, Mr. Cravath called attention to the numerous controversies caused by the old rating of series carbon open arcs as 2,000-candlepower lamps. Lamps should nowadays be rated in terms of total lumens emitted, by mean spherical candlepower and a statement of the angle to which the maximum flux is radiated. The horizontal rating of incandescent lamps, though still largely used, is not very reliable. Better discernment is obtained by a large number of small lamps than by a small number of larger lamps. On account of the limited appropriations usually available, residence streets cannot be laid out with a very large number of lamps, however. Therefore, it is desirable to use auxiliary reflectors or refractors to increase the illumination between the lamps. The street-lighting contract should provide for checks on the actual street performance of lamps as compared with laboratory tests. Depreciation in service is quite serious

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and must be watched to secure proper maintenance. Flexibility in a street-lighting contract is desirable; a plan meeting with considerable favor now is for the city to buy its energy on the kilowatt-hour basis and to own its lamps and circuits, thus permitting change in the latter without affecting the contract. Various criteria have been considered in street illumination. Probably the best is the minimum vertical illumination between lamps in the case of residence streets and minimum horizontal illumination in business streets. Avoidance of glare is a very important consideration; this is receiving recognition as is shown in the fact that mounting heights of street lamps of 16 to 25 or even 30 feet are now becoming common, as compared with 10 to 14 feet formerly in vogue.

A. C. King then read a paper entitled "Some Experiences and Tests in Connection With Chicago Street Lighting." He referred to the first extensive use of flame arc lamps of the series alternating-current type, which was made in Chicago about the year 1912; in 1914 the city also made the first extensive use of gas-filled tungsten lamps for street lighting. Although the flame arcs are more efficient in laboratory tests than the gas-filled incandescents, it has been found that their average performance in service does not yield even approximately the results anticipated. The absorption of light by the globe averages about 40 per cent in these units. Experience in Chicago has shown that the 300-watt gas-filled, or type C, lamps give as much light in service as the 465-watt flame arcs; the power-factor of the circuit in which they are used is also raised from 82 (in the case of flame arcs) to 98 per cent. Both these facts now permit placing 100 type C lamps on a circuit in place of 65 flame arcs, and this without any change in the equipment in the substation. The guaranteed 1,000-hour life of the gas-filled lamps has been considerably exceeded, some lamps running up to 4,300 hours. On January 1, 1916, the city had in use 12,275 of the type C 300-watt lamps; in a few months this figure will have been increased to nearly 16,000. In order to get the best results from these lamps, close regulation of the circuits is necessary. Prismatic refractors that were tried out on these lamps in order to improve the character of distribution have been found objectionable in many residence districts because too much light was thrown into the upper stories of houses, thus making it necessary in many cases to put shades on the building side of the lamps. The city also has in use nearly 8,000 80-watt type C lamps giving 100 candlepower on series circuits in residence districts where many trees are met with. Reports of lamp outages for these three types of lamps average as follows: Flame arcs, 1.95 per cent; 600-candlepower type C lamps, 0.76; 100-candlepower type C lamps, 0.39.

F. A. Vaughn then gave an illustrated talk on "Street-Lighting Plans of Milwaukee." He briefly reviewed the survey of street lighting which had been made last summer and explained the plans which had been drawn up for the complete rehabilitation of the street-lighting equipment. About one square mile of the city has been equipped with the new system during the present winter. Three types of posts have been selected, having respective heights of 15, 22.5 and 30 feet; the first are used in residence districts and boulevards where trees are plentiful; the second on secondary business streets; and the third on the principal business streets. The posts are all made of concrete by a special process. All the electric lamps used are of the gas-filled tungsten type. In the case of the 15-foot posts, a type of inverted-mantle gas unit has been developed that is nearly equivalent to the 1,000-lumen type C lamp; in external appearance it resembles closely the electric unit. At street intersections, and also in the case of some streets that are undergoing transition, lamps are suspended over the middle of the street. They are cleaned by means of a tower wagon with collapsing platform. This permanent mounting does away with the loose wires formerly common in similar suspended lamps. At the municipal election next April extension of the system throughout the entire city will be voted on.

In the general discussion there participated Ward Harrison, C. H. Shaw, L. Friedmann, D. W. Roper, P. Junkersfeld and Mr. Vaughn. Mr. Harrison described briefly the new type of white-way lighting being installed in Cleveland in which lanterns of special design are used. Mr. Shaw spoke of the excellent performance obtained from 600-candlepower type C lamps in Sheboygan, which have been in use about one and one-half years. They are placed at street intersections and mounted 25 feet above street surface. The results obtained have been so satisfactory that the city has extended the system and in the near future probably will practically double it.

Kansas City Jovians Hear Speech on Valuation of Utilities.

The Jovian Electric Club, of Kansas City, Mo., held a luncheon February 25, at which the attendance was the highest yet recorded, 124 being present. The chief speaker was F. S. Lyman, senior telegraph and telephone engineer of the Interstate Commerce Commission, in charge of valuation in the district between the Mississippi River and Utah. Mr. Lyman told of the purposes and probable results of the inspection, and of the methods used. He said that an important result probably would be the demonstration that many utilities would be shown to be worth more than their stocks and bonds, and that investors would, therefore, be encouraged to put money into them, to the great advantage of the utilities and the public served by them. Considerable data are being collected on the effects of various influences, such as rainfall and soil, on poles and wire. One of the interesting disclosures of the inspection is that iron wire has a life of at least 60 years under certain conditions. He referred to the Western Union wire between St. Louis and Washington, installed in 1856, and still sound.

The second of a series of four rejuvenations at Kansas City was conducted at Shrine Hall, February 24. The candidates numbered 28. A luncheon was served after the ceremonies, P. Lloyd Lewis, statesman for Missouri, acting as toastmaster. Ell C. Bennett, Mercury of the Order, talked on the purposes and opportunities of Jovianism. L. E. Reed, Tribune of the Order at St. Joseph, and J. E. French, Tribune at Salina, also spoke.

Program of Boston Convention, March 7 and 8.

Sessions of the Spring Question Box Convention of the New England Section, N. E. L. A., will be given to the following subjects: Tuesday, March 7, forenoon, New Lighting Business: Commercial Campaigns, Residential, House Wiring Plans, Concentric Wiring, Mazda C Lamps; afternoon: New Power Business: Your Share of Prosperity, Small Customers, On the Farm, Large Contracts, Diversity Factor; also, Electric Vehicles and Electric Ranges.

An informal dinner will be held in the evening, at the convention meeting place, the American House, Boston, and on Wednesday the subjects will be Production and Distribution and Accounting. The subject of Production is divided into Combining Plant Capacities, Reaching Outlying Territory, Duplication of Lines, Joint Maintenance Construction, Voltage Regulation, Street Lighting in Outlying Districts, Underground Construction Methods, Electrolysis, Fusing of Transformers, and Maintenance and Inspection. Standard Classification will also be considered.

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Missouri Public Utilities Association to Hold Convention-Cruise.

At a meeting of the Executive Committee of the Missouri Public Utilities Association, held recently in Kansas City, it was decided that the next annual convention of the association should again be held on board boat. The start will be made from St. Louis on May 11, and after passing the scenic bluffs of the Mississippi River, the boat will enter the Illinois River, arriving at Peoria on the second day. A sight-seeing trip will be held at Peoria, and the return to St. Louis will be made on May 12, arriving at St. Louis at 2 p. m., Saturday, May 13.

A very interesting program of papers and entertainment is being arranged, and all indications point to a very successful convention. The fare for round trip, including meals and berth, will be $15. F. D. Beardslee, of the Union Electric Light & Power Company, St. Louis, is secretary of the association.

Canvass Shows Highway Lighting Neglected.

The lighting of public highways, other than streets, in municipalities by townships, counties or states, has been sadly neglected in all parts of the country. In fact, it is doubtful whether there are any highways in the United States which are illuminated at the expense of the state or county. In gathering data for the report of the Committee on Municipal and Highway Lighting, of the Lighting Sales Bureau, N. E. L. A., the secretary of each state in the Union was consulted for information regarding highway illumination which is paid for by the state or by counties. About 90 per cent of the states in the Union were heard from to the effect that no moneys were ever expended for this purpose or that the subject had never been given consideration.

The rapid increase of traffic during the night, for which the automobile is largely responsible, calls for the safeguarding of public highways by illumination, and it is expected that the committee of which Thomas F. Kelly, of the Dayton Power & Light Company, Dayton, Ohio, is chairman, will incorporate in its report some ways and means for bringing about a movement for interesting state governments in the safeguarding of at least the principal highways by illumination.

Texas Case to Test Value of a Franchise.

Recommendations for a solution of the traction and electric lighting situations in Dallas, Tex., filed with the Board of City Commissioners on February 19 by E. W. Bemis, were adopted by the Board and formally rejected by Stone & Webster, owners of the properties.

Following the rejection of the "model franchise" proposed as a result of the investigations conducted, it was announced by the city administration that a charter amendment embodying the adoption of the franchise would be submitted to a vote of the people at the city election April 4 and that the city would seek to condemn the present Stone & Webster franchise if the company does not change its mind and adopt the franchise offered. In case the company does not adopt this franchise, it will be offered to any corporation that cares to enter the field.

The franchise proposed embodied the following ideas:

The street railway east of the river should be capitalized at $3,500,000 upon which the company would be allowed to earn a maximum of 6 per cent, net per annum.

The electric lighting property should be capitalized at $3,500,000 upon which the company would be allowed to earn 7 per cent net per annum.

Electric light rates should be reduced to a figure not determined definitely, but which would not be more than 8 cents per kilowatt-hour as against 10 cents per kilowatt-hour as at present.

A sliding scale for reduction of street-car fares, as profits increased would be adopted.

All revenues above operating expenses and allowed net earnings should be devoted to reduction in fares and light rates.

Complete rehabilitation of the rolling stock of existing street-car lines and of electric light plant and wide extensions of service of both.

The franchise to be determinate for ten years only. After that period the city either would have the right to take over for itself or some corporation offering better terms both the street railway and lighting systems, upon payment of a stipulated sum.

Appointment of a public supervisor to represent both the interests of the investors in the properties and of the citizens of Dallas, the supervisor to have jurisdiction in ordering improvement of service and equipment.

Arbitration of differences between the public utilities company and the city.

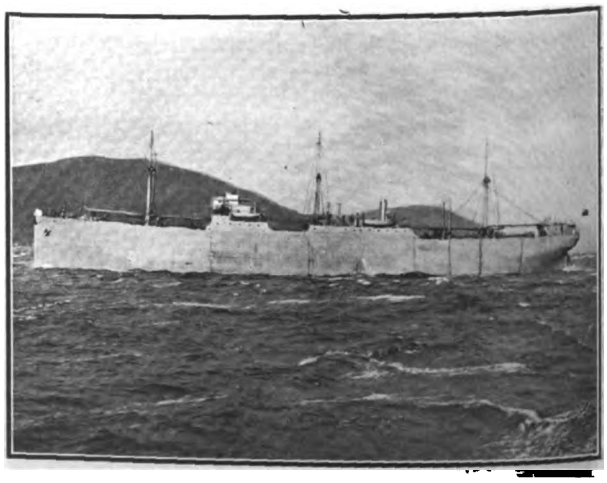
The entire proposition was rejected by Stone & Webster on the ground that the capitalization and rate of income proposed are both too low. They claim a valuation of $5,000,000 each on the traction lines east of the river and the light plant, and want 8 per cent upon this capitalization.

If the charter amendment proposed is passed at the April election, the matter will no doubt be taken to the courts and the proceedings will be watched with interest.

The main point seems to lie in the power of the city to condemn the present franchises of the company which yet have a long period to run. If this point is decided by the courts in favor of city it will set a precedent which will make it hard to finance any kind of a public utility investment in Texas, as franchises will not be worth anything at all and will be no guaranty of certain points under which a corporation may operate.

New Motor-Driven Steamship Makes Its First Trip Across the Atlantic.

A steamship without boilers and lacking the usual smokestack, is the twin-screw freight and passenger motor ship *Bostonian*, which recently entered Boston on its maiden trip from Liverpool. This novel craft, which is the pioneer in transatlantic service, was built in Belfast, Ireland, and is equipped with Diesel oil engines and electric motors which operate all working arrangements of the ship, including all deck machinery, steering gear and windlasses. Besides having large cargo capacity, the *Bostonian* has accommodations for a number of passengers, being constructed under the British Board of Trade passenger certificate survey.



Motor Driven Steamship on Its Maiden Voyage.

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Important Hearing on Yosemite Power Case.

At special hearings on January 26, 27 and 28, at Washington, D. C., Secretary Lane heard legal arguments on the application of the Yosemite Power Company for permission to make hydroelectric developments on the Main Tuolomne River, in the Yosemite National Park. This application of the Yosemite company, or that of its predecessors in interest, has been pending before the Department of the Interior for several years. Action by the Department has been deferred due to objections by certain irrigation districts further down the river, and by the City and County of San Francisco, which also has rights on the same river within the Park.

The application of the Yosemite Power Company specifically is for the right to erect a dam and maintain a reservoir in the Poopenaut Valley, which lies immediately below the Hetch Hetchy Valley. By special act of Congress, passed December 19, 1913, the City and County of San Francisco were granted the right to construct a dam and flood Hetch Hetchy Valley and impound waters therein for the purpose of making certain hydroelectric developments and supplying the City of San Francisco and the adjoining districts with water for municipal purposes. Under the terms of the grant by Congress, San Francisco is compelled to release certain amounts of water from the Hetch Hetchy reservoir for the benefit of the Modesto and Turlock Irrigation Districts, and the city objects to any department of the Government granting permits for other corporations or individuals to make developments along the main Tuolomne between the Hetch Hetchy Dam and a point 12 miles further down stream, known as "Early Intake," where the water in the stream will first be diverted into the aqueduct to be constructed by the city. The grounds for protest are that regulation of the flow by the city would be interfered with and, moreover, the building of a dam, aqueduct lines and power house by other interests would cause physical conflict with the structures to be erected by the city. The irrigation districts object to the granting of any application to the power company on the ground that they have prior rights to the use of water in the river, although they admit their objection is largely technical and they would probably be benefited by the creation of additional dams and reservoirs on the water-shed above them. The Yosemite Power Company claims to own water rights prior to rights granted by Congress to the City of San Francisco, and as the act of Congress specifically provided that nothing in the act should "be construed as affecting or intending to affect or in any way to interfere with the laws of the State of California relating to the control, appropriation, use or distribution of water used in irrigation or for municipal or other uses, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with the laws of said State," the attorneys for the power company argue that, under the State laws of California, pursuant to which the company made its water filings in the Poopenaut Valley, the Secretary of the Interior is in effect compelled to recognize the prior rights of the power company as derived under the State laws, and issue a permit for the proposed development. The company's representatives further call attention to Section 3 of the Act of Congress, which says "that the rights-of-way hereby granted shall not be effective over any lands upon which homesteads, mining or other exiting valid claim or claims shall have been filed or made, and which now in law constitute prior rights to any claim of the grantee until said grantee shall have purchased such portion or portions of such homestead, mining or other existing valid claims as it may require * * *."

As the Yosemite Power Company, early last year, continued to urge the granting of its application by the Department of the Interior, the latter employed Henry Floy, consulting engineer of New York City, to go to California, examine the physical conditions on the ground, and report particularly with regard to the engineering questions involved, and possible interference in the construction plans proposed by the different parties interested. Mr. Floy twice visited California last year and spent considerable time ascertaining the various engineering features involved, and while there in November held a public hearing at which the officials, engineers and attorneys of the various parties interested appeared and presented evidence, testimony and argument, particularly along engineering lines. Upon submission of Mr. Floy's report, Secretary Lane appointed January 24 at which time he agreed to hear the legal arguments of the respective parties as to their rights in the case, and objections as to why the application of the power company should not be granted. This hearing was continued for three days, and at its conclusion Secretary Lane took the whole matter under advisement for further consideration, but it is expected he will hand down his decision some time during the present month.

Outline of Industrial and Yard Lighting Committee Reports.

The Committee on Industrial and Yard Lighting, Lighting Sales Bureau, Commercial Section N. E. L. A., has announced through Oliver R. Hogue, secretary of Lighting Sales Bureau, and chairman of the committee, the outline of its divisions of the Lighting Sales Bureau's report at the 1916 convention. The outline was prepared by Mr. Hogue with the assistance of members of his committee.

The part of the report devoted to industrial lighting will consist of eight sections, as follows: (1) Preface. (2) Methods used to obtain industrial load. (3) Designs of industrial lighting systems. (4) Data on typical installations. (5) Arguments for good lighting. (6) Load-factors. (7) Maintenance. (8) Color value.

The purpose of the paper will be outlined in the preface. The second section will be a comprehensive, detailed discussion of methods used by central stations to obtain industrial lighting loads. Section 3 will present various lighting systems and equipments in use in the industrial field. Section 4 will be a view of installations for typical plants of 30 industries. Section 5 will give many arguments in favor of good lighting, of value to the lighting salesmen. Section 6 will be a presentation of load-factors, giving tables and a general discussion. The reasons for maintenance of lighting systems in industrial plants, data on cost and saving, as well as other data, will be given in section 7. In section 8 the color values of various units, their uses and results obtained will be presented.

The part of the report devoted to yard lighting will discuss the purpose of the invention of such lighting, the field covered, methods used, and existing installations.

An appendix to the committee's report will present policies in the United States and abroad, in regard to the lighting code.

The report of the committee is being prepared with the thought of presenting data and suggestions of practical value to those interested in the subject.

Protest Against Washington Power Plant.

The council of the American Institute of Consulting Engineers has adopted a resolution protesting against the proposed new government power plant, to be erected on the Potomac River at Washington, D. C. Many other protests have been made by others, the principal objection being that the site chosen interferes with the plan for beautifying the city, and was not approved by the Art Commission.

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Miscellaneous NEWS NOTES

Private Contracts Are Private.—Private contracts made by power companies cannot be investigated by the Public Service Commission, according to a decision of the Supreme Court in the case of the Washington Commission against the Spokane & Inland Empire Railway Company.

Illuminated Traffic Regulator.—A new type of traffic regulator, known as the "Dinox," with interior lighting arrangement which permits of night as well as day operation, as the name implies, has been invented by a Boston man and installed on trial at two important street intersections in Boston. The lantern, on which are the signs "Go" and "Stop," is illuminated by two 40-watt Mazda lamps installed within.

Improved Type of Radiogram Receiver.—A type of radiogram receiver that does away with ear pieces has been invented in Spain. It is stated that the radius of operation of the new apparatus is in excess of 3,100 miles and that it is contemplated to institute radiographic service between Spain and the United States. Details of the new instrument are not yet available.

Successful Jovian Rejuvenation in Columbus.—The new Elks Home was the scene of the Columbus Jovians' annual rejuvenation, on the evening of February 18. There were 55 initiates, and 206 people sat down at the banquet which followed the initiatory ceremonies. A feature of the event was the perfection with which the team performed its part. The Columbus district now has a registration of over 300 members.

Signs Must Be Lighted in Joplin.—An ordinance recently adopted by the city commissioners at Joplin, Mo., provides that signs shall protrude no more than 2 feet from the property line, and illuminated signs shall be lighted between 5 and 10 o'clock every evening. Cloth signs are prohibited. The ordinance affects about 80 electrical signs, and nearly as many signs without illumination. There is agitation to make 7 o'clock the time for lighting up in the summer months.

Safety-First Exposition.—Twenty-six bureaus of the government service participated in a Safety-First Exposition in Washington, D. C., February 21-26. Various means for protection from electrical hazards were exhibited by the Bureau of Standards. Among the specific lines represented were: Hazards due to falling overhead wires, building failures by electrolysis, National Electrical Safety Code, direction indicator for wireless fog signals, and a form of decremeter to prevent the interference of wireless signals.

New Machinery Hall in New York City.—Machinery manufacturers are to be aided in trade expansion by the establishment of permanent machinery exhibition rooms in Machinery Hall, on the fifth floor of the Grand Central Palace, New York City. Space will be subdivided to suit exhibitors, an area of 55,000 square feet being available. Besides permanent exhibition it is proposed to hold an American Machinery Exposition annually. A publicity bureau will be maintained and manufacturers will be aided in extending their foreign as well as domestic business.

Safety Problems Discussed by Steel Electrical Engineers.—The regular monthly meeting of the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers was held at the Seventh Avenue Hotel, Pittsburgh, Pa., February 19, 1916. The past work of the association in regard to safety work was reviewed. President W. T. Snyder referred to the association being among the first to take up organized safety work in the iron and steel industry, through the appointment of a special committee for this purpose in 1908.

British Illumination Committee.—At the annual meeting of the National Illumination Committee of Great Britain it was reported that a great part of the international work had been wholly suspended during 1915, and during the year 1916 co-operation would be impossible. Therefore, the committee will concentrate on subjects already before it. The committee asked the National Physical Laboratory and teaching institutions to investigate and determine the height of the Amyl acetate flame, which affords the light of one standard candle, and A. P. Trotter has made a comparison of results obtained, as a result of the appeal, by Dr. Houston and Professors Mather, Marchant and Morris.

Power Plant on Model Farm.—E. C. Burchfield, of Athens, O., has just completed an electrical installation at the model farm of Judge J. M. Wood which gives a wide variety of service. The power plant consists of a 10-horsepower gasoline engine, which runs the generator set and also furnishes power for the operation of a feed and ensilage cutter and a feed grinder. The current generated is sufficient for both light and power for the house, barn and other parts of the premises and is used for the operation of a number of electrical appliances on the farm.

Louisville Jovians Elect Officers.—At the annual election of the Louisville Jovian League, held February 22, Frank H. Miller, superintendent of motive power, Louisville Traction Company, was elected president, succeeding Robert Montgomery, manager of the commercial department, Louisville Gas & Electric Company. P. S. Pogue, general manager, Louisville Home Telephone Company, was elected vice-president, and Paul Tafel, of the Tafel Electric Company, was re-elected secretary and treasurer. Frank E. Good, T. B. Wilson, Charles Smith and W. D. Rauch were elected members of the board of directors. March 17 has been named as the date of the next Jovian rejuvenation.

South Dakota Central-Station Men Form Organization.—A meeting of central-station owners in the state of South Dakota was held in Sioux Falls February 22, at which a permanent organization was formed under the name of the South Dakota Power Association. The following officers were elected: President, Robert Ferris, Yankton; first vice-president, N. C. Draper, Consumers Power Company, Sioux Falls; second vice-president, B. S. Hill, Mobridge; secretary, A. H. Savage, Dakota Light & Power Company, Flandreau; treasurer, F. A. Brown, Huron Light & Power Company, Huron; executive committee, W. C. Blanchard, Aberdeen; F. A. Brown, Huron; J. F. Cameron, South Dakota Light & Power Company, Armour; E. G. Sherwood, Mitchell Power Company, Mitchell. The next regular meeting of the organization will be held in Watertown, S. D., in July, 1916.

Columbus Company Makes Gains in Accident Prevention.—The Columbus (O.) Railway, Power & Light Company has just announced its safety first record for 1915. The figures given are in the form of comparison with 1914, which show the following in various classes of accidents: Employees' accidents, 10.2 per cent decrease; collisions, cars and automobiles, 3 per cent increase; car collisions, 35.5 per cent decrease; collisions, cars and wagons, 20.6 per cent decrease; leaving moving cars, 21.7 decrease; boarding moving cars, 4.6 per cent increase. In the matter of collisions between cars and automobiles, Columbus stands without a rival, the report claims. The records of seven other large cities in this class of accidents show an average increase of 28 per cent, as against the 3-per-cent increase in Columbus. The hearty co-operation of all employees of the company is responsible for the splendid safety record, made during 1915, says the report.

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Passing of Harrison Street Station

Historic Plant of the Commonwealth Edison Company Being Dismantled—Was Largest Station in 1894

No more impressive example of the tremendous development in the electrical industry could be cited than the dismantling of the Harrison Street station of the Commonwealth Edison Company, Chicago, which is now under way. This station marked an epoch in electric generation. Built in 1893, it embodied many radical features which characterized it as the most important development in the central-station industry—yet in only a comparatively few years it has served its usefulness.

The station was designed in 1892, the year in which Samuel Insull became president of the Chicago Edison Company, and marked the first step in the rehabilitation of the Chicago central-station system. It is interesting to note that during the World's Fair in Chicago, in 1893, many radical departures in electricity generation were shown for the first time, and a number of these were later embodied in the Harrison Street station. In fact, some of the equipment exhibited was purchased and installed. Direct-connected engines and generators were first used on a large scale in this station.

The Harrison Street station was first placed in operation in October of 1893, and was for the first few months used as an adjunct to the main plant of the company, located at what was then known as 139 Adams Street. In August of 1894 the Harrison Street plant was placed in permanent operation, and became the principal generating station of the company. The original equipment consisted of one 1,250-horsepower triple-expansion Edison engine, direct-connected to two 400-kilowatt generators.

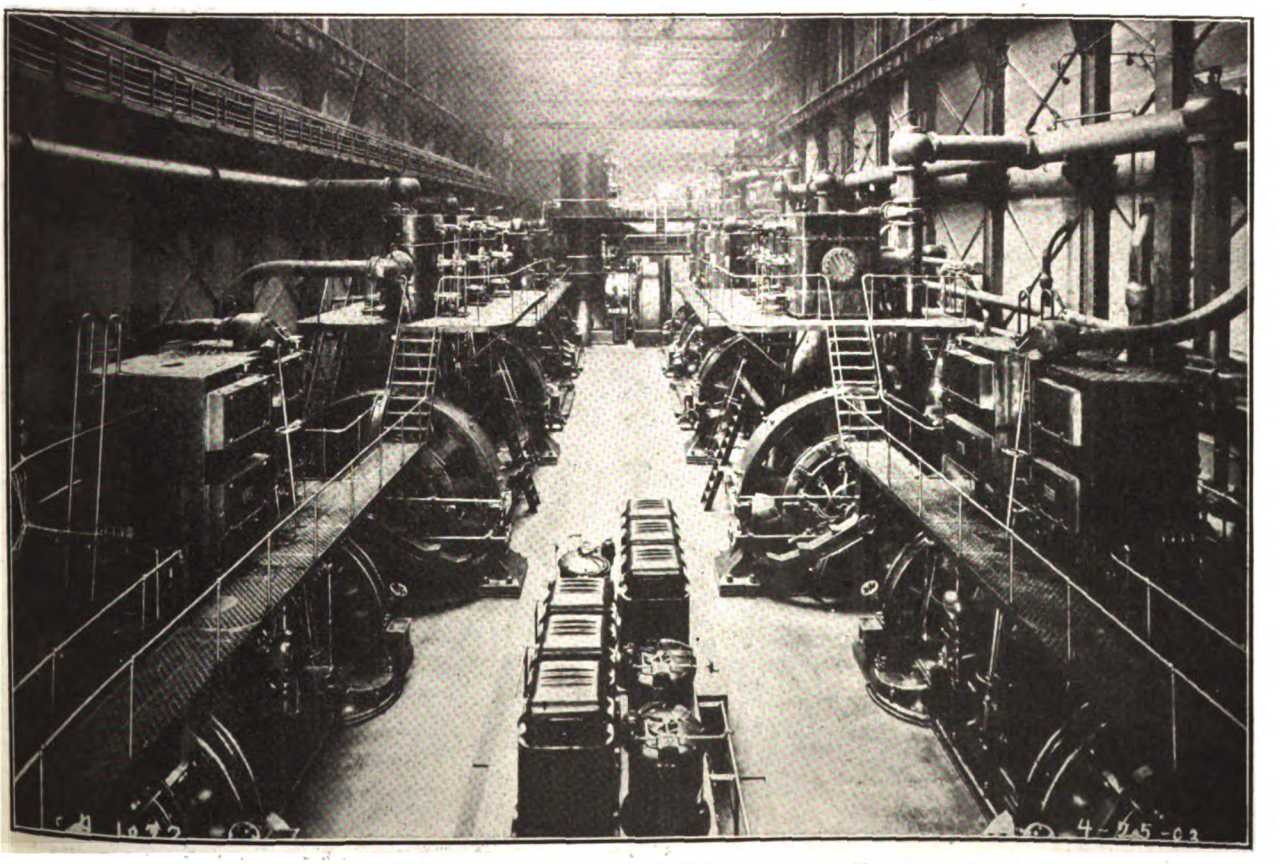
In 1894 four 600-horsepower triple-expansion Southwark engines, each direct-connected to two 200-kilowatt generators, were installed. In 1895 five 1,200-horsepower engines were purchased, each operating two 400-kilowatt generators.

In 1901, a radical departure from previous practices was made by the installation of a 3,500-horsepower vertical cross-compound Allis-Chalmers engine, direct-connected to a 2,500-kilowatt General Electric double-current generator. The latter machine permits the entire output to be taken in the form of either alternating current or direct current. The installation of this generator marked the beginning of the 25-cycle, alternating-current system in Chicago.

In 1902, a 5,000-horsepower, cross-compound engine, driving a 3,500-kilowatt, 9,000-volt, 25-cycle generator was installed, also two 1,000-kilowatt synchronous motors, running as generators. A 2,500-horsepower vertical cross-compound engine, direct-connected to an 1,800-kilowatt, 9,000-volt, alternating-current generator was installed in 1903, and was the last piece of generating equipment installed.

It is interesting to note that the total generating capacity of Harrison Street station, considered in those days an extremely large station, is less than one-half the capacity of a single unit now in use by the Commonwealth Edison Company in Northwest station. On December 15, 1905, the maximum load of the Harrison Street station was 18,827 kilowatts, the highest figure ever reached.

All of the machinery and equipment is being removed, and will be sold, as it is still in good condition, although obsolete, in so far as the stringent requirements of the Commonwealth Edison Company are concerned. The Price Iron and Steel Company, of Chicago, is handling the machinery sales.



Interior of Harrison Street Station of Commonwealth Edison Company Now Being Dismantled.

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Electricity in Rural Communities

Data Presented by W. R. Sammons, of Knoxville Railway & Light Company, Indicate Successful Operation of Electric Milking Machines—Other Farm Applications Show Economy of Central-Station Service

Industrial Power Series—Article No. 156

Electricity in a Farm Dairy.

Developments in rural communities show that the farmer is realizing the value of electricity as a partner, and where service is available is beginning to electrify his farm.

Now that summer is coming and the valley of the annual load curve is approaching it is a good time to look for business that will help fill up this valley.

The accompanying illustrations of a farm-dairy installation and the data given show the value of this class of load.

The dairy in question is a part of the business end of a large ranch in the South, and does a fine business in the city communities near. It is located about seven miles from town, and furnishes fresh milk, butter and cream to the people of the city by means of automobile delivery wagons.

In order to provide against extreme summer temperatures a five-ton refrigerating machine has been installed. This is driven by a 15-horsepower motor, and besides providing cold-storage space for the dairy furnishes the necessary ice used about the ranch. One of the accompanying illustrations shows this machine and the motor which is driving it.

The other illustration shows a one-horsepower motor driving churn and separator.

This business makes a good class of load, as the peak comes in the summer, as shown by the data given herewith.

Number.	Size.	Speed.	Application.
1	15	1,200	Driving 5-ton refrigerating machine.
1	2	1,800	Driving well pump.
1	1	1,800	Driving churns and separators.
1	0.5	1,800	Driving brine circulating pump.

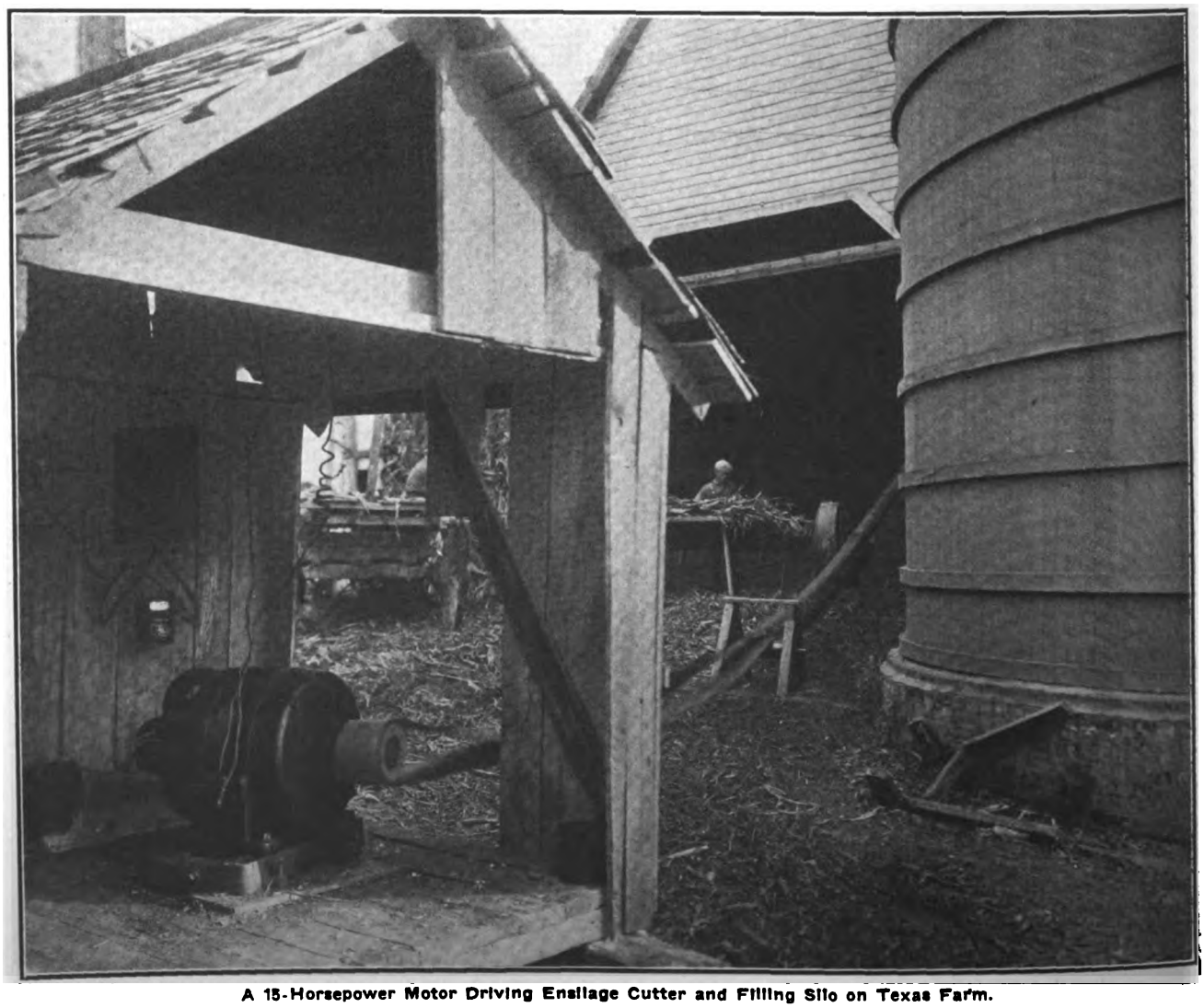
The energy consumption for eight months on this installation was as follows:

May	1,048 kilowatt-hours	September	1,370 kilowatt-hours
June	1,048 kilowatt-hours	October	682 kilowatt-hours
July	1,690 kilowatt-hours	November	102 kilowatt-hours
August	1,260 kilowatt-hours	December	92 kilowatt-hours

Besides the motors indicated above, this power customer also has a 50-horsepower motor, which is used for general purposes on the ranch, and is operating a cotton gin and oil mill electrically, the latter two plants having been installed since the operation of the dairy was started.

Milking Machines Successful in Knoxville Dairy.

W. R. Sammons, commercial manager of the Knoxville



A 15-Horsepower Motor Driving Ensilage Cutter and Filling Silo on Texas Farm.

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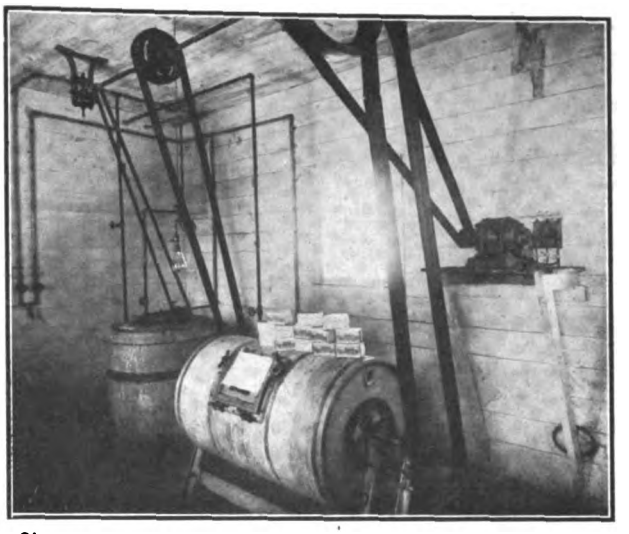
View Showing Milkers in Operation.



Churns and Separator Driven by One-Horsepower Motor.

Railway & Light Company, contributes the following interesting account of an installation near Knoxville:

Within the past few years everyone has observed with much satisfaction the increasing demand for pure foods, together with pure-food laws which have been enacted from time to time. Just what constitutes purity in food seems, in many cases, to be a question for the courts to decide, but in the dairy business the degree of purity of the product depends almost wholly on the sanitary conditions existing in the dairy, and in this connection electric power has played an important part, not only in increasing cleanliness, but in cheapening the cost of production.

One of the greatest drawbacks to those engaged in the dairy business has been the difficulty in having the work of milking cows properly done. There is a great deal of drudgery in milking by hand, while at the same time it is delicate work, that requires particular intelligence and care.

For many years various devices have been brought out for milking cows mechanically, and the need of such an apparatus has caused dairymen to persist in their experiments until a machine has finally been produced which is entirely practicable. Several makes of mechanical milkers are in use throughout the country with complete success, and the number in use is rapidly increasing. The best machines are operated by electric power, driving a suction or vacuum pump connected to a pipe line, which runs through the barn or cow sheds above the stalls.

The milkers are, of course, movable units, which can be moved from one cow to another as the milking progresses, the unit being attached to the pipe line by means of a flexible tube. At the side of the milker is a hose, which branches to four other short lengths, to which are attached four cups that are fitted to the udder, as shown in the accompanying illustration. When the machine is in operation the vacuum passes through the milking unit, and is applied directly at the cups, the suction being sufficiently strong to withdraw the milk which flows down the tubes into the reservoir.

The milking machine is equipped with a device known as a pulsator, which intermittently cuts off the suction, to keep in from being constant. Compressed air is also applied to the cups, alternately relieving and applying the suction. By this arrangement the old method of hand milking is duplicated as closely as possible. The machines are easily regulated to give any number of pulsations per minute.

The advantages of the mechanical milker are very apparent, as with this apparatus milk is produced that is absolutely clean and practically free from any germ life. In addition, a great saving is made in both labor and time.

The country surrounding Knoxville, Tenn., is widely known as an excellent agricultural and dairy section, and many stock farmers have taken advantage of the electric service furnished by the Knoxville Railway & Light Company. Among the farms which are using electric power are the Valley View Farm, Sterchi Stock Farm, and Maple Hill Dairy Farm. These farms use power not only for the milking machines, but for cutting ensilage, threshing grain, pumping water, lighting and operating household appliances.

All service furnished these farms is single-phase, 60 cycles, most of which is 110 volts.

The energy consumption varies, of course, with the seasons of the year, in so far as cutting ensilage is concerned, but the consumption for pumping water, milking machines and cream separators and churns is constant.

The use of the machinery for milking and operating the cream separators reduces the time and labor, as referred to, as it requires only about two men to look after the milking of a herd of 50 cows, and the milking time required is only one hour per milking, or about two hours per day. This enormous saving of time enables the dairyman to get his product ready for early morning delivery, and enables the consumer to have today's milk today, which is worth while.

For a dairy consisting of approximately 50 cows the average consumption is about 200 kilowatt-hours, which includes milking machinery and cream separator. This means a cost of approximately $15 per month with the average rates for energy.

For ensilage cutting and grain threshing, the average consumption of a 15-horsepower motor is about 1,000 kilowatt-hours. This, of course, means operating at a varying load-factor, which is dependent on how fast the stock comes from the field. While there are certain times of the year for this class of work the farmer may have this motor available for general utility work, such as cutting lumber, wood, or anything which might come up.

The investment in the motor installation is much less than that for a portable steam engine, to say nothing of the danger from fire in the barns, due to sparks from the engine, and convenience. It is not a difficult matter to get the farmer who lives close to the lines to become interested on a small scale in electric power for his dairy, and if he can be shown what can be done with electricity, he is very apt to increase his installation to meet the demands of his business.

The accompanying illustrations show very clearly the motor applications on the farms and in the dairies of this

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section. The motor installations pictured are of a 15-horsepower motor, driving an ensilage machine; a five-horsepower motor, driving a Sharples vacuum pump for the milking machine, and a three-horsepower motor driving a cream separator.

It behooves all central stations to impress on the farmers who are conveniently located to take advantage of electric service, as it is profitable to both the farmer and to the central stations.

Serving Farmers in Iowa.

The Upper Iowa Power Company division of the Interstate Power Company, of which W. H. Burtis is president and general manager, owns and operates a lighting system in northeastern Iowa, serving the towns of Decorah, Waukon, Cresco, Postville, Lansing and Frankville, in which the systems are owned by the company, and wholesales energy to the lighting companies in Calmar and Ossian. These are the principal towns in Winneshiek, Allamakee and Howard counties. The power is generated at two hydroelectric stations on the Upper Iowa River, one being seven and the other twelve miles from Decorah. The power is distributed on 13,200-volt, three-phase, 60-cycle transmission lines, the combined length of which is at present 100 miles.

This company has made a practice of serving farmers directly from this 13,200-volt line, through step-down transformers, reducing to 110 and 220 volts, giving single-phase energy for power and light. Efforts have not been made to push this business strongly so far, as it was somewhat experimental. During the first year a large number of transformers were burned out by lightning, and there was some trouble with the primary leads in these small high-tension transformers. This has all been practically overcome by better design in transformers, especially in the larger cases, and better insulation of the primary leads, and by more adequate high-tension fuses. The trouble from this source is now reduced to a reasonable amount, but the expense attending such trouble will naturally be greater than upon city transformers, and must be taken into account in making a rate for this class of service.

This company now considers this farm business practical and profitable at proper rates. The rate which is now made is as follows: The service is metered and sold at 12 cents per kilowatt-hour, with a minimum bill of $5.00 per month upon any installation requiring a transformer having a capacity of five kilowatts or less. The transformer usually installed in one of three-kilowatts capacity, as this is suitable for most every farm.

This company furnishes the high-tension transformer and the high-tension fuses, and horn-gap arresters for protecting same, and installs the same upon its high-tension line. The farmer must pay for all secondary wires and all wiring and expense of the installation upon his premises.

Two important features entering into the determination of the proper rates for this service are the heavy investment and core loss, which are largely in excess of that per residence customer, or per dollar of income in the city. These two features are taken care of approximately in the minimum charge. An example showing the cost of such an installation and the core loss in the transformer is given herewith, as follows:

Cost of three-kilowatt transformer and high-tension fuses installed	$100.00
Interest at 6 per cent, depreciation and maintenance at 10 per cent	$ 16.00
Core loss, 54 watts. Core loss per year, 467 kilowatt-hours. This at three cents equals	14.00
Cost of these items per year	$ 30.00
Per customer per month	$ 2.50

These same items figured upon a transformer serving city residences would amount to less than 10 cents per customer per month. It is, therefore, evident that either a much larger minimum bill or a much larger demand charge must be made for this class of service.

There is, however, a great difference between the rates charged for this service by different companies. It is to be hoped that a more uniform method and scale of rates will be decided upon at an early date. The Iowa Section of the National Electric Light Association is giving the matter attention, and a committee is now at work collecting data on this subject and making a study of it with this purpose in view.

The Upper Iowa Power Company now has 22 farm customers served in this way, and, as stated before, it has never really solicited the business.

Referring to the benefits derived and the approximate cost to the farmer, the company has customers who have lights in their house and barns equal to the ordinary city installation in the house, and exceeding this materially in the barns and yard, and who have a washing-machine motor, cream-separator motor, motor for pumping the water, and a three-horsepower motor for doing light feed grinding. One such customer is now installing a power milking machine. It is very rarely that a bill exceeds $5.00 in any month for this service.

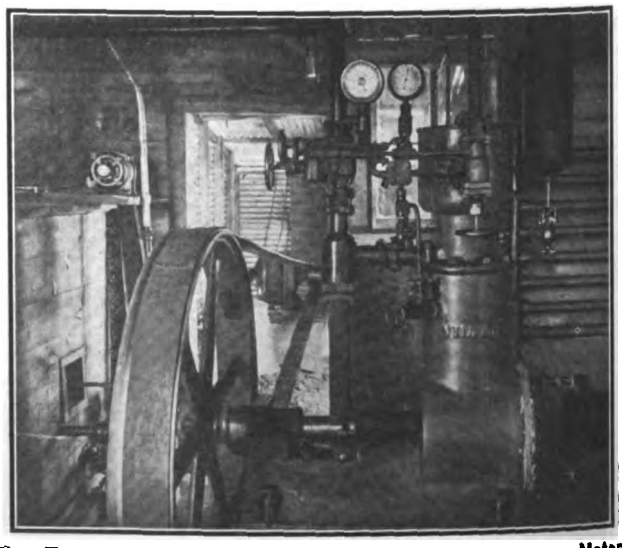
A letter calling attention to this service, which this company is about to send out, is as follows:

Letter to Prospects.

Decorah, Iowa, February 25, 1916.

The Upper Iowa Power Company now has an electric

View of Three-Horsepower Motor Driving Pump and Separator.



Five-Ton Refrigerating Machine Driven by 15-Horsepower Motor.

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transmission line or power line passing by or near your farm. This will enable you to have the benefit of electric service from this power line, if you so desire, as this company is ready to install the necessary apparatus for reducing the current for your use upon what we think we can show are very reasonable terms, and such that you can obtain the electric service from this line at a much lower expense than from any other means, and, furthermore, you can obtain a much better service.

The power company will install the transformer and protective apparatus without any expense to you, and they will maintain this transformer. All you need to do is to run the wires from the transformer to your house and other buildings, and wire the buildings. This transformer and other apparatus which the company will install costs them about $100, and, of course, there is some care necessary and occasional repairs, all of which the company assume. This transformer will be large enough so that you can install lights and motors which would require a five-horsepower engine to operate at one time. Besides lighting your house, barn yard, including the use of an electric iron for your wife and a washing-machine motor, you can also pump your water and do such grinding as you can with a three or five-horsepower motor. You can readily think of many other uses for which you can employ this power.

The charge for this service will be at the same rate as that which we charge for lights in Decorah and other towns on this system, namely, 12 cents per kilowatt-hour, and the service will be metered. There will be a minimum bill of $5.00 per month, and the charge will be no more than this, unless during any one month your bill, at 12 cents per kilowatt-hour, amounts to more than $5.00. We find that our farm customers very selodm have a bill in excess of $5.00 per month. We will explain that a kilowatt-hour is one-third more than a horsepower-hour; that is, it would be equivalent to a horsepower operating for one and one-third hours. We might explain, further, that as a 32-candle-power Mazda lamp consumes 40 watts per hour, a kilowatt-hour will operate such a lamp for 25 hours. The cost of such a light would then be practically one-half cent per hour.

Now, referring to the other way in which you can secure electric service, namely, by installing your own plant, consisting of a gasoline engine, generator, and storage batteries, and switchboard. The cost of such a plant, outside of the wiring of your buildings, will be about $500, and of this amount the batteries will cost about $200. With an outfit of this size, namely, about 2.5-horsepower in the engine and 1.33-horsepower in the generator, you could not do anything but light your house and run very small motors, surely nothing over one horsepower, and whenever you would operate any motors, or even use the electric, you would have to keep your engine running, as otherwise you would reduce the charge in the batteries and have nothing left for lighting. This investment of $500 in such an outfit would be what you would have to pay to get electric service in this way in excess of what it would cost you for investment to get it from the power line.

A fair estimate of the cost of operating such a plant, including all of the items which must be considered in the long run, would be as follows:

Kerosene or gasoline for power for lighting only, $18 to $24 per year at present prices—average	$ 20.00
Interest on $500, at 6 per cent	30.00
Depreciation and repairs on batteries, $200, at 20 per cent	40.00
Depreciation and repairs on engine and generator, $300, at 10 per cent	30.00
Total per year	$120.00

We have taken account of only $500 of investment, as this is the amount that the private plant would cost in excess of investment, if the service is obtained from our lines. This does not include anything for the labor of operating the plant. You can readily see that the cost of operating such a plant will be about twice the cost of obtaining the service from our power line, and as we have explained above, you can, by using power from our line, get a great deal more for $60 than you can for $120 from your own plant.

We would be glad to have you call upon us at Decorah, or drop us a line, saying that you are interested in our proposition, and we will call and make an estimate upon a complete job of wiring your farm buildings.

The method of obtaining the meter readings is this: A slip having upon it meter dials is sent out, on the twenty-fourth of the month; the customer marks the position of hands on dial, from which his bill is calculated, which is mailed to him with a stamped, addressed envelope for return, and he comes in to the city office and pays his bill.

From the above it would seem that every prosperous farmer reasonably near a transmission line which can give him the service should be so served with electric light and power. Hardly anything can be added to his equipment which will give more comfort and pleasure. We have heard it said by the younger members of one family now receiving this service that if they could not have the electric lights they would feel like leaving the farm.

It is surely a great agency in reducing the drudgery of housework, always the bane of existence for the housewife on the farm. It is the latest step to make the farmer's occupation enviable, following the telephone, the automobile, and rural delivery, and we think it is not the least of these.

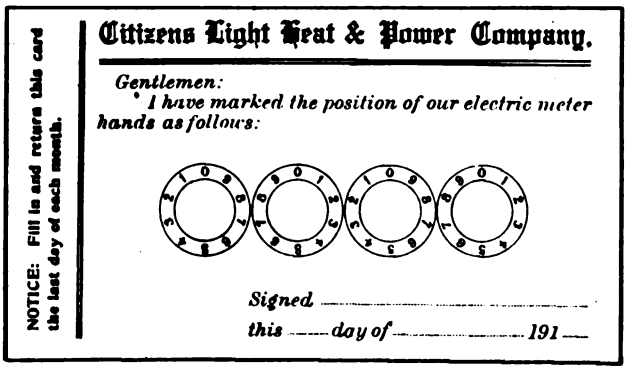
Success in Minnesota.

C. W. Erick, of the Citizens Light, Heat & Power Company, of Canby, Minn., reports considerable success in acquisition of farmer business. His statement of conditions is appended herewith:

"We are supplying electric power and light to thirteen farms within a radius of four miles from town.

"The average cost per farmer for complete installation including his part payment of line, runs about $425.

"Our method of reading meters on the farms monthly is through the post-card system. We mail customers a post card with imprint of meter dials on one side and our address on the other. These they mark the same as meter


NOTICE: Fill in and return this card the last day of each month.

Citizens Light Heat & Power Company.

Gentlemen:

I have marked the position of our electric meter hands as follows:

Signed _____

this ____ *day of* _____ *191*__

Form of Post Card for Reporting Meter Readings.

indicates, and mail to us, then we take reading from card. Our meter readers then check over these readings for correctness about once every six months, being in the spring and fall. This system has proven very satisfactory. Bill of amount used is then mailed on the first of each month, on which they receive a five-per-cent discount by paying within ten days.

"Our farm customers' average cost per month is from $4.00 to $6.50. On this amount they do their ironing, washing, pumping, separating and feed grinding, as well as having light in all barns, haymow, granary and house. In fact, every place that light is needed they have it.

"Our present farm customers are our solicitors for more customers, as they are so well pleased that they always say a good word for us in this line. The sizes of these farms run from 160 to 240 acres."

The following is the proposition made to farmers by the Citizens Company and which is expected to result in considerable business this spring:

For the sum of $438 we hereby propose and agree to equip your farm with motors and lights, as follows:

One three-horsepower motor with pulley and sliding base, installed to operate a six-inch mill and belt, to be supplied by owner.

One one-half-horsepower motor with pulley, belt and Stickney pump jack and automatic pressure switch, connected to pump or pump head supplied by owner.

One light in cellar with switch at top of stairs.

One light and ceiling chain pull fixture in each room, except parlor and dining-room, where a three-light fixture may be chosen, not to exceed $6.50 each.

Three lights in horse barn, with switch near door.

Three lights in cow barn, with switch near door.

One light in haymow, with switch near ladder.

Two lights in granary with switch near door.

One light in pump or milk house, and switch with all

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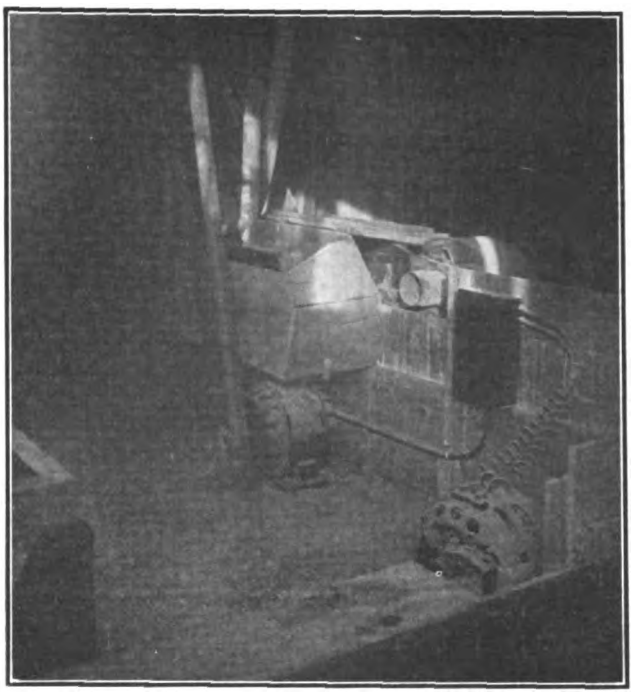

Five-Horsepower Motor Driving Vacuum Pump.

transformers, poles and wires necessary to connect to present line.

You may turn the ownership of the pole line and wires over to us, and we will maintain the same in good repair, otherwise if you wish to keep ownership you will also be obliged to maintain same.

If this seems satisfactory kindly sign and oblige.

Farmer's Attitude.

The attitude of the farmer towards central-station service is admirably expressed in the following letter, received by the Citizens Light, Heat & Power Company:

Since I have had electricity installed on my farm, two months ago, for illumination and power, I have become entirely convinced that it is the greatest improvement any farmer can make, that is considering it from the standpoint of the amount of time and labor that it saves, and also from the financial standpoint.

First of all, will I consider its great improvements of light over the kerosene or gas lights. There is no danger of a leaky gas pipe, nothing at all for the owner to look after, we can rest assured that all is safe, and the lights are always ready to respond to the turn of the button.

Then all the dirty work that the housewife formerly had to do, such as cleaning dirty lamps, chimneys, filling the lamps with kerosene and all other kinds of disagreeable work is done away with.

Better still, then, is its advantages in the house, and there is no danger of one's barn being set on fire by some careless workman upsetting his lantern in the haymow, and causing great loss. The light is decidedly better than lanterns. The entire barn can be lighted up in every corner, while a lantern lights only a few feet around it. A workman does not have to be bothered by continually carrying the lantern with him wherever he goes. This becomes very monotonous for any farmer, especially in the cold weather of the winter months, when most of the chores are done by lamp light.

So far as power is concerned I firmly believe that there has not been anything invented that can compare with it. When one wants to pump water all he has to do is to turn on the switch and the water comes. Formerly one would have to stand and try his temper on a gasoline engine for about half and hour, when it's cold, to get it started. Many a time a farmer will have to work with the cold iron of a gasoline engine until he is almost frozen, and then very likely he will have to pump by hand. When one has electric power he does not have to be a gasoline engine expert or an electrician. The electric company repairs the motors and lines on short notice.

Then the little motor under the washer. My! but it's a dandy. There is no danger of the washerwoman getting her clothes caught in the pulleys and flywheels of the gasoline engine. No extra man is needed to watch the engine or to turn the machine by hand. The housewife can do it all herself, and other household duties at the same time. Then comes the powerful three-horsepower motor, which pulls a six-inch feed mill and a two-hole corn sheller at the same time, fed to their fullest capacity, without a moment's notice of the operator's attention.

The flatiron for the housewife greatly lightens her burdens.

Considering electricity from the financial standpoint, I know from actual experience that electric lights are much cheaper than the old kerosene lights, when you figure the cost of kerosene lanterns, globes and chimneys that are broken very often.

The electric power is cheaper than any gasoline engine will ever be. You consider the price of a five or eight-horsepower engine to grind with, and compare with the three-horsepower motor, a one or two-horsepower engine is also necessary to pump and wash with and do other light work. These engines burn a large amount of gasoline, which at the present price soon becomes a large bill. Then there are batteries, which have to be replaced at least every six months. Lubricating oil is also very high priced, and repair bills add a great deal of expense to the operating.

I can do all the work that the above engine will do with the motors I have mentioned, for at least half the expense of gasoline power.

I firlmy believe that electricity is the greatest labor device known. I believe it is the greatest necessity of the American farmer. Yours truly, L. F. Miller, Canby, Minn.

Power Companies to Install High-Capacity Turbogenerators.

Many turbogenerators of high capacity are being installed or contracted for by the large power companies of the country. Among these are the Commonwealth Edison Company, Chicago, and the Duquesne Light Company, Pittsburgh, orders having recently been placed with the Westinghouse Electric & Manufacturing Company.

The Commonwealth Edison Company has ordered for installation in its Northwest power house a unit consisting of a three-phase, 60-cycle, 12,000-volt, tandem, compound turbogenerator rated at 30,000 kilowatts. This unit consists of a high-pressure turbine, a low-pressure turbine and one generator, all in tandem on one shaft, operating at a speed of 1,200 revolutions per minute. This unit will be capable of carrying a momentary overload of 35,000 kilowatts. The turbine will be served by two Westinghouse 28,000-square-foot surface condensers which will maintain at full load a vacuum of from 28.5 to 29 inches.

The Duquesne Light Company has purchased, for installation in its Brunots Island power house, a three-phase, 60-cycle, 12,000-volt cross-compound turbogenerator, rated at 40,000 kilowatts. This unit consists of a high and a low pressure turbine driving separate generators which operate in parallel. The speed of the high-pressure element is 1,800 revolutions per minute and of the low pressure 1,200.

Annual Meeting of Associated Manufacturers of Electrical Supplies.

The annual meeting of the Associated Manufacturers of Electrical Supplies will be held on Thursday, March 16, 1916. In the afternoon of that day at two o'clock the business session of the meeting will be called at the Hotel Biltmore, Forty-third Street and Madison Avenue, New York City.

The Executive and Associate representatives of member companies are asked to attend the business session, that the important matters to be presented at the first annual meeting of the Association may receive consideration by all its membership.

After the business session of the Association, at which will have occurred the election of new members to the Board of Governors, the regular organization meeting of the Board of Governors will be called.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

CENTRAL-STATION HOUSE-WIRING CAMPAIGNS.

Some Suggestions Based on Successful Sales Efforts.

Every spring efforts are made to increase business from the wiring of already-built houses. In some instances special campaigns are carried on, based on special offers, while in other cases extra sales effort is relied upon entirely, no special inducement in the way of reduced prices or premiums being offered. Both plans are successful.

For the coming spring elaborate plans are being formulated to stimulate house wiring, and under the auspices of the Society for Electrical Development a comprehensive movement has been inaugurated to enlist the co-operation and support of all elements of the electrical industry.

In the following paragraphs some suggestions are offered central stations, which are based on campaigns which have been tried and found successful. Some particularly valuable ideas may be obtained from the experiences of the Louisville Gas & Electric Company.

Comparatively few cities in this country have as many as 50 per cent of the houses wired for electric light out of the total in the city which could reasonably be expected to use electric light. In Eastern cities this percentage is probably as low as 25 per cent, therefore, the outline of a practical house-wiring campaign, that has been tried and found successful, will, without doubt, be of interest to all central-station companies.

A house-wiring campaign was started in Louisville, Ky. (population 250,000), some time ago, with the results that the Louisville Gas & Electric Company is now adding to its lines an average of 70 old houses per week, from the campaign proper, with a total result of approximately 150 new residence consumers each week, as the direct and indirect result of the house-wiring campaign. The average cost of the wiring, including fixtures and 40-watt Mazda lamps, is $36.43 per house. In starting this campaign in Louisville, the residence portion of the city was divided into five districts, with one house-wiring salesman being assigned to each district. It is estimated that there are approximately 40,000 residences in Louisville, and that, of these, there are 15,000, at present, connected to the company's lines. Assuming that 50 per cent of the remainder is prospective, at this time, there are approximately 12,500 old unwired houses which are considered prospective lighting consumers. It is the intention, in Louisville, to keep this campaign going, until practically every home in Louisville is wired or connected to the company's lines, should it be found that some of these houses are already wired but are not connected. If a thorough canvass were made, in any city in the United States, to ascertain the number of houses wired, but not connected to the lighting company's lines, the result would be surprising. In one large city such a canvass showed that there were as many houses wired, but not connected, as there were of residences taking service from the lighting company.

Difficulties Encountered in Launching a Campaign.

Many central-station companies have discontinued the practice of selling appliances and doing house wiring, and not desiring to enter into this business, even temporarily, they are often confronted by difficulties which seem almost insurmountable, especially when it is a question of making satisfactory arrangements with the electric contractors to do the work. This difficulty was experienced in Louisville, since the Louisville Gas & Electric Company does no piping or wiring, nor does it sell appliances of any kind, this being the policy of all Byllesby properties. Therefore, with a view of enlisting the necessary assistance to carry out such a campaign, the contractors were invited to attend a noonday luncheon for a conference. The entire matter was laid before them. There were given figures showing the large field of operation. The campaign was carefully outlined, and the number of unwired houses in Louisville calculated. The contractors were given to understand that the company would spend a large amount of money in advertising the campaign in the daily newspaper, through hand bills, and, through its five salesmen, would be able to hand them a large volume of business which would warrant their making prices that would be satisfactory to carry on a successful campaign. It was pointed out to the contractors that they could pool their interests, purchase materials as a single jobber, and effect economies in taking care of the business handed over to them by the lighting company, to say nothing of other business which would come directly to them at a much lower cost than they have ever been able to do heretofore. These contractors were requested, at this meeting, to submit specifications and quotations, on a flat-rate basis, making a price, per outlet, for the wiring, also a flat price for each fixture, hung complete, ready to burn, including 40-watt Mazda lamps, figures based on a standard line of fixtures. The Louisville Gas & Electric Company proposed to bear all expense of a vigorous advertising campaign and to have five of its salesmen, referred to above, secure the house-wiring contracts, contracts to be taken between the consumer and the contractor, the company not being a party to the contract, but merely acting as a sales agent.

WIRING SPECIFICATIONS AND SCHEDULE OF PRICES

LOCATION	Ceiling Outlet	Bracket Outlet	Wall Switch including Snap Switch	3 way Snap Switch (Pair)	Base Recept. Snap Recept.	M. M. Bracket Brick Wall	M. M. Snap Wall Brick Wall	Concealed B X Bracket Brick Wall	Concealed Flush Sort Brick Wall	Open Work per Outlet	Snap Recept. Basement
PRICE EACH	$2.50	$2.50	$2.75	$6.00	$3.00	$3.50	$3.50	$4.50	$5.00	$1.50	$1.50
Porch											
Vestibule											
Reception Hall											
Reception Room											
Living Room											
Library											
Dining Room											
Lavatory											
Pantry											
Kitchen											
Basement											
Rear Hall											
Upper Hall											
Upper Rr. Hall											
Bath											
N. E. Chamber											
S. E. Chamber											
N. W. Chamber											
S. W. Chamber											
Chamber											
Chamber											
Closets											

Flush Switches and Flush Base Board Recepts $1.00 extra each.

Four, Five or Six, Outlet Contract, at $3.00 per Outlet.

Wiring Schedule Used in Louisville with Marked Success.

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The above plan, it will be seen, does not necessitate the contractor spending any time in obtaining the business. In view of these facts, and considering that contractors would be relieved of all advertising and selling expense, as well as the cost of making estimates, it was reasonable to expect some very attractive prices from them.

Contractors' Prices High.

After due deliberation, the contractors submitted specifications and quotations, which were rejected by the company because they were too high to make the campaign a success, in fact, the prices were no lower than the average price regularly charged.

An application blank was then compiled by the company which constituted a form of contract between the contractor and consumer, in which the contractor agreed to do the work, on a time-payment plan of 25 per cent cash, on completion of the work, the balance to be paid in twelve equal monthly payments, the entire charge subject to a discount of 10 per cent in the event the consumer desired to pay cash within ten days after the work was completed. The contract blank was prepared in such a way that it was a very easy matter for the consumer and salesman to select the fixtures and the kind of wiring, location of switches, etc., best suited for the particular residence and ranging in price from $10 to $150, as best suits the pocketbook of the consumer. As soon as this application had been compiled, it was submitted to the contractors. They considered the prices entirely too low, and, in a body, refused to take up the work at the prices named.

One Contractor Accepts Company's Schedule.

Fortunately, a few days later, one contractor voluntarily accepted the company's schedule of prices and contract, providing the company turned over to him all of the work. After the company had satisfied itself as to the ability of this contractor to finance such a large business, on the time-payment plan, the campaign was launched.

In addition to the large number of contracts that the company is turning over to the contractor, he is now receiving practically an equal volume of house-wiring business which comes to him without solicitation, induced, no doubt, by the advertising of the company's campaign.

All Electric Contractors Benefited.

All the other contractors are apparently doing a much larger business, since the campaign was started, than they had been doing before. Also the sale of portables, electric irons and other appliances has increased materially, at all supply houses and dealers. The contractor, to whom the company turns over the house-wiring business, found it necessary to perfect an organization capable of handling such a large business efficiently and included in his new organization is a credit man, who passes on all accounts; a trained fixture salesman in charge of fixture room, who takes care of the many customers who prefer to call and see the fixtures, rather than select them from a salesman's catalog, and an outside superintendent in charge of 42 wiremen.

The capital required by the contractor to carry on the business, as outlined above, is approximately $25,000, and, to be successful, a contractor must carry on and watch his business as carefully as any successful merchant would.

Cash Prizes to Salesmen.

As evidence of the contractor's satisfaction with the prices adopted in Louisville, it should be noted that he voluntarily furnishes to the commercial department of the Louisville Gas & Electric Company $10 per week, which is given as prizes to the two salesmen securing the largest number of house-wiring contracts each week, $6.00 to the highest man and $4.00 to the next highest. In addition to these prizes, the company gives a cash prize of $10 to the salesman showing the highest efficiency each month, a certain percentage being added for every kilowatt contracted for and connected, also for working overtime, turning power prospects over to power and gas salesmen, taking care of complaints, etc., a deduction being made for tardiness, carelessness and for other similar reasons. The relative standing of each man is posted daily on a blackboard in the commercial department, which has resulted in a keen rivalry

Application for Electric House Wiring.

Louisville, Ky. _____ 191__

The undersigned, _____

_____

hereby make application to _____

hereinafter called the "Contractor," for wiring the premises and installing fixtures as listed herein, at No. _____ in accordance with the specifications and schedules endorsed hereon and attached hereto, which are incorporated herein, and agree to pay therefor at the office of the Contractor the sum of _____ Dollars ($_____) as follows:

Twenty-five (25%) or _____ Dollars ($_____) on completion of work and the balance in twelve (12) equal monthly payments, or _____ Dollars ($_____) on or before the first of each month following, until the whole amount has been paid. Failure to meet payments when due shall render the deferred payment feature of this contract void, and the remaining payments on said contract shall become due and payable at once.

A discount of ten per cent. (10%) from the above contract price will be allowed, provided full payment is made within ten (10) days from the date of completion of installation.

It is mutually agreed that in event of any modification of the installation specified herein, the amount of this contract shall be revised in accordance with the Schedule of Prices incorporated herein.

The Contractor shall wire said premises and install fixtures as herein specified with forty (40) Watt Mazda or Tungsten lamps, including all labor and material necessary to do the work, covered by the General Specifications and Schedules incorporated herein and made a part hereof, in a thoroughly substantial manner, according to the Rules and Regulations of the National Board of Fire Underwriters as interpreted by the City Electrical Inspector, complete and ready for service.

The Contractor shall save harmless the Applicants from any and all damage or expenses that may arise during the performance of this contract by reason of injury to persons or property resulting from negligence or carelessness on the part of the Contractor in the performance of this contract.

The Contractor agrees to commence work within _____ days of the acceptance of this contract and to complete same without unnecessary or unreasonable delays.

_____ Tenant. } Applicants.

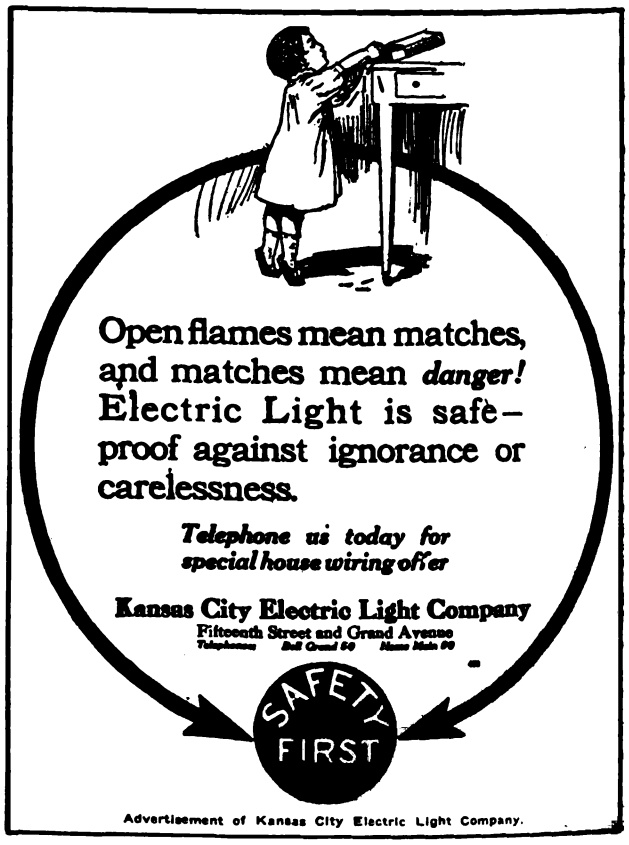
_____ Property Owner.

Accepted the _____ day of _____, 191__

_____ Contractor.

Forms Used by Louisville Gas & Electric Company in House-Wiring Campaign Being Conducted.

Louisville House-Wiring Contract.



Advertisement Used in Kansas City Campaign.

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for first place. The entire commercial department of the Louisville Gas & Electric Company holds a meeting every Saturday afternoon, presided over by Mr. Montgomery. At this meeting a paper is read on some subject of general interest, a lively discussion following. These papers and discussions have proved very attractive and beneficial to the department and to each of the salesmen individually.

It was decided, while public interest is aroused because of general publicity and the special advertising by the company, that the sale of electric irons could, at this time, be stimulated effectively. A large retail tea and coffee company in Louisville, that sells about two dozen staple groceries, on the premium plan, purposes to add to its premium list the choice of two standard electric irons, the premiums being distributed upon delivery of the first pound of tea or coffee, after signing an agreement to take a certain quantity, which entitles the purchaser to the premium. It is through this medium that this aggressive concern, with seven delivery wagons in Louisville, will be able to place a large number of irons on the lines of the company within the next few months.

Any campaign for business can be made successful if planned along the right line and then carried out with the necessary steam back of the efforts exerted.

The reason many house-wiring campaigns "peter out" is not because the plan was wrong, but because the one in charge or responsible is asleep at the switch. All effective advertising must have a punch. The efforts of a department manager, to be successful, must be stimulated by the determination to win. A house-wiring campaign, or other campaign, in the hands of such a man will be successful because it will not be launched until he knows the plan is right and that he can put it into successful execution.

Campaign in Boston Edison Territory.

There are about 160,000 unwired houses in Edison territory, in and about Boston. This represented a large potential business, such as every central station has at hand in greater or less proportion. The small householder is always the hardest proposition. Many schemes which aimed to interest this class failed because the latter could not be convinced of the disinterestedness of the company; they balked at paying contractors' prices for installations. Also, they do not like to be bothered with dickering with a half dozen competing contractors who are out for profit. It has been found by the Boston company that in order successfully to induce householders to sign a wiring contract the company must assume a part of the financial burden. Consequently the company set on foot and carried out the comprehensive house-wiring campaign, by which prospective customers were asked if they would be interested in a proposition to wire their homes at an original investment of $2.35, and $2.00 a month for six months—a total of $14.35. For this expenditure a customer is given a service to the premises, a service pipe in the overhead districts, a meter board wth fuse plugs, and the wiring of one outlet in armored cable, at any location on the first floor, except the ceiling. This proposition was good bait, but of the 918 contracts, only 29 were for the rudimentary equipment offered. Practically all went further and ordered equipment varying in cost from the $14.35 mentioned, up to over $200. The average contract amounted to about $83. The total value of the contracts was $75,800, representing 17,000 fifty-watt equivalents added to the company's connected load, with an estimated income of $21,000 yearly. Cash payments amounted to $7,700, leaving $68,100 to be paid in monthly installments. On this basis the company's financing investment will be taken care of in 15 months and its real investment will be but the interest on $68,000 for about 7.5 months. The net increase in income of $21,000 represents an expenditure on the company's part of only about $2,100.

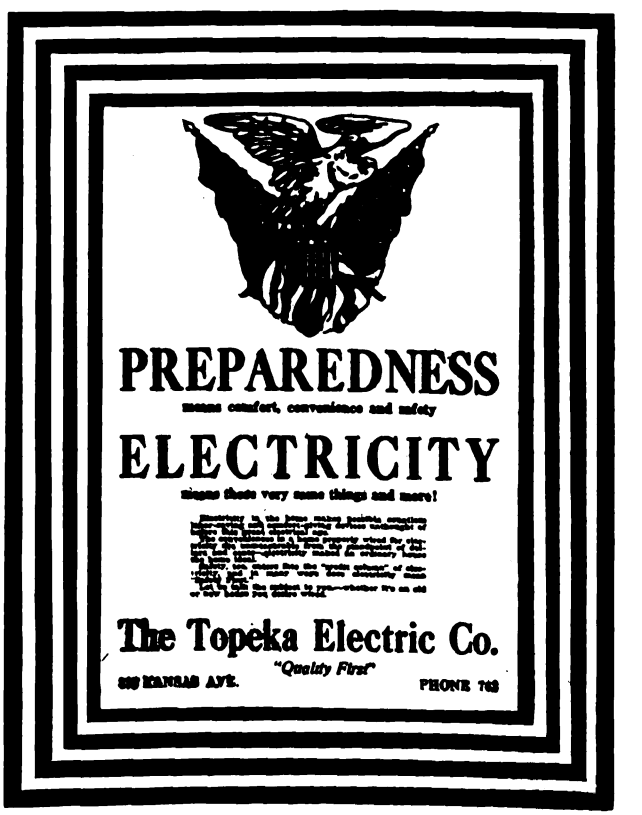
The company contracts to make the installations without even seeing the premises. The customer simply tells where he wants the outlets, the agent checks them from the published list and totals the results. Then the contract is turned over to a contractor without his having viewed the premises. At first there was some opposition on the part of contractors. They felt that the Edison Company would profit at their expense. In making up the price list the company consulted one contractor, who consented to execute any contract obtained at prices quoted. Then the proposition was put before the contractors as a whole, at a meeting at which all were told that they would all share in executing the contracts if they cared to. The result has been that now 200 contractors are executing the contracts as they are turned over to them, and the company is asked daily if there are not contracts on which they can work.

Wiring contractors are paid $2.00 for each new customer secured, plus 25 cents for each outlet the customer contracts for. In this way 248 contracts have been gotten from contractors for which a compensation of $1,265.25 has been paid, or $5.10 per house. This compensation has been shared by 50 contractors, who really act as advance agents.

Another campaign begun some months ago is one by which the company furnishes fixtures for a minimum of 100 watts for interior lighting or 150 watts outside. The inside fixture is a spun-brass canopy with stem and chain, fitted with Holophane prismatic reflector. The outside fixture is a spun-copper inclosed unit with 14-inch glassware that makes it possible to use a 500-watt lamp. In addition to furnishing the fixtures, the company finances the wiring and has adopted the following schedule: 5 outlets, $17.50; 4 outlets, $15.50; 3 outlets, $13.50; additional outlets over five, $2.50 each.

Timeliness in Topeka Advertising.

The Topeka Electric Company took advantage of the advertising opportunity during the recent visit of President Wilson to Topeka, and in large display space, among other advertisers in a special issue of the Topeka *Capital*, exploited electricity as an element in "preparedness."



Attractive Advertisement of Topeka Company in Red, White and Blue Colors.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

THE WIRING OF OLD HOUSES FROM THE CONTRACTOR'S POINT OF VIEW.

A General Survey of House-Wiring Campaigns, Plans and Costs as They Affect the Contractor.

Interest in the wiring of old houses is being revived and in order to stimulate activity in this line the period from March 15 to April 15 has been designated as "Wire Your Home Month." Special efforts are being made in this connection through the Society for Electrical Development, which fairly represents all branches of the electrical industry. Anything involving wiring is, or should be, of deep concern to the electrical contractor. In regard to the wiring of houses already built, however, contractors to a large extent show apathy instead of interest; there are certain definite reasons for this. That it should not be the case, however, is self-evident.

This article attempts to review the subject of wiring finished buildings insofar as it affects the electrical contractor. The subject is covered in only a general way, it being the purpose to deal with general policies and not with the details of how the work is done.

Desirability of Wiring Old Houses.

It is not generally known that less than 8 per cent of the houses in this country are wired for electric service. This percentage varies in different parts of the country; in the western and newer portion the percentage is very much higher, running in some exceptional instances as high as 90 per cent; on the other hand, in the eastern, southern and all older portions of the country the percentage is very low. This fact alone shows that there is great opportunity for activity on the part of electrical contractors. Most interest in the subject of wiring finished houses has been taken heretofore by central-station companies. This is only natural because it has been estimated that not 20 per cent of the houses adjoining the lines of such companies now have electric service; this figure is an average figure for the country as a whole.

Central stations have always been endeavoring to increase the size and density of their loads. Since commission and other legal regulations are compelling them to serve all customers who apply for service in their territory, they have been forced to put up many lines to which there are connected but few customers. By increasing the number of customers connected, the density of the load on each line affected is increased and the cost of serving each customer is somewhat reduced. It is evident that a line serving only one resident out of ten or more in a block is not nearly as profitable as a line serving practically all of these residents. If the lighting company materially increases the number of its customers along its lines and thereby reduces the cost of serving them, the rates for electric service are likely to be reduced, which urges other residents to have their houses wired and apply for service. Thus, a stimulus is given to the entire electrical industry and the contractors, manufacturers and dealers benefit as well as the central station.

Need for Aggressive Measures to Get the Business.

It is generally conceded that the new-business managers of the most progressive central-station companies are experts in getting after new business. It has been found from experience by most of these men that in order to get wiring of old houses special efforts are required. The fact that the houses are not wired and served with electricity may be due partly to the fact that their owners have not been aroused to the value of electricity, partly to their fear that the wiring of their premises will involve a great deal of upset, dirt and confusion, but chiefly due to the so-called high cost of wiring. Progressive central-station managers have found the first two of these difficulties to be easily overcome through newspaper advertising and other publicity means. They claim, however, that the third difficulty is a very important one and for this reason have been trying to devise methods for wiring existing buildings at minimum possible cost. The recent agitation for approval of concentric wiring demonstrates this fact. It is also stated that experience proves the most successful campaigns for wiring old houses are those in which special prices and other special concessions or inducements are made so as to arouse the common desire for getting something at exceptional or bargain rates.

Contractors, on the other hand, as a rule have not been enthusiastic for special low prices for the very simple reason that, if a contractor is to escape bankruptcy, he must insure receiving a reasonable profit on all work he undertakes. For this reason a great many contractors have evinced no interest in the subject whatsoever.

Necessity for Co-operation.

This lack of interest on the part of the contractors, combined with the positive assertions of the central-station interests that aggressive means and low cost are absolutely necessary for getting this business, has brought about in many cases very unfortunate conditions. Determined to secure the business, central-station companies have in numerous cities engaged in the work, thus further arousing the enmity of the contractors. In many instances, however, a more reasonable attitude has been taken by both sides and after conferences in which a desire to talk the matter over frankly and understand each other's problems has been shown, a friendly feeling has developed and successful co-operative schemes have been put into effect. There is no need to harp on the value of co-operation because of the agitation on this subject in recent years; nearly every one is agreed, in principle at least, that it is highly desirable.

In undertaking any co-operative scheme, the first thing that should be done is to discuss freely the entire subject from all points of view and especially attempt to make clear the claims of the apparently opposing central-station and contractor's sides. An agreement should then be undertaken on a fair schedule of prices covering different kinds of work and different types of building. Further agreement is then necessary as to how the work shall be solicited, whether advertising is to be carried on, to what extent and by whom paid for. An arrangement should then be drawn up for the equitable division of the work among the contractors in the community. Finally the subject of payment should be agreed on and any plan for ex-

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tending the period of payment should be definitely settled.

Before undertaking any co-operative scheme it must be clearly understood that whatever rates are agreed upon must be ample to cover the cost of doing the work by the contractor. Such rates, however, can frequently be made somewhat lower than most contractors are willing to concede on first consideration of the subject. If a strong co-operative arrangement resulting in a definite campaign is brought about, as has been shown in a number of cases, co-operative purchases by a group of contractors will result in decided savings in the buying of materials. If the campaign is carried out so actively as to keep the contractor or at least one of his gangs steadily employed on the wiring of old houses for a considerable period without the expense of soliciting the business or estimating and closely supervising the work or of collecting the account, the overhead expense to the contractor is materially reduced. These features account for the success of quite a number of co-operative campaigns that have been carried out in various cities.

Wiring Plans Most Used.

Of the very many special campaigns for the wiring of old houses which are reported as having been most successful, at least from the standpoint of the number of houses wired and connected for service, the following may be pointed out as being three distinct general classes:

(A) Single outlet or panel, which amounts practically to simply a service switch, cutout and meter loop with one or possibly two outlets for a flatiron and lamp, installed usually in the kitchen. A large number of these installations have been made, especially in small cities or in communities where there are many small cottages and modest homes in which the wiring cost must be kept at the lowest possible figure. The installation of such meager facilities is advocated merely as an entering wedge to demonstrate the advantage of electric service and stimulate the desire for more extensive wiring and more general use of electricity at a future time. Against these advantages there are numerous disadvantages to this plan, of which probably the most serious is that the stimulation to greater use of electricity is so great that the householder himself undertakes wiring his entire cottage or home. Many houses have been found in which lamp cord has been run from a single outlet to every room in the house, the cord being run around doors and windows and tacked on the wall with ordinary staples. The hazard of such an installation is self-evident.

(B) Wiring each principal room, but with a minimum number of outlets and the cheapest possible fixtures or only drop lamps without fixtures. The advantage of this plan again is its cheapness and that it overcomes the likelihood of attempts by the owner to wire his own premises. The disadvantages, however, are that in the attempt to make a very cheap installation, inferior wiring equipment is installed, necessitating considerable maintenance on the part of the central-station company due to the frequency with which fuses are blown. Moreover, the use of bare drop lights is a relic of the early days of electricity and the most advanced electrical and illuminating experts agree that all efforts possible should be made to overcome this tendency by insisting on at least well screened lamps and shades. Where each room is provided with only one outlet, as is the common practice under this plan, the desirability of more convenient means of connecting portable lamps and other appliances frequently produces patched-up wiring on the part of the owner or tenant. The small number of outlets also hinders the more liberal use of portable appliances.

(C) Wiring the entire building as completely as it would have been wired if the work had been done during erection. Needless to say this plan has been followed out in relatively few cases. However, from all standpoints it is by far the most desirable. It overcomes all objections to the two preceding plans and has the only disadvantage of being relatively costly. In many cities the deferred-payment plan has been followed with great success and the adoption of this method of extending the payments over a considerable time permits carrying out plan (C) in a very much larger number of cases than is usually considered possible.

Attitude of Contractors on These Plans.

Opinions have been obtained from a large number of contractors representing the relative merits of these principal plans and also modifications thereof. Plan (A) is almost universally condemned, not only by contractors but also by electrical inspectors. In the small cities, plan (B) has met with some approval on the part of contractors. It has been most successful where a large number of buildings of one kind, as four-room cottages, have been wired on the same general plan and with practically the same equipment. In such cases co-operative campaigns have been worked out to the advantage of both central station and contractor. An improvement on plan (B) whereby, although the number of outlets installed is still small, say one per room, yet the installation is made with all the thoroughness and with as good equipment as the best practice requires, has met with favor on the part of some contractors. Practically all are agreed that plan (C) is by far the best, not only in that it makes it worth while for the contractor to put in an installation of reasonable size, but that it will give the most satisfaction in the long run.

Deferred Payments.

Contractors in general have regarded with much favor the plan of financing the wiring installation by the central-station company. In this plan the work is done by the contractor and when it is completed he receives full payment. The owner of the house can extend the period of payment by a system of monthly installments covering in some cases six months, in others one year and still others up to two years. The central station carries the account and charges interest thereon to the owner. Contractors favor this because it is much easier for the utility company to increase its working capital than it is for the contractor, who, as a rule, cannot secure sufficient capital to carry a large number of outstanding accounts. Since the central station can easily carry out a scheme of making the customer add his monthly payment to the bill for current and since it has the continued benefit of the patronage of the customer, it is looked upon as being the party best capable of handling the installments.

One contractor pointed out that the plan of deferred payments which is coming into such extensive use in nearly all lines of business is bringing into the realm of necessities things that were formerly looked upon as luxuries. For example, pianos, phonographs and automobiles are now very commonly purchased on the installment plan. Therefore, the purchasing of a good wiring system combined with decent fixtures can be carried out as well by this plan. By following the installment method of payments the burden is spread over a considerable period and the customer at the same time enjoys the privilege of full use of the facilities purchased. He is also enabled to purchase a much more expensive installation and one more complete and satisfactory in every way than by accepting a meager wiring scheme with cheap and stereotyped fixtures.

Wiring Costs.

The cost of wiring an old building depends upon a large number of conditions. In the first place it depends upon the nature of the wiring regulations of the community. In small cities, where exposed wiring, wiring with molding, or

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concealed wiring on the knob-and-tube system is permitted, the cost is evidently very much lower than in the large cities, in which none of these systems is permitted, and the installations must be made entirely with rigid or flexible metallic conduit. The cost also depends upon the prevailing market prices of materials, which, in the case of copper wire, at least, have shown a decided rise during the past year. It also depends upon the cost of labor. Consequently, figures that are frequently cited in connection with house-wiring campaigns cannot be accepted by the contractor as applying to his own conditions without exact knowledge of the conditions prevailing in the place from which the figures are reported. Therefore, the exceptionally low cost figures, such as wiring a four-room cottage for $15 or less, which are frequently reported in this connection, are of practically no value to the contractor in a large city, such as Chicago, Philadelphia and New York.

Every contractor has heard in the last few years speeches and appeals for keeping close track of costs. If he has developed an accounting system which permits this he is in good condition to talk intelligently to the central-station representatives when plans for a co-operative campaign are being discussed. It is usually conceded that in order to appeal to the owner of an already built house successfully, it is necessary to give him a definite figure without elaborate preliminary estimate; therefore, an agreed specified price (subject to modification on important changes in market prices) for a certain type of outlet in a certain type of building is desirable, since it permits the solicitor to name a total price with little computation, and, therefore, greatly increases the likelihood of securing the business with little effort.

Although a statement of low-cost figures, as a rule, is not of much value, unless the conditions are exactly similar, yet a knowledge of what is being done in the case of medium and first-class installations is of interest to the contractor, as showing him what may be done under favorable conditions that can frequently be attained.

A contracting firm in New Haven, Conn., which has made quite a success of old-house wiring during the last few years in co-operative campaigns with the local central-station company, reports the following cost figures:

			Cost per Outlet.		
Year.	System.	No. of Outlets.	Material.	Labor.	Material and Labor.
1912	.....	4,952	$1.15	$1.38	$2.53
1913	.....	320	.....	.....	2.18
1914	.....	993	1.16	1.20	2.36
1915	Knob and tube	915	1.11	1.26	2.37
1915	BX	173	1.80	1.56	3.36
1916	Knob and tube	334	1.28	1.40	2.68

In the above table, for the first three years no attempt was made to keep separate record of costs for knob-and-tube outlets and BX outlets. The figures for 1916 cover only one and one-half months; it will be noticed that both material and labor costs are now higher than in 1915, showing that a set, inflexible price is not advisable. It is to be noted that these costs are for material and labor only, the overhead expense and profit are not included.

At Lynn, Mass., all the work is turned over to contractors and paid for either direct to the contractor on completion or on deferred payments to the central station, the latter carrying the account. The agreed costs are as follows: Service connection, $11; cellar outlet and switch $5.50; piazza, hall, parlor, dining-room and bathroom, in each case an outlet and switch, each room, $7.75; kitchen, pantry, bedrooms, closets and inside halls, each outlet, $3.25; also each additional outlet, $3.25; outlets with flush wall receptacles, $4.50 each, extra switches, $4.50, three-way switches, $6.75. The fixtures are separate, and, as a rule, relatively inexpensive.

At Providence, R. I., a successful campaign recently inaugurated has included as a special proposition the wiring of 11 outlets, simple fixtures, and a flatiron for $79.50, of which 10 per cent is paid promptly and the remainder in installments of $2.98 per month for two years. The work is turned over to contractors, and the account handled by the lighting company. Extra ceiling and wall light outlets are $3.75 each, extra outlets for wall, baseboard or floor receptacles, $4.25; for basement porcelain receptacle, $4.25; for single-pole flush switches, $4.25, and for three-way flush and for electrolier switches, $4.75.

Chicago Schedule Prices.

One of the most complete schedules has recently been worked out by a revised joint agreement between the Electrical Contractors' Association of Chicago and the Commonwealth Edison Company. For any contracts secured according to this schedule by the contractor the utility company will pay for the work on completion and inspection and let the customer reimburse it through monthly payments extended over two years. The prices given in the table do not include switches or receptacles, but cover wiring only. All wiring is concealed and involves the use of BX flexible iron-armored wire or the equivalent standard of construction.

In this table Class A applies to two-story flat buildings of brick or wood construction, of a character that will rent for $25 to $40 per month, or residences that could rent for $20 to $50 per month. Class B applies to three-story buildings of same renting value as Class A. Class C applies to two-story buildings that rent for $50 and up. Class D applies to three-story buildings renting for $50 and up.

No. of Lights.	Class A.	Class B.	Class C.	Class D.
10	$ 55	$ 77	$ 83	$ 97
11	57	79	86	100
12	59	81	89	103
13	65	89	95	109
14	67	91	101	112
15	69	94	105	116
16	72	96	108	119
17	74	98	111	122
18	76	100	114	125
19	78	102	118	129
20	80	105	121	132
21	83	107	124	136
22	85	109	128	140
23	87	111	131	144
24	89	113	133	147
25	95	121	139	155
26	97	123	142	160
27	99	125	145	164
28	101	128	150	168
29	103	130	154	173
30	106	132	157	177
31	108	134	161	181
32	110	136	164	185
33	112	139	167	189
34	114	141	171	193
35	117	143	174	196
36	119	145	177	200
37	124	157	183	208
38	128	161	185	213
39	131	165	190	218
40	134	168	194	223
41	138	172	198	228
42	141	175	201	232
43	144	179	205	237
44	146	182	208	241
45	149	185	211	245
46	152	191	215	250
47	155	194	218	254
48	157	197	221	259
49	163	205	227	266
50	166	209	231	271
51	169	213	235	276
52	173	217	240	281
53	176	220	244	286
54	179	223	249	291
55	183	227	252	295
56	186	230	256	300
57	189	233	260	304
58	193	237	264	309
59	196	240	268	313
60	199	243	272	317

A special schedule applies to Class E buildings, which are one or one and one-half story cottages with open attic. This is as follows: Seven to 12 lights, $44; 13 lights, $49; 14 lights, $51; 15 lights, $53.

Another special schedule (G) covers the wiring of workmen's homes, particularly wooden, stucco or brick one-story cottages with roughly finished attics. This provides a charge of $12 for installation of service mains complete, including service switch, cutout cabinet, etc., plus $2 per

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outlet where the total number of lights does not exceed 12. If more than 12 lights are desired, there is an initial charge of $5 for each additional circuit of 12 lights, plus $2.20 per outlet. It is not contemplated that any switches for chandeliers will be included. A simple assortment of fixtures with shades and pull-chain sockets is available at low extra charge. The complete installation, including 12 lights and fixtures, can usually be provided for under $45, which when spread over 24 monthly payments is not burdensome.

The wiring for all switch outlets is as follows:

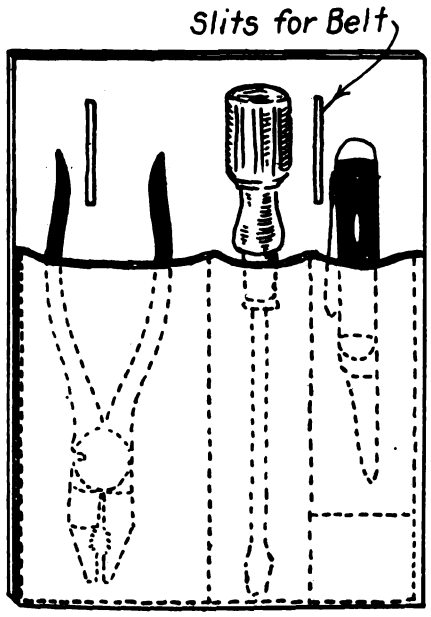
Type.	Class A.	Class B.	Class C.	Class D.	Class E.
Single-pole	$3.50	$4.00	$4.50	$5.00	$3.00
Three-way	5.00	5.50	6.00	6.50	4.50

In addition to the above prices for wiring, there are prices for switches, etc., as follows:

Flush push-button single-pole switch	$1.00
Standard snap single-pole switch	.50
Automatic door switch	1.50
Three-way flush switch	1.10
Three-way snap switch	.50
Drop cord (including spun brass canopy, cord and socket)	1.00
Drop cord (without canopy)	.75
Waterproof floor receptacle	3.00
Flush baseboard receptacle	1.50
Standard wall receptacle	.50

Handy Case for Electrician's Tools.

Herewith is shown a case for pliers, screw driver and knife. It is made of heavy leather and is provided with slits in the back, which extends up higher than the piece which forms the front of the case. The handles of the tools are easily accessible. If worn on the belt it will be



Case of Electrician's Tools.

found very handy for the electrician, since all of the tools are kept together and are readily accessible. The sections of the case are made to fit the tools.

J. Randle.

Electrical Contractors Use Display in Daily Press to Secure Workmen.

Beard & Lyons, electrical contractors at Lexington, Ky., used display advertising space in local papers to advertise for an expert electrician, stipulating the high qualifications required of workmen employed by that company. Although a newspaper of general circulation is not a good medium for such an advertisement, it is pointed out that the contracting concern obtained an indirect benefit through the impression of high capabilities of its employees created upon the lay readers.

Among the Contractors.

C. P. Cochran, electrical inspector at Nashville, Tenn., reported that 1,701 electrical permits were issued in 1915. Total inspections made were 1,846.

Herbrick & Lawrence, Nashville, Tenn., has secured the contact for electric wiring in the five-story building of the Fourth & First National Bank, Nashville.

The Electric Shop, E. C. Nebel, manager, has been opened at Stevens Point, Wis. Beside contracting, electrical fixtures and supplies will be handled.

The Gaines Electric Company, Cleveland, O., has secured the contract for the electrical construction in the new plant of the Mason Tire & Rubber Company, Kent, O.

W. R. Katterjohn has been elected to the board of directors of the Paducah (Ky.) Builders' Exchange and will represent the electrical contracting interests of the city.

The Lavier & Long Electric Company, of Detroit, Mich., has opened a branch office at 112 Campau Avenue N. W., Grand Rapids, Mich., with Herman Gutebunst manager.

The Pacific Fire Extinguisher Company, Berkeley, Cal., was awarded the contract for the installation of a new lighting system in Lighting District No. 1 in Berkeley on its bid of $22,300.

Otto Harloff and Karl Loprich have formed the Harloff-Loprich Electric Company, 109 North Hamilton Street, Madison, Wis. The firm will do electrical contracting and handle supplies.

The Plattsburgh (N. Y.) Plumbing & Electric Company has been formed by C. W. Howe, C. E. Bragg, F. L. Carroll. The new company will do a plumbing and electrical contracting business.

The Weston Electric Company, Cincinnati, O., has been awarded the contract for the installation of power plant machinery in a plant to be constructed by W. S. Chandler at Mt. Olivet, Ky.

The Webster Electric Company, Youngstown, O., has the contract for the electrical equipment of the Salem High School, which includes the wiring for lighting, power, bells and telephone system, all work to be in conduit. Mr. Webster reports business good.

Irvin W. Guthman, formerly of the Bothwell-Guthman Electric Company, Youngstown, O., has severed his connection with that company and is in business for himself at 115 South Champion Street, Youngstown, O., and will handle motors, carry a full line of supplies and do a general electric construction business.

Kohler Brothers, 111 North Jefferson Street, Chicago, Ill., have closed a contract for the installation of six 100-horsepower motors at the factory of the Corn Products Refining Company, Argo, Ill. These motors will replace steam-engine equipment in one of the factory buildings. Power wires leading from the power house will be placed in underground conduit. This company is also doing the electrical construction work in the Sterling Morton High School, Cicero, Ill. This school will have a manual training department employing a large number of individual-motor drives. An isolated power plant, consisting of Western Electric 100-kilowatt and 50-kilowatt generators driven by Ball engines, will be installed.

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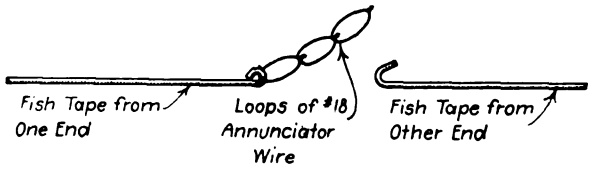
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Hooking Snakes.

In the issue of February 12 Mr. Myers gave his idea of a method to hook snakes in a run of conduit with bad bends. I have tried that plan a number of times, but did not have as good success from a labor-saving standpoint as with one illustrated herewith.



Hooking Snakes.

The tape from one end has an ordinary hooked end. The tape from the other end has the hook bent to the tape surface, making an eye end. With some No. 18 annunciator wire three small loops are made and fastened to the eye end. When the two tapes are drawn past one another the hook will catch one of the loops on the first attempt.

M. J. Moriarty.

To Keep Tape from Unraveling.

In using friction tape it is very common to find that the tape begins to tear in from the edges in unrolling; this causes the electrician to stop and pull the raveled edge off of the roll of tape, necessitating considerable loss of time and more or less annoyance. To avoid this it is

Tape Arranged to Prevent Unraveling.

necessary merely to cut across the roll of tape with the point of a knife as shown in the sketch herewith; cut on both sides of the roll and in the direction of two cross diameters.

W. D. Wilson.

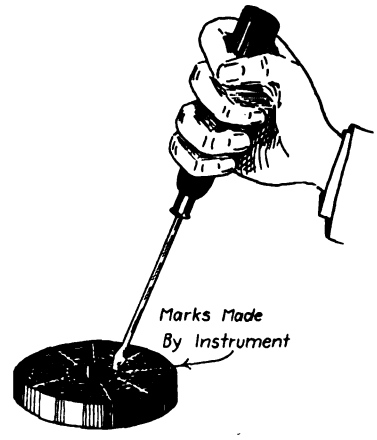
Convenient Fishing for Gang Switches.

In wiring old houses when there are several switch loops to be fished, it will be found to save trouble and time if the fish chain is long enough to allow the wire to be attached to the middle of it after the man below has fished out the lower end of the chain. Then the loom can be pushed back on the wire in the attic and the wire allowed to go through the hole with the chain until it is pulled out below. As soon as the man below takes the wire off and holds it, the chain is pulled back into the attic. The loom is then slipped down on the wire. This will save many trips up and down the ladder and much crawling around in the attic to get the chain again.

J. Randle.

To Protect Rubber Tape.

In using a roll of rubber insulating tape, I find that when new it has a tendency to fall apart and dropping on the floor becomes covered with dirt, which renders it useless. This is remedied by marking it cross-sectionally (from the



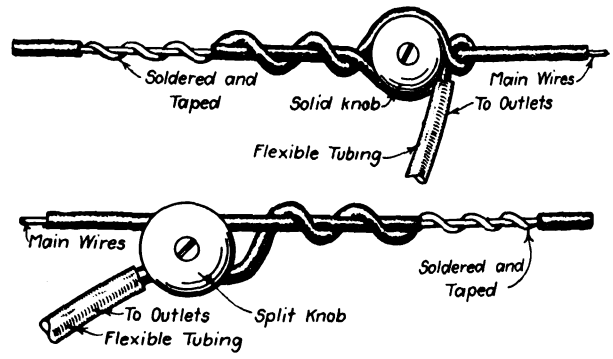
Scheme for Preventing Unrolling of Tape.

inside out) seven or eight times on both sides with a sharp instrument or tool, such as a screwdriver.

Herbert V. Smith.

Outlet Taps in Knob-and-Tube Work.

In knob-and-tube wiring one may frequently save a little time and make a better job where the wires run past an outlet, if the knobs used to secure the wires leading to the outlet are also used to hold the main wires. This is shown in the accompanying sketch both for solid and split knobs. In each case the one knob serves both for the



Securing Outlet Taps.

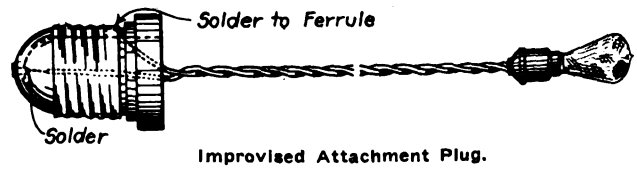
main wire and the outlet tap. Many wiremen use separate knobs for this purpose.

A. F. Stearns.

Improvised Attachment Plug.

On a job the other day I had need of an extension cord and not having an attachment plug available, used an old plug fuse as shown.

Take out the mica cap and solder one wire to inner side of end contact. Bring the other wire from the inside of



Improvised Attachment Plug.

plug to the ferrule or screw-shell contact through the small hole in side of plug and solder. With some types of refillable plug fuses the wires could be attached without soldering, if an emergency required a very quick connection.

F. C. Petersen.

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ELECTRICAL MERCHANDISING

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

THE USE OF DIPLOMACY IN MAKING COLLECTIONS OF POOR ACCOUNTS.

Suggestions to the Merchandizer for Collecting from the Different Classes of Slow Debtors.

By W. B. Parker.

In an article on handling slow collections by mail, published in a recent issue, the writer explained an efficient and inexpensive method of renewing the interest of "Mr. Slow Pay" in the fact of his indebtedness and of placing him in the right mental attitude to facilitate a satisfactory adjustment of his unpaid account. But when "Mr. Slow Pay" answers one of the letters the work of collection is only commenced unless he settles in full at the time. In practice it will be found that he will often pay an installment of the indebtedness, promising to pay the balance at a future date, or will attempt to settle the entire account in promises instead of cash. In either of these cases the right kind of collection diplomacy is needed to complete the work already accomplished in turning a poor account into a good one.

In order to intelligently decide on a plan of action in any given case, it is well to remember that there are just four general classes of slow debtors, and that your particular slow debtor must be first properly classified before the right method of handling him can be judged. We will consider the first class as consisting of those who were abundantly able to pay at the time of contracting the indebtedness but have since met with reverses and through no fault of their own are unable to fulfill their obligations. The second class takes in those who are financially solvent but are given to the pursuit of interests that require ready cash and have gotten into a habit of putting off as long as possible the payment of all charge accounts. The third class consists of those whom we may call the "happy-go-lucky" variety, who contract obligations without at all considering their ability to meet them. The fourth class contains the deliberate deadbeats, who may or may not have means to pay, but who are "law proof" and do not intend to pay any account that can be avoided.

When a debtor of the first class—one who has met with reverses and is really temporarily unable to pay—tells his story of hard luck it is easily possible for the creditor to take one of two positions, either one of which is wrong. On the one hand, he may feel that he had nothing to do with bringing about his debtor's ill luck and that it is nothing to him, that the debtor should sell what he has or borrow the money, but that no matter how he has to get it his account must be paid, and at once. On the other hand, if the creditor is of a kindly, easy-going disposition, he may simply bid Mr. Debtor take his time and pay when he gets ready. Both of these attitudes are wrong.

The correct method is to express a sincere regret for his misfortunes and by adroit questioning ascertain as closely as possible the exact situation and his probable future ability to take care of the account, and accept his promises for the future only to the extent that they seem possible of fulfillment. For example, it would be exceedingly unwise to accept a six-months' note for $200 where the debtor will receive his income in small, occasional amounts and would be required to save up the amount to meet the note. Ths is too much to expect of average human nature, even with the best of intentions. The result might be a payment of $10 or $20 and a request for another six months' extension. In this case, the better plan would be to ask for ten notes of $20 each, payable monthly, commencing, say, sixty days from date with a proviso in each note that it should immediately become due in case of failure to pay any prior note. This offer shows a willingness to help the debtor on his feet by giving him all the time he needs, and creates good will and a disposition to exert every effort to meet the small amounts as they come due.

It is, of course, important that the debtor be notified of all installments as they come due and his interest in settling the account be kept up to the same pitch as when the installment arrangement was made. Where the debtor owes a number of accounts at the time of meeting with misfortune it is clear that the creditor using helpful but energetic methods in handling the case will be the first one to receive his money, as well as to keep the debtor's good will, which means future business and profit.

The second and fourth classes of debtors—those who habitually delay payment, though solvent, and the deadbeats who have no intention of paying at all—are the hardest to handle because in neither case do they make promises in good faith and, of course, their promises cannot be relied upon. An experience of the writer while credit man for a manufacturer will serve to illustrate the usual real reason for slow payment by one well able to pay. A certain highly rated dealer was behind in his accounts and paid no attention to monthly statements or the ordinary letters calling his attention to the matter. Therefore, regardless of his high rating, he was put upon the "high pressure" mailing list—cards sent every other day—which finally induced an answer. His excuse was that he had been putting his ready money in some new buildings and improvements, and could not conveniently take care of his account. In other words, he was using the manufacturer's money for his own business expansion. Diplomatic correspondence failing to change his views, he was given the alternative of paying in full at once or being sued. He paid and his account went to some other manufacturer, but the point the writer is making is that no business house can afford to carry this class of accounts on any terms, and that the only way to handle this class of debtors is to promptly reform their habit of using their creditor's money regardless of terms, or to insist on settlement in full and let someone else have the doubtful benefit of their trade.

The deadbeats are the hardest to handle of all, as their promises are absolutely worthless, and compelling payment by law is usually impossible. As a general rule the best results are obtained by refusing to accept promises to pay in the future for longer than a week or ten days and on each failure to keep a promise, again resorting to "high pressure" mail, in some form of notice every other day—the very persistency of which may get on the debtor's nerves so that he will pay the account in order to avoid the constant annoyance.

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Turning Over Stock by Means of Special Sales

An Interview with George B. Johnson, Manager of the Commonwealth Edison Company's Electric Shop, Which Gives Some Pertinent Views on Turn-Over and Special Sales

With the approach of a nation-wide house-wiring campaign an opportunity will be offered to electrical merchandizers for capitalizing on publicity which will be given to the industry. The ideas regarding stock turn-over and special sales suggested in this article will be found particularly pertinent at this time.

"Turn over your stock." What these words mean and imply is the basis of successful electrical merchandising, according to George B. Johnson, manager of the Commonwealth Edison Company's Electric Shop, Michigan and Jackson Boulevards, Chicago, Ill.

"You know," Mr. Johnson said, "turn-over is defined as the ratio of sales during any period to the average capital invested in stock during that period. I believe a stock of electrical appliances should be turned over at least three times a year and some portions of a stock should move as often as six times a year. The ratio of turn-over is the barometer of a business enterprise. Calculating the ratio for periods of different length—say three months, six months, one year or two years—and then making comparison of periods of the same length, there is obtained as positive an indicator of the general trend of business as it is possible to get.

"A minute analysis of the general status of a business for certain periods, through the medium of these ratios, will lead to specific deductions relating to the details of a merchandising business. If the analysis shows an ever-increasing ratio, the progress and its extent will be apparent. It will also be possible to recognize what general conditions and sales methods were responsible for the indicated progress. However, if there are periods of decrease shown by the ratios it will be possible to note them and to deduce some of the reasons therefor, placing the merchandiser in better position to ward against occurrence again.

"There is one element, however, which may affect the ratio of turn-over adversely on paper, but which is allowable and even desirable when the proper conditions are existent. This is the purchase of goods not for immediate sale but for sale in the future. Such goods, on account of the certainty of a rise in price (the increasing cost of metals at the present time is a good example), can be placed in stock and held for future sale if too great an expense is not incurred for interest on the investment, rental for stock room space, and the like.

"Even in this case care must be taken not to overstock on goods, such as silk shades, for example, which will depreciate on account of change in styles or on account of their perishability. On the other hand, a well-chosen overstock of metal and glass portable lamps, purchased at the bottom of a rapidly rising market, is good business, because such goods will not depreciate while in stock, and when the time comes to sell may be either priced higher to agree with the then prevailing selling prices and more profit secured, or if then placed on sale at the regular profit will move out quickly because the same goods are being sold elsewhere at profits com-

A View of the Electric Shop Display Windows During Special Sales Period.

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Interior of Electric Shop Showing Special Sale Tags.

mensurate with the higher prices paid by competitors.

"The whole analysis," Mr. Johnson continued, "brings in so many considerations that there is difficulty in putting a finger on the specific defects of a business enterprise. If any exist, the analysis will point them out and the periods during which they occurred. If it is desired to make the analysis more specific, it is possible to make up a set of ratios for the different classes of merchandise, keeping separate records of heating appliances, motor-driven appliances, portable lamps, etc. The deductions made from a set of records of this kind will enable the merchandiser to assume a position best suited to correcting apparent defects in purchasing or selling methods of any certain class of goods.

"The seasons of the year will, of course, affect the ratio of turn-over and this effect must be taken into account in making comparisons of short periods. For instance, the last quarter of the year, which includes the holiday season, should show a greater ratio of turn-over than any other period. The first quarter, which is the dullest sale season of the year, will undoubtedly show the least ratio. In order to make the first quarter of the year show a greater increase of stock turn-over, special sales are usually inaugurated in most electrical merchandising salesrooms. An additional reason for January and February sales is the disposal of seasonable goods, such as portable lamps and gift articles left over from the holiday stock."

Mr. Johnson stated the method of conducting these sales was along lines of procedure carefully worked and carried out. The date of the commencement of the special sales period is made about the middle of January. By that time people who have received electrical appliances or lamps as gifts during the holiday season will have had an opportunity to make any exchanges desired. Another reason for beginning the sale at this time is because the competitors of the Electric Shop, which in the major are the department stores, do not as a rule begin their sales of heavy goods until some time in February. Taking these things into consideration, the timeliness of this special sale is apparent.

While a complete inventory of stock is taken the first few days of the year, the special sale is anticipated by an inventory taken just after the Christmas rush is over of such articles it is thought should be offered for special sale. A list of the different articles is prepared, the number of each in stock, and the original selling price. This list gives a very good summary of what stock has been moving, especially as regards electrical appliances.

The sale is conducted principally for the purpose of turning over seasonable goods. In the particular case of the Electric Shop it is portable lamps and electrical gift novelties. But to make the sale comprehensive of the whole stock, some appliances are included, especially those which have not been moving rapidly. The latter usually consist of appliances which are about to become obsolete or of very slow-moving articles which are not considered good adjuncts to a stock and will not be handled in the future.

When the sales list has been completed, the price reductions are determined. And, as the matter of price-cutting is a much-mooted one, some considerations of prime importance are involved. In the case of portable lamps the difficulty is not so great. The Electric Shop buys portables from 80 different manufacturers and because of the variety and nature of the stock a set retail price is not usually made by the manufacturers of the lines of portable table and floor lamps referred to here. The profit to be made from a certain lamp is determined by the merchant himself. The combinations which may be made with shades and bases of portables allow considerable leeway in artistic effects which give great latitude in pricing them and eliminates to a great extent the competitive element involved in staples. Hence, there is not much difficulty in deciding what reductions should be made for a special sale. But in making price reductions on staple cataloged appliances difficulties are not so easily overcome. The customer can see reasons for a sale of portable lamps, but why should electric irons, which are always staple and standardized as to kind and price, have reduced prices unless there is a diminution of quality? Then, what will be the effect on the competitive dealer? Sales reductions on the less staple appliances are not so noticeable to competitive dealers and do not have an adverse effect on customers. The whole matter is cleared up by including in the sales those appliances which are less staple, and adding a few of the staple articles to give a tone of comprehensiveness to the sales.

When the list of appliances to be placed on sale is completed and price reductions determined preparations for the sale are begun. Of greatest importance are the window displays. Situated, as the Electric Shop is, on Michigan Avenue, where the windows are viewed by discriminating purchasers, there is demanded a different tone of display than could be used on many other streets of Chicago. The difficulty encountered in special sales advertising is utilizing the windows, and yet doing this so unobtrusively that the general character of window display on the avenue will not be affected. One of the accompanying illustrations shows five windows on Michigan Avenue side of the store. The placards and signs at the bottom of the windows were redrawn several times before they were finally used for the sale. Displays in the different windows were frequently changed. The liberal use of price cards can be noted in the illustrations showing the windows and interior of the store. Careful observations of the effects of the different window displays were made, the number of people attracted to each being noted during certain periods of observation. In this way the least attractive windows were made known and new forms of display substituted.

In the store, numerous displays of the special sale articles were made. As much thought and study was given to these as to the window displays and they were changed frequently, both by the sales made and by rearrangements.

But, as Mr. Johnson explained, a special sale is only one way of accomplishing turn-over of a certain portion of a stock, and is but a single phase of merchandising. The principle of turn-over is the fundamental and the merchandiser should keep it ever in mind for the successful conduct of his business.

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Jobber Distribution as an Ultimate Economy

An Interview With J. W. Wooley, Sales Manager of the Oshkosh Manufacturing Company, Oshkosh, Wis.

A great deal of discussion and comment, favorable and otherwise, has been aroused among central-station companies and telephone companies concerning the policy of the Oshkosh Manufacturing Company, in marketing its entire product through the legitimate electrical supply jobber. Up to about two years ago the Oshkosh Manufacturing Company sold its product to both the jobber and the consumer—with plenty of accent on the latter. Many features developed which were unsatisfactory both to the consumer and to the Oshkosh Company, and the latter felt that some remedy was imperative.

"It was out of the question," said J. W. Wooley, sales manager of the Oshkosh Manufacturing Company, who was asked to make an explanation of the company's policy, "to attempt to raise prices to the consumer to care for the crying need for 'service,' and as a result we had to devise a better method.

"To convince the consumer that we are familiar with both sides of this discussion," said Mr. Wooley, "I want to say that we made a thorough and detailed study of the question. Among other things we found that the average amount of an order from an operating company was only a small fraction of the amount of an order from a jobber, but *that the cost of filling each order was the same.* While a little time could be saved in assembling the smaller amount of tools listed on an order from an operating company, the saving was lost in the increased ratio of cost of special packing cases, etc.

"A large percentage of these orders," Mr. Wooley continued, "came to us from operating companies that did not have a copy of our catalog, and therefore did not have our catalog numbers available. This necessitated further correspondence to ascertain just what the company required and therefore long delays in shipment.

"Orders for only 80 to 90 pounds of tools came to us from companies 2,000 miles distant from our factory. This meant an immense freight item in view of the fact that the weight of these small orders would not even come close to making up the weight allowed under the minimum freight charge. Investigation of several hundred orders showed that an average of 12 per cent on the total cost of the tools could have been saved by the consumer had he been able to specify enough tools to make up the minimum required by the transportation companies.

"On these orders the matter of 'delivery' time was ascertained and it was found that the average time from date of shipment to delivery was nine days, an item of considerable expense to the operating company in 'delay.'

"We were, as a rule, so far away from the operating company that no accurate credit rating could be obtained. We, of course, used standard rating books but we found them ofttimes unable to do justice to either the operating company, or to us, in view of the fact that the ratings shown were frequently those made a year previous. Many times no rating was shown.

"Special reports were out of the question for two reasons:

"1st—The small amount involved would not warrant the expense, and

"2nd—the delay while securing this report. As a result of our not being able to handle these 'credits' satisfactorily a considerable amount was annually charged off to profit and loss. A large percentage of this could undoubtedly have been recovered by suit, but here again the small individual amount involved precluded the possibility of such action.

"After all was said and done," Mr. Wooley continued, "the one great underlying objection to selling or marketing tools direct was the lack of 'service.'

"A large percentage of tool requirements are for emergency work and, in any event, owing to the relatively small amount of tools used in comparison to such other items as poles, pole-line hardware, and so forth, less consideration is given this matter by the storekeeper than on items of which large amounts are required. As a result tool requirements are not specified until the supply is exhausted and 'service' is imperative.

"For these reasons the desired 'service' cannot be obtained from the average manufacturer."

"What about the 'economic' side of this problem?" Mr. Wooley was asked.

"Our experience in the last two years," he replied, "has been that we can sell tools to the jobber, who will maintain a large and representative stock, and arrange a fair profit for him and still deliver the tools to the operating company at lower prices than we would have to charge if we sold to it direct.

"By selling the jobber," Mr. Wooley pointed out, "our line is exploited by all his traveling salesmen at a small fraction of what it would cost us to do the same work. It is self-evident that the selling cost, whatever it is, must be paid for by the consumer.

"The jobber's salesman will call at least four times to the manufacturer's once. Being in close personal touch with the consumer, the jobber's salesman has many friendships among the trade. He knows when to sell and when not to sell and for him to solicit an order for his jobbing house is in many cases equivalent to securing it. He has made a close and careful study of his particular territory and, it being local in scope, he is enabled to save time and money that the manufacturer could never hope to. He has not only one line to sell but probably hundreds of others and his selling cost is so prorated among these lines that as a result he is enabled to call on his trade oftener and sell more and at far less expense than had he the one line to exploit.

"Now why can we arrange our prices to the jobber so that he can sell the goods to the consumer cheaper than we can sell them to him direct, to say nothing of the saving on the shorter less-than-carload freight haul? Let us summarize:

"1st—Our selling expense outside of advertising is practically nothing.

"2nd—The jobber can and does pack tools for shipment along with many other items of which the manufacturer has never even heard. The packing and shipping charge is divided between several items and the item of tools is only a small proportion of the whole.

"3rd—We have no credit losses.

"These three items about cover the economic side of this proposition. Call the jobber a necessary evil if you wish, but the fact still remains that we could not market our tools, in my opinion, to the ultimate consumer were it not for this very same jobber who minimizes our selling costs and takes all our credit risks.

"When I make this statement, I recall to mind the case of a prominent electrical manufacturing concern which was organized to manufacture a certain line of switches and electrical specialties—now sold extensively through the jobbers.

"At the outset this electrical concern felt that it could, by eliminating the jobber, more advantageously market its goods to the user. It failed to see how the jobber, who neither made the goods nor used them, had a right to exist on the products of others.

"Just about the time that the factory began to sell its product direct to the consumer it found to its great dismay that its

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marketing conclusion had been wrong. After interviewing several jobbers on the subject it learned the several facts which have since made this same concern a power in the industry.

"For instance, it was found that the jobbers were in business to sell goods; that the jobbers made no goods whatever; did not know how to make goods; nor did they want to know; that they devoted their entire energies to the sale of merchandise. They found that the jobber had made a study of and had built up an organization based on many years of experience; that the concern which devoted its time to minimizing the troubles and expense of selling goods, had not time to cope with the problems incidental to their manufacture and that the factory which has succeeded in manufacturing an article successfully and economically has solved all the difficulties it should be troubled with and that it is more profitable to leave the marketing of that article to concerns which know how to market it better than the manufacturer ever will.

"The company referred to learned that by marketing its product through the jobber it would not cost them one penny for anything they did not sell and that it would cost them only a very small percentage of the price on what was sold.

"Had that company properly considered in the beginning what it was going to cost it to market its product direct—as it had contemplated—it would have known that it would need an army of salesmen which would cost in salaries alone an amount that would be appalling, to say nothing of other incidental expenses, all of which would have to come out of the sales of the one line alone. And not only that, the expense would be on what it did not sell as well as on what it did sell.

"All these things were learned by bitter experience and this company has so revised its selling methods as to eliminate all of these troublesome items and turn the practical end of the marketing of its product over to highly trained and expert sales organizations maintained by the legitimate electrical jobber and in this way it has been enabled to dispose of its product to the ultimate consumer at a far less price than had it continued its original method of selling direct.

"I do not know of a better illustration of the fact that the middleman or jobber is an economic necessity, especially in the electrical supply business.

"But putting aside all questions of an economic nature and getting down to the fundamental reason for the jobbers' existence we come back to the one word 'service.' The jobber combs the country for standard electrical merchandise, buys it in the right market and maintains large stocks in his warehouses for immediate shipment to his customers and can, as a rule, deliver material to them in an average time of two days. That's what counts in these 'high pressure' days."

THE VALUE OF GUARANTEES.

By H. N. Gilbert.

The question of guarantees on manufactured products is one that has been discussed for years. We are inclined to laugh when guarantees are mentioned in connection with some things. This condition of affairs has been brought about by the extravagant claims made by some concerns in the past. Many of these guarantees were given and are given with no intention or expectation of living up to them. In this connection at least the concerns giving such guarantees are morally on the level with the green goods man who sells the Masonic Temple to our cousin from the country for a few hundred dollars.

This guarantee question is an important one that should be considered very seriously by manufacturers and users. If a manufacturer is honest in his attempt to manufacture a piece of apparatus to be of good service to the user, it is perfectly proper that he should make a reasonable guarantee as to the apparatus and its performance. It is hard for the buyer to look at a piece of apparatus and tell just how it will perform or whether there are some defects in the materials or workmanship. The manufacturer has control over these points with the possible exception of defective castings, etc., and he can afford to guarantee his apparatus to the user.

The manufacturer should give a great deal of thought to the wording of his guarantee. It should not be a comparatively meaningless mixture of high-sounding words which in the last analysis say nothing definite, nor should it guarantee a long list of things which it would be impossible to fulfill or which the manufacturer has no intention of living up to. It should be plain and simple so that it is not misleading as to its real meaning and yet should be so worded that the manufacturer cannot be imposed upon by some unscrupulous user. It must give the user facts and not convey the idea that he can get repairs free on a piece of apparatus damaged by neglect.

The National Gas Engine Association, made up of the leading gas-engine men in the country, is considering the following guarantee which was presented to it at its last meeting by its Standardization Committee:

"We hereby agree to supply new parts in place of any part of this engine which is proven to be defective in material or workmanship provided that such defective part be returned to us, transportation charges prepaid, within one year from date of shipment, ordinary wear and tear excepted.

"(A) We hereby guarantee that this engine will develop its rated horsepower at its rated speed at sea level.

"(B) We further guarantee that this engine has developed its full rated horsepower at its rated speed in our testing room."

The Electric Power Club, made up of 35 leading manufacturers of electric motors, generators, transformers, and industrial-control apparatus, has gotten up several guarantees in the years of its existence. At last meeting, the Electric Power Club adopted the following guarantee:

"The manufacturer guarantees that apparatus manufactured by him will deliver successfully its rated output as marked on the nameplate, provided said apparatus is kept in proper condition and operated under normal conditions with competent supervision.

"The manufacturer agrees to correct and shall have the right to correct by repair or replacement at his own expense (at his option f. o. b. his works) any defects in said apparatus which may develop under normal and proper use within six months after date of shipment where inspection proves the claim, provided the purchaser gives the manufacturer immediate written notice of such defects and provided further that during said period said apparatus is kept in proper condition and operated under normal conditions with competent supervision. The correction of such defects by repair or replacement by the manufacturer shall constitute a fulfillment of all his obligations to the purchaser.

"Where apparatus is purchased and resold the maximum guarantee period shall be 12 months from date of shipment from the manufacturer's works.

"The manufacturer shall not be responsible for any defects resulting from improper storage or handling prior to placing the apparatus in service, and the manufacturer shall not assume any expense or liability for repairs made outside his works, without his written consent.

"The manufacturer shall in no case be liable for consequential damages for any failure to meet the conditions of any guarantee."

This is a very well worded guarantee and bears evidence of a great deal of thought. It is fair to the user and gives him the protection to which he is entitled and on the other hand it works no injustice to the manufacturer. Manufacturers of other electrical products can afford to consider this subject and word their guarantees in as satisfactory a manner.

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"LET THE CODE DECIDE."

Secretary's Message.

The Secretary has received the following letter, which may be of interest to our members, and though he has not had time to consult with the other officers, it seems not improper to print it here—it being, of course, understood that the association takes no stand upon the advantages or disadvantages of *any* particular device—that is the province of the Laboratories, and the "List of Approved Fittings" is our standard of reference.

GENERAL ELECTRIC COMPANY.
Schenectady, N. Y., February 19, 1916.

Mr. William L. Smith,
Secretary of the National Association of Electrical Inspectors,
Concord, Mass.

Dear Sir:

On page 252 of the February 5 issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN are some answers by the inspectors to question No. 317, as to the best practice in fireproofing rubber-covered wire for use on the back of switchboards, as referred to under Rule 3*e*.

Our experience in securing the Underwriters' Laboratories' approval of satisfactory flame-proof or slow-burning wires for switchboard service, with insulation equivalent to rubber, would indicate that the combination of rubber and asbestos cannot be made to meet the test requirements of the Laboratories, for the reason that when the rubber is subjected to the Bunsen flame for 15 seconds, the gases readily pass through the meshes of the asbestos hose or tape and readily ignite and act like a gas burner and will continue to burn as long as the vaporized rubber-gas is produced by the heat. This has prompted us to use varnished cambric instead of rubber with a satisfactory fireproof treatment of the outer braid. This has met the severe test of the Laboratories and has received approval, and is listed in the list of Approved Fittings under flame-proof wires for switchboard service, page 148.

I mentioned this because it may be of interest to the members of the Association to know that rubber-covered wires with asbestos braid or tape would fail to met the Laboratories' test for a flame-proof wire for switchboard service as required under Rule 3*e*.

Yours very truly,

H. R. Sargent,
per F. A. Barron.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Circuit-Breakers or Switch.

Question 318. In a two-phase, five-wire system, grounded neutral common to both phases, would it be permissible to use circuit-breakers in place of service switch, the breakers disconnecting the four phase wires but leaving the neutral unbroken?

Answer 1(P).* I find nothing in the Code to prohibit this.

Answer 2(S).* No. See Rules 19*a* and 23*a*. The switch should cut off all wires, neutral included.

Answer 3(B).* Any device approved as a severe switch should open all wires.

Answer 4(F and G). The use of circuit-breakers in lieu of service fuses is somewhat unusual but there is no objection to their use for this purpose. We would require them however to open all poles according to Rule 23*a*: "Cutouts must be placed on all service wires either overhead or underground in the nearest accessible place to the point where they enter the building and inside the walls, and arranged to cut off the entire current from the building. Departure from this rule may be authorized only under special permission in writing."

Answer 5(R).*. If it is to replace the switch *only* I would say, Yes.

Answer 6(E). Under the conditions expressed in the above question it is permissible to use the circuit-breakers instead of fuses and switch, but the circuit-breakers should open all the wires *as a switch*. While Rule 23*a*, third paragraph, states that automatic cutouts must not be placed in any permanently grounded service wires, it is equally true that Rule 24*a* requires that switches must be placed in all service wires. A circuit-breaker is both cutout and switch and in consideration of the requirements for the grounding of low-potential secondaries it was felt that the fuse might be safely omitted, but that the switch should be retained. Our department would approve of the use of circuit-breakers on the service wires provided all the wires were treated alike.

Answer 7(O). It would not be permissible to use circuit-breakers in place of service switch if any wire of the service is not disconnected.

According to Rule 19*a* all the wires of the service, including the grounded neutrals, must be opened by the switch, but these grounded neutrals must not be opened by the automatic cutout provided.

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Answer 8(T). No. As rules state that switches must disconnect all wires I should interpret this as applying in this case and require that the switch disconnect neutral line although grounded. Rule 19*a*.

Answer 9(D). We should say, Yes.

Answer 10(H).* No. Circuit-breakers do not fill the requirements.

Answer 11(N).* Rule 24*a* requires a service switch in all wires of the service.

Rule 23*a* forbids a cutout in a permanently grounded neutral.

Rule 19*a*, second paragraph: " . . . in four-wire three-phase circuits, there must be a trip coil in each phase. If a circuit-breaker is also used in place of the switch it must be so arranged that no one pole can be opened manually without disconnecting all the wires." No distinction between services or elsewhere.

The arrangement of the circuits in the question is exactly analogous to the above, it being in fact a quarter-phase star or better, equal-armed 90-degrees cross, while the rule refers to the three-phase star.

My reply then would be: "Yes, according to the rules of the Code, you may use the circuit-breakers; but you must have them so connected that overload in any one of the phase wires will trip the breaker in that wire alone leaving all the others intact, but so interconnected with an additional breaking device in the grounded neutral that it shall be impossible to open any one of the five wires by hand without the other four opening automatically and simultaneously."

Crane Wiring.

Question 319. In putting in control wires for an electric crane is it necessary to insert turnbuckle at the ends of the runs? What is the best way of insulating these wires from the crane girder?

Answer 1(E). It is not necessary under the Code rules to insert turnbuckles on control wires of an electric crane. These wires may be in conduit or on knobs or insulators, keeping them at least one inch from surface wired over. The *collector* wires should have a turnbuckle at each end.

Answer 2(R.).* No, but it is good practice. A good method is to have the contactor arranged to lift these wires, as the crane travels along, a sufficient distance above the girder.

Answer 3(U). No, but it is good practice; strain insulators at ends of lines and porcelain-covered hooks to take up sag.

Answer 4(S).* See Rule 43*a*; collector wires must be held at ends by strain insulators. Control wires do not require such supports. When control wires are exposed on open work, cleats, knobs, etc., flexible tubing may be used, depending on conditions.

Answer 5(F and G). Turnbuckles are not absolutely necessary but are useful to take up the slack in the wire. Ordinary strain insulators are satisfactory at the ends.

Answer 6(A).* Not having any electric cranes in this section I cannot offer any suggestions.

Answer 7(O). Assuming that the "control wires" in this question are the same as "bridge collector wires" in Rule 43*a*4, I should judge that they are not necessary, but are usually used. The wires may be insulated from the crane metal in numerous ways. The Code does not restrict the crane manufacturer to any particular mechanical construction.

Answer 8(T). I am without sufficient information on this.

Answer 9(M). It is not necessary, provided supports are interposed so as to support wires properly and relieve strain.

Answer 10(N).* Not on control wires—advisable on collector wires. *Method* of insulating is hardly a Code matter, but rather one of engineering practice.

Some Thoughts Suggested by Question 318.

This question, referring to service protection on a quarter-phase five-wire star system, is very interesting because of the peculiarities of some possible combinations which may occur.

Originally there seemed quite a possibility of competition between the various polyphase systems and numerous combinations were tried out, among them for instance the monocyclic.

They soon were all boiled down to the three-phase star and mesh, the two-phase with four separate wires, two per phase, and the two-phase with three wires, one being common to each phase. This latter was for a while in competition with the three-phase star, but it was subject to the difficulty that while the three leg currents in the three-phase star were equal under balanced load, the current in the common return of the other system was 141 per cent of that in either phase leg. This made a greater drop in the return wire than in the others, distorted the voltages and generally messed up all ideas of symmetry.

In the meantime, it having been found impossible to operate a three-phase with both motor and lamp load without changes on one phase causing disturbances on the other two, the four-wire three-phase system—a star with a neutral brought from the center, so that lamps might be operated at leg voltage single-phase from line to neutral and motors three-phase at 1.72 times leg voltage between the line wires—was worked out.

This system (taking as 100 per cent the copper used in a two-wire single-phase system) requires for equivalent power at equal loss and minimum potential 29.17 per cent copper.

To meet this, the quarter-phase five-wire star, on which lamps might be run on four practically independent lines to neutral equal-voltage circuits, and quarter-phase motors on the four lines at 1.42 times leg voltage, was developed.

This system on the same basis of comparison as above requires 28.125 per cent copper.

This combination might be obtained from two single-phase generators with their armatures rigidly fastened 90 electrical degrees apart, that is in quadrature, the midpoint of each armature connected (as may be accomplished in various ways) to a common "neutral" bus; or a single machine, with a four-legged star winding and fifth collector ring tapped on at the center, may be used.

There were some of these machines put out, but I do not think very many; personally I never saw one except in a laboratory where it was very handy, giving us 100 volts either line to neutral, 200 volts between opposite lines, or 142 volts between two adjacent lines.

In order to show what curious combinations may be obtained with such circuits, I will describe the following. A machine being available with special leads brought out to make possible different experimental combinations, it was connected up as a two-phase three-wire induction motor, and as such had a rating of 10 kilowatts.

A five-wire quarter-phase star generator was arranged and from this was run out a five-wire circuit arranged to equal a 500-foot run of No. 2 wire. The resistance of each line was $r=0.08$ ohm, and inductive reactance $x=0.05$ ohm, so that the impedance $z=\sqrt{r^2+x^2}=0.094$.

The leg voltage was adjusted for approximately 115 volts line to neutral, and as shown in the diagram, Fig. 1, the motor was connected between phases A and B and the neutral.

It was loaded to 7.5 kilowatts and then ran with a power-factor of 0.8, efficiency of 82 per cent; under these conditions each phase current was 50 amperes, the power component being

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40 amperes and the wattless component 30 amperes.

Calling the line of reference the electromotive force of phase A at the receiving end, the electromotive forces were

$$E_A=115+j0 \quad E_B=0+j115.$$

The currents were.

$$I_A=40-j30 \quad I_B=30+j40.$$

Angle of $I_A=-37°$, angle of $E_A=0°$.

Angle of $I_B=53°$, angle of $E_B=90°$.

Phases C and D were now each given a noninductive load of 50 amperes, so the electromotive forces were

$$E_C=-115+j0 \quad E_D=0-j115$$

and currents

$$I_C=-50+j0 \quad I_D=0-j50.$$

Angle of $I_C=180°$, angle of $E_C=180°$.

Angle of $I_D=270°$, angle of $E_D=270°$.

$$Z_A=Z_B=Z_C=Z_D=r-jx=0.08-j0.05.$$

Under these conditions the current in the neutral was

$$I_N=-20+j40 \quad i_n=44.7 \text{ amperes at angle } 116°30'.$$

The corresponding voltages at the generating end were relatively

$$V_A=116.7-j4.4, \text{ angle}=-13', \; v_a=116.8$$
$$V_B=4.4-j116.7, \text{ angle}=89°47', \; v_b=116.8$$
$$V_C=-119+j2.5, \text{ angle}=179°50', \; v_c=119$$
$$V_D=-2.5-j119, \text{ angle}=268°50', \; v_d=119.$$

This gives a distortion of the neutral so that if it be assumed to remain symmetrically situated at the receiver end, at the generator end its potential is off center at an angle of 264°30′ by $V_N=-0.4-j4.2$. The various line drops in numerical values were:

Line A=1.8 volts, Line B=1.8 volts, Line C=4 volts, Line D=4 volts, Neutral=4.22 volts.

Check on neutral drop $i_n z=44.6\times0.094=4.19$ volts.

Without going into details in each case, let us see what happens when the four lines are opened in turn.

First, suppose we open phase D. The neutral current then becomes 22.6 amperes at an angle 206°30′, the drops are in A, 1.8 volts; in B, 1.8 volts; in C, 4 volts; but in the neutral it becomes 2.11 volts and it is thrown off center in another direction.

Second, suppose we open phase C instead of D. The neutral current then becomes 80.6 amperes at an angle 150°30′, the drops in A and B are as before; in the neutral it becomes 7.6 volts and it is thrown off center in a third direction.

This accounts for the two noninductive phases, but before examining the inductive phases we must note how the motor acts.

When the motor has one of its phases opened, it runs as a single-phase induction motor, but its rating is now about 7 kilowatts instead of 10 kilowatts. It is therefore fully loaded or even a bit more, its efficiency is a little better, and since it now takes double the magnetizing current in the phase that is left, its power-factor is changed somewhat.

Third, if then we open phase B we find that the current in phase A, which before was 50 amperes at —37°, now becomes 96 amperes at —38°. The line drops are, in A, 3.3 volts; in C, 4 volts; in D, 4 volts; and in the neutral, 10.3 volts; while the neutral current becomes 113 amperes at an angle of 103°.

Fourth, if we open phase A instead of B, we find that the current in B, which was originally 50 amperes at 53°, becomes

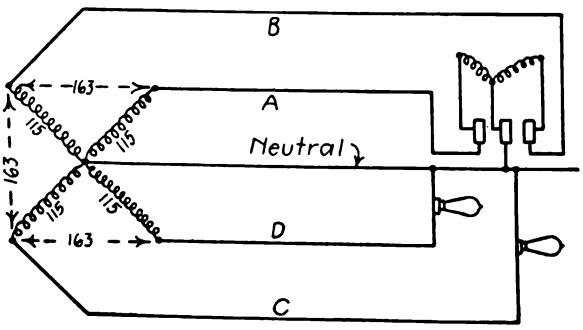

Fig. 1.—Circuit Diagram.

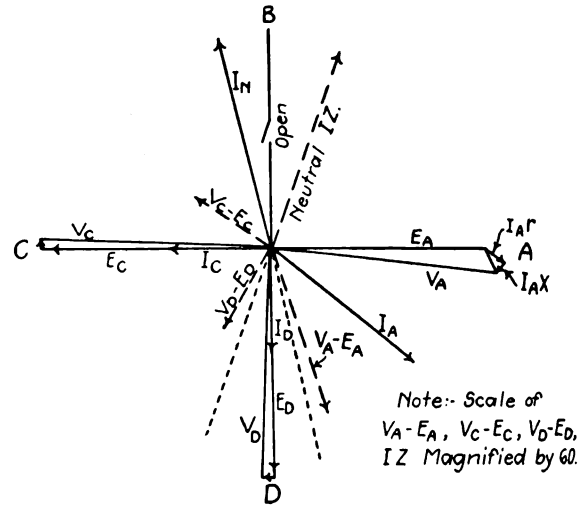

Fig. 2.—Vector Diagram.

96 amperes at 52°. The line drops are, in B, 3.3 volts; in C, 4 volts; in D, 4 volts; and in the neutral, 2.5 volts; while the neutral current is now 26.6 amperes and the phase angle 248°.

Fifth, if C and D are opened together, the neutral current is 71 amperes at 188°; the neutral drop 6.74; while if A and B are opened together, the current is still 71 amperes, but at an angle of 45°, and the drop again 6.74 volts.

Fig. 2 shows the vector diagram for case 3 above. Thus we see that in this case the neutral current assumed successively values

22.6 amperes, phase angle 206.5°
22.6 amperes, phase angle 248.0°
44.6 amperes, phase angle 116.5°
71.0 amperes, phase angle 188.0° or 45°
80.6 amperes, phase angle 150.5°
113.0 amperes, phase angle 103.0°.

When the heaviest load was on, the neutral current was 44.6; and in some of the other cases the total load on the generator was reduced, while the range of neutral I^2R is from 41 to 1,021 watts.

Of course it is hardly to be supposed that an exact parallel of this case would arise in practice, though it is perfectly *possible*, but it does illustrate the nature of the possible combinations that might arise, and it shows very clearly the importance of the requirements of Rule 19 of the Code. It would be very bad if one of these phase wires in opening automatically carried the neutral with it as in some of the cases the disturbance of the portion of the system left alive would be extreme, to say the least, and it would also be exceedingly bad to allow of opening the neutral by hand without also opening all the other lines at the same time, the same being obviously true of any of the lines, so that the wording of Rule 19*a*, second paragraph, is none too strong.

For though it is unlikely that such a motor and lamp combination would ever be found, nevertheless cases of noninductive loads on some phases combined with inductive loads on others might easily be found and this problem is at least interesting.

W. L. Smith.

New Aluminum Plant for Norway.

An extensive aluminum smelter is being organized at Höyanfjord, Norway, where there is a waterfall which may furnish 60,000 horsepower. It is proposed to develop 20,000 horsepower at once, to provide for the production of 4,000 tons of aluminum per year. The capital stock of the company is fixed at $3,350,000, of which $2,680,000 is subscribed. The banks of Christiania and Bergen have declared a willingness to underwrite a loan of $1,000,000 for the company.

A number of bauxite beds have been secured in southern France, where the ore will be worked into oxides and shipped in this concentrated form to Norway.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Compact High-Frequency Generator for Electrotherapeutics.

Physicians have been using high-frequency currents for many years, and have accomplished wonderful results in nearly all cases of scalp and skin diseases, and in cases where body treatments are necessary. The only drawback heretofore has been that the machines have been so expensive that the doctor was compelled to charge from $3 to $5 for each treatment. An advance in application of high-frequency currents has been made through advent of the Violetta high-frequency generator, a modern scientific instrument, which, it is claimed, does all the work of the bulky old-type machines and eliminates the objectionable features thereof. The compact construction of the Violetta equipment, its simplicity of operation, and its safety makes the high-frequency current now possible for private use in the home.

This instrument is self-contained and is inclosed in a polished hard-rubber casing. Its weight is only 1.5 pounds and with its various electrodes is packed in a neat and handy carrying case. The outfit can be used on either direct-current or alternating-current circuits, and takes only a small fraction of an ampere to energize it. By means of a small button the treatment can be easily adjusted to be mild, medium or as strong as desired. The instrument here shown is constructed to meet the requirements not only of the medical profession, but also of the private individual for use in the home.

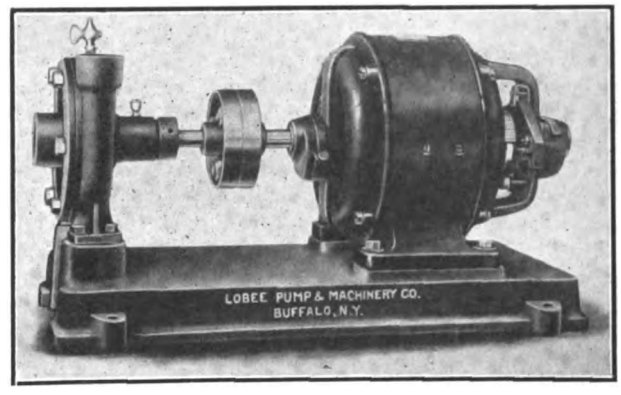
The current set up by the Violetta apparatus produces a minute cellular massage, which is more penetrating and more beneficial than the muscular massage produced by

Violetta High-Frequency Set.

mechanical vibration. It furnishes its supply of electricity in a most pleasant form, as the high-frequency current causes no muscular contraction or unpleasant sensations of any sort. It is really a luxurious electric treatment. The Manufacturer, Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill., furnishes with each instrument a booklet on the subject of high frequency. This booklet takes up its uses in a concise and simple style devoid of technical phrases, so as to be readily understood by the layman. This instrument opens up an entirely new and profitable field for the electrical dealer, jobber and central station.

The Lobee Motor-Driven Centrifugal Pump.

The compact centrifugal pumping outfit shown in the accompanying illustration is manufactured by the Lobee Pump & Machinery Company, Buffalo, N. Y. This is a small iron centrifugal pump fitted with bronze runners to resist the



Electrically Driven Centrifugal Pump.

chemical action of the water. It has 1.5-inch suction inlet and 1-inch discharge outlet. Its capacity is 25 gallons per minute against a head of 35 feet. For driving the pump at this load a Westinghouse one-horsepower motor is used. The pump is also built for heads up to 90 feet, but of course in such cases requires correspondingly larger motors.

This pump is designed for use in buildings where the pressure is low or for the circulation of brine in coolers, and for other purposes of a similar nature.

New Lighting Unit for Gas-Filled Lamps.

The very high efficiency obtained by the use of gas-filled tungsten lamps is bringing about their rapidly increasing use for industrial and commercial interior installations. Since the filaments of these lamps are of quite concentrated construction and of very high intrinsic brilliancy, it is necessary to surround them with effective diffusing shades or globes. At the same time it is desirable to provide over the lamp a reflector which will throw downward into useful directions most of the rays that would otherwise be wasted on the ceiling or upper parts of the walls.

The requirements of such a unit have been incorporated in the design of a new lighting fixture recently placed on the market by the Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago. The general arrangement of this unit is shown in Fig. 1, which is a night view of the outfit taken by its own light, to give an idea of its appearance in actual service. The interior construction is made clear from Fig. 2. It will be

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Fig. 1.—Night View of Denzar Unit.

observed that a metal housing covers the entire socket, which is of mogul size to accommodate large gas-filled lamps. Beneath this housing is a metal holder for the upper glass reflector and the glass diffusing globe. Secured to this holder is a spring support that holds a porcelain deflector, which is immediately above the neck of the lamp and is arranged to reflect light that would be otherwise wasted in the upward direction. The upper or reflecting dome is made of opal glass, which throws the bulk of the light downward, but permits enough light to fall upon the ceiling to remove the gloomy aspect thereof that is noticeable where opaque reflectors are used. The surrounding globe or shade is of special design; it is a continuous glass envelop, the upper concave portion of which is of clear glass, whereas the lower, or convex portion, is finished with a polished enamel coating that conceals the lamp filament and effectively diffuses the brilliant rays. The relative arrangement of the two globes is shown in Fig. 2, which also makes clear the fact that no portion of the filament itself can be seen. In the bottom globe or shade is an opening that serves as an air intake for ventilation. Outlets for the heated air are provided in the upper part of the unit.

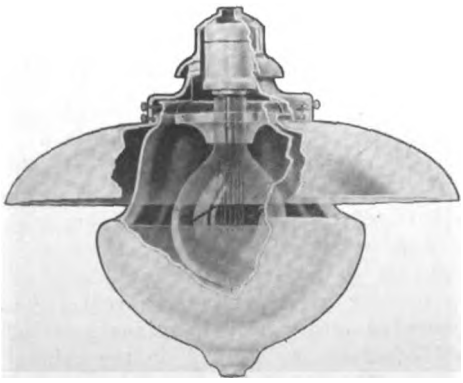


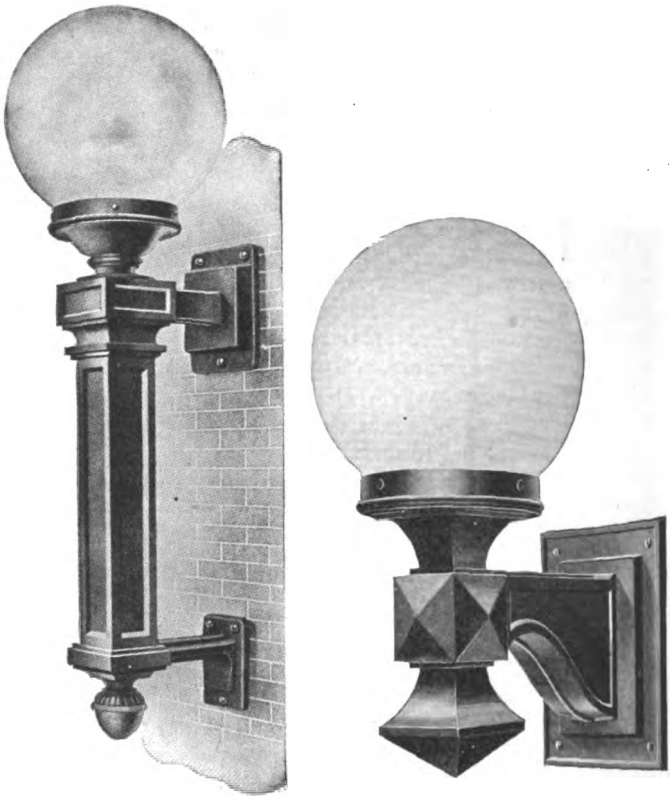
Fig. 2.—Partial Section of Denzar Unit, Showing Construction.

This unit is free from any metal supporting rods and is very easily kept clean. When lighted it has a uniform appearance in all parts. This unit is sold under the trade name "Denzar." It is made in two sizes, of which the larger has a reflector diameter of 20 inches and accommodates either 400 or 500-watt lamps. The smaller unit has a diameter of 17 inches and is arranged for 200 or 300-watt lamps.

Ornamental Brackets for Use at Doorways of Public Buildings.

At the entrances to public buildings, as well as private structures of imposing character, such as schools, hotels, club houses and other institutions in which the architect has been given considerable freedom in design, it has been regarded as being very appropriate to install ornamental lighting brackets of a design to harmonize with the architecture of the building. The design and manufacture of such equipment, as well as other fixtures for outdoor lighting, has for some time been made a specialty by the Herwig Art Shade & Lamp Company, 2140 North Halsted Street, Chicago. The firm manufactures a very large assortment of ornamental brackets of all kinds, pillar and pedestal lamps, lanterns, etc.

In the accompanying illustrations are shown two recent designs of brackets, of which Fig. 1 shows a pattern with an upright portion three inches square. The entire height



Figs. 1 and 2.—Ornamental Brackets for Building Entrances.

of the fixture to the top of the holder is 28 inches. The center of the lamp is brought 7.5 inches from the wall. Another design shown in Fig. 2 brings the center of the lamp 10.5 inches from the wall. The height of this fixture to the top of the globe holder is 10.75 inches. In each of these brackets a six-inch holder is provided for the globe.

Brackets of this and a great many other designs made in durable metal are being used extensively at the entrances to school buildings, telephone exchanges, power houses and substations, fire headquarters and police stations, etc. The design of the brackets is simple and yet heavy and substantial to be in keeping with the architectural design of the building.

This company has recently also secured patent rights for the Ventilite fixture, which is intended for exterior lighting with gas-filled tungsten lamps, and is particularly suitable for the lighting of yards, station platforms, etc.

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Fig. 3.—Ventilite Outdoor Fixture.

This fixture is characterized by its specially good ventilating properties. Three sets of ventilating passages are provided in the upper portion of the fixture, which supply liberal cooling for the lamp itself and for the socket. This fixture is built on the unit principle, permitting interchange of detail parts without the necessity of rewiring the entire outfit. Although not yet on the market for a very long time, it has come into extensive use on account of its merits.

These fixtures are made of durable, weatherproof construction suitable for store and theater fronts, and all other outdoor purposes. They also are excellent for indoor use by industrial plants, etc. They can be suspended by chain, stem or conduit, cable, bracket or gooseneck, as conditions require.

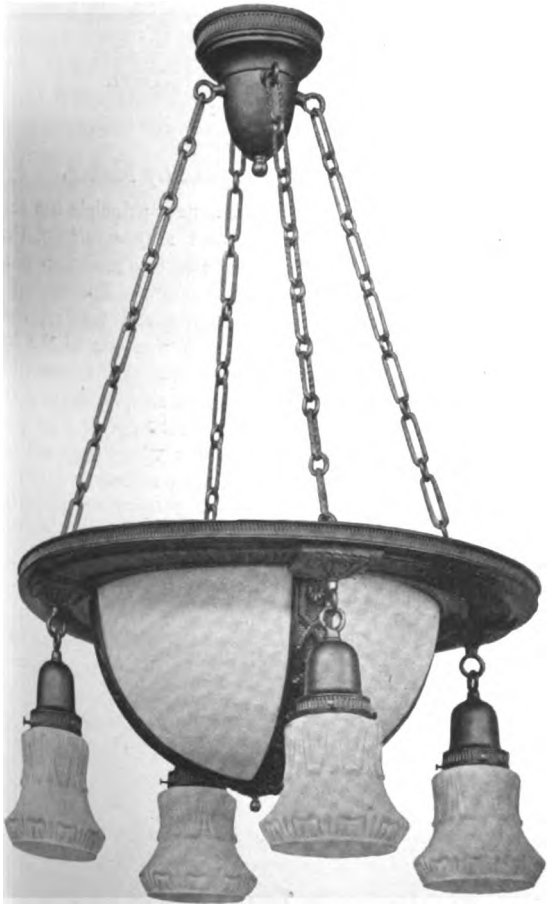
Retherford Electric Fixtures.

There has been noticeable in recent years a marked tendency to avoid stereotyped designs in lighting fixtures and particularly such as suggest former models of gas chandeliers. This has imposed on fixture designers and manufacturers the necessity for continually bringing out new designs. A fixture manufacturer that has been devoting much attention to this is the Retherford Brothers Company, of Muncie, Ind. In a recent catalog issued by this firm there are over 230 plates, each of which averages four or more fixtures, thus making an especially large assortment from which almost any desired selection can be obtained.

It is impossible to give in the limited space available much of an idea of the wide range of these designs. Only a few taken at random are illustrated herewith. The one shown in Fig. 1 is a combined semi-indirect and direct fixture which is made with four pendent lamps and a large central Thorion glass paneled bowl. The spread of this fixture is 26 inches and its length 36 inches. This fixture is particularly suitable for use in dining rooms, replacing the domes that formerly were much in vogue, but which were found unsatisfactory in many respects This fixture is also made without pendent lamps and in another form with upright candle-resembling lamps in place of the pendents.

A semi-indirect fixture with hand-decorated floral bowl, is shown in Fig. 2. This bowl is of very attractive design and is 10 inches in diameter and 7 inches deep. The entire length of the fixture to the bottom of the bowl is 30 inches. The bowl-supporting ring is of attractive finished metal.

A pleasing shower fixture shown in Fig. 3, includes five pendent lamps suspended from an ornamental plate. The diameter of the latter is 16 inches and the total length of the fixture 36 inches. This design avoids the objection felt in the minds of some against shower fixtures with individual long chains. The socket enclosures harmonize with the design of the plate and canopy.



Figs. 1, 2 and 3.—Three Typical Designs of Fixtures Made by the Retherford Brothers Company.

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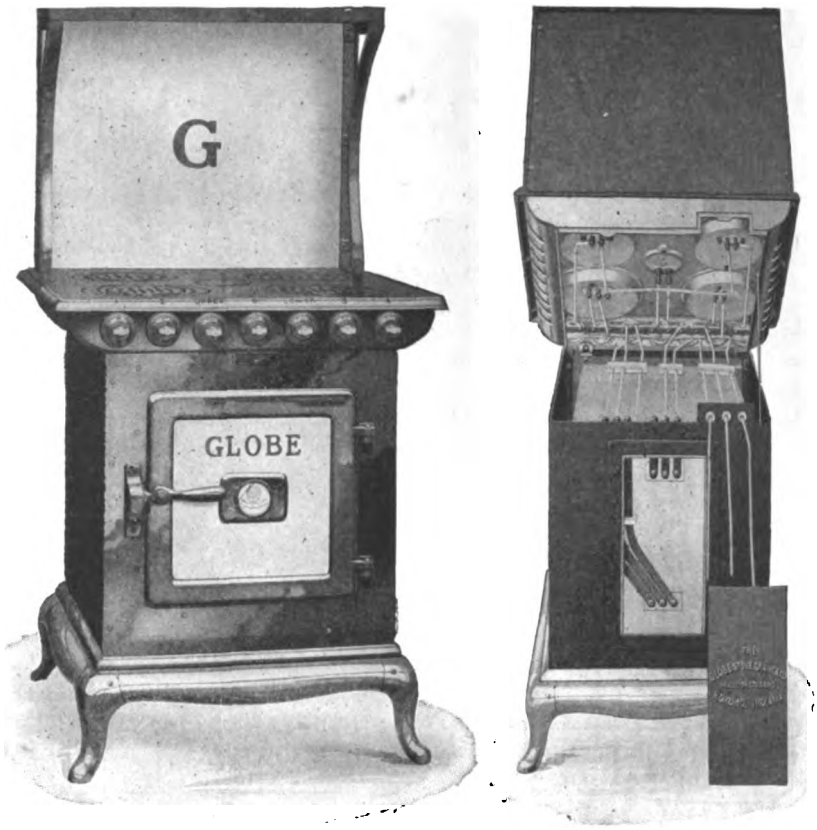
Electric Range with Readily Accessible Wiring.

An electric stove with a completely accessible wiring system has recently been placed on the market by the Globe Stove & Range Company, Kokomo, Ind. Two different models are manufactured, the accompanying cuts showing both front and rear views of the B-1 type.

To insure absolute ease of inspection and repair, the top of this Globe Electric has been hinged just above the oven door. When the top is raised the entire wiring system of the top of the stove is exposed to view. Every unit and terminal may be easily reached. The removal of the metal plate in the back of the range renders accessible the terminals of both the upper and lower oven heating units.

In construction this model is probably one of the most simple and at the same time effective electric stoves on the market today. Although it is built up to the Globe company's high standards of construction, which make the need for repairs very remote, it has been thought desirable to arrange the wiring for instant inspection, so that should at any time such a need arise, due to misuse, no time will be lost in locating and getting at the trouble.



Front and Rear Views of Globe Electric Range, Showing Ready Accessibility of All Wiring.

Ownle Telephone Holders.

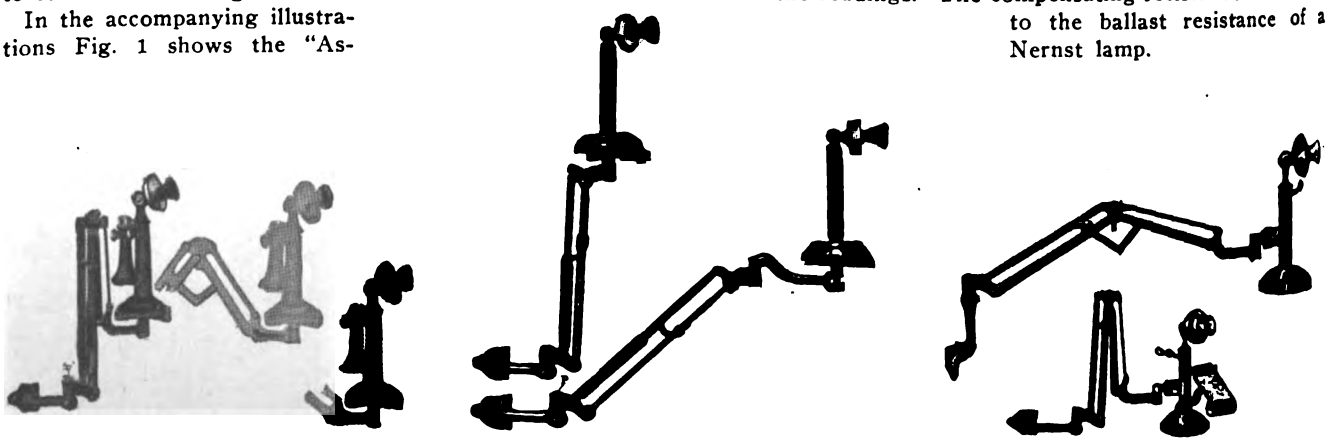
The manufacturing and sales rights of the Ownle line of telephone holders, formerly made by the Ownle Manufacturing Company, of Camden, N. J., and which were invented by William B. Oliver, have been secured by the K. & B. Company, which is moving the plant to its Philadelphia address, 25 North Seventh Street. By adding these types, known as the "As-You-Like-It," "Phonopoise" and "Projecto" holders, to its own formerly very extensive line, the K. & B. Company presents to the trade what is said to be the most comprehensive assortment of telephone holders and accessories on the market.

This line of equipment has been developed as the result of 25 years' experience. The K. & B. Company long ago realized that no one type of telephone holder would meet a universal demand, and in presenting all types, it enables the trade to secure business from every prospect, whereas if only one type were offered, an order would often be lost. The large sale of this material enables the manufacturer to offer an interesting line of discounts to the trade.

In the accompanying illustrations Fig. 1 shows the "As-You-Like-It" holder, which as its name implies, permits the telephone to be put in any desirable position. Three positions are shown, also the path of movement of the instrument. The "Phonopoise," Fig. 2, swings up or down, all the time remaining perfectly balanced. In Fig. 3 the "Projecto" is shown in two positions; it moves the instrument in a horizontal plane. All these holders also swivel at their point of attachment and are made for one or two telephones.

A New Type of Frequency Meter.

A frequency meter based upon a new principle has been put on the market by Siemens and Halske, Berlin, Germany. It utilizes the fact that the effective resistance of an iron wire depends upon the frequency. By sending a definite current through a coil of such wire the difference of potential at its terminals becomes a measure of the frequency, and it may be read upon a voltmeter graduated in cycles per second. The instrument is calibrated for a circuit of definite voltage, and used in series with a compensating resistance, so that fluctuations of voltage will not vitiate the readings. The compensating resistance is similar to the ballast resistance of a Nernst lamp.



Figs. 1, 2 and 3.—Three Types of Ownle Telephone Holders in Various Positions of Adjustability.

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INDUSTRY ACTIVITIES

The Electric Storage Battery Company, Philadelphia, Pa., has issued the fourth number of its house organ, "The Booster."

The Ohio Brass Company's Bulletin for January-February contains two interesting articles, one on gas-weld bonding and another on trolley systems for coal-mine service.

The National Conduit & Cable Company, New York, N. Y., has issued a folder called "Copper Gossip," which gives a brief review of the conditions in the present copper market.

Magnetic Manufacturing Company, Milwaukee, Wis., has issued Bulletin No. 5, which describes its line of electromagnetically operated vibrators for foundry use. Price lists are also included.

The Railway & Industrial Engineering Company, Pittsburgh, Pa., has issued a neat folder which gives illustrations showing a number of installations of Burke horn-gap switching and protective apparatus.

The Kentucky Light & Power Company, Hartford, Ky., has contracted with the Ridgeway Engine Company and the Allis-Chalmers Company for a 125-horsepower engine and generator. The contract calls for installation in 45 days.

The Nashville Machine Company has purchased the business and equipment of the Atlas Machine Company, of Nashville, Tenn., at a reported consideration of $80,000. Both concerns manufacture electric elevators and other electrical equipment.

W. R. Ostrander & Company, New York, N. Y., is distributing a folder describing a wireless battery cabinet recently placed on the market. The company has also prepared a folder describing its line of sun ray reflectors for store-window lighting.

Pass & Seymour, Inc., Solvay, N. Y., manufacturers of electrical wiring devices, have opened a branch office at 158 Purchase Street, Boston, Mass., George L. Hatheway being in charge. The New England and Canadian territory will be handled from the new office.

The Robbins & Myers Company, Springfield, O., has recently acquired the entire top floor of the Bushnell Building Annex, and has equipped it for club rooms for its employees. Every employee of the company is a member of the club, and no dues are charged. The illustrations show the billiard room and the auditorium. The latter is used for the monthly meetings of the club, for which prominent speakers are engaged and music and luncheon provided. The room is also at the disposal of the members for social gatherings, and is used by the 24-piece band maintained by the company. A reading room, provided with all the latest magazines and technical publications and an electrically operated Victrola is a feature of the club rooms.

The Federal Telegraph Company, San Francisco, Cal., has leased from the city of Palo Alto a two-acre strip of land, and it is understood work is to begin immediately on the construction of a $10,000 factory building for the manufacture of electrical equipment.

Westinghouse, Church, Kerr & Company, New York City, has issued a neat folder, showing illustrations of recent concrete work done by the company. One of the illustrations shows a view of the Pennsylvania station, New York City, now in course of construction.

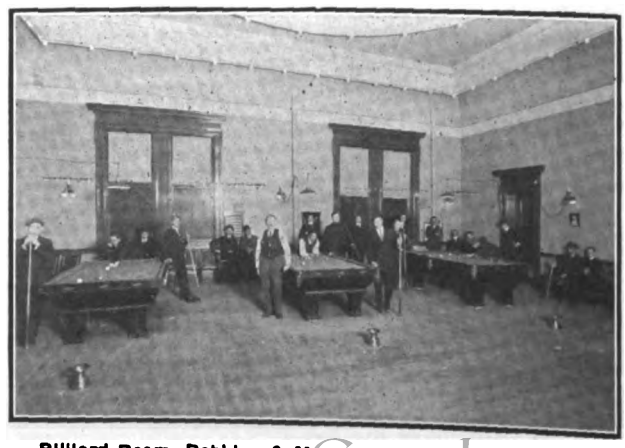
Hotpoint Electric Heating Company, Ontario, Cal., is issued a new discount sheet on its electrical-fitting specialice. These publications are issued monthly and valuable data on methods of merchandising and co-operation between dealers and manufacturers is presented.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has issued a new discount sheet on its electrical fitting specialties and supplies. It gives the discount for the territories east and west of the Mississippi River and also net prices. Discounts are also given for various quantity purchases.

Rome Wire Company, Rome, N. Y., manufacturer of bare and insulated electric wires, has prepared a four-page folder entitled "Copper History," which gives the average price of copper for each month from 1885 to 1916. The company will furnish, free of charge, copies to anyone desiring them.

Westinghouse New York Automobile Service Station.—An instance of the recognition of service in connection with automobile accessories is to be found in the automobile service station maintained by the Westinghouse Electric & Manufacturing Company at 250 West Fifty-fourth Street, New York City, where cars equipped with Westinghouse ignition, lighting and starting apparatus are cared for. The company also maintains in the same city a repair shop and service station for general electrical machinery. Owing to the fact that the electrical and mechanical corps at the automobile station consists of men that have been trained at the Westinghouse works, the service rendered is especially rapid, and a surprisingly small amount of space suffices for

Auditorium, Robbins & Meyers Company Club Rooms.



Billiard Room, Robbins & Meyers Company Club Rooms.

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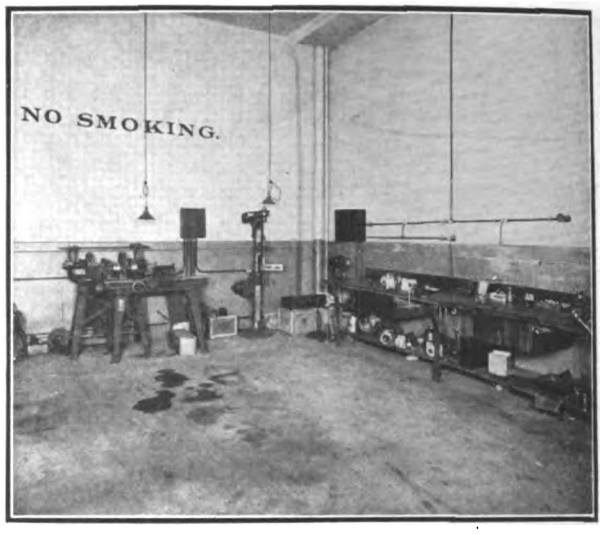
Front View, Westinghouse Automobile Service Station, New York City.



Repair Shop, Westinghouse Automobile Service Station, New York City.

the necessary service for the district, which includes Greater New York and the territory that extends west as far as Syracuse. The shop equipment includes the necessary machine tools, a motor-generator battery charging outfit, an air compressor, and testing tables for determining the characteristics of engines, ignition, lighting and starting apparatus. A complete line of repair parts is on hand at all times, and lighting and starting equipment is for sale for attachment to used cars. A limited amount of high-grade lighting and starting installation is handled for the New York agents of several of the most important cars in the country. The sales-service station is under the management of S. D. Levings, assisted by G. E. Hanken; E. A. Cousins superintends the shop department.

Benjamin Electric Manufacturing Company, Chicago, Ill., has issued a 28-page "Handy Lighting Manual." The booklet gives general information on questions concerning illumination, tables and formulas. Illustrations and price lists of a number of Benjamin reflectors, fittings and fixtures are also included.

The Adapti Manufacturing Company, Cleveland, O., has prepared Bulletin No. 105-A, which is descriptive of the company's 700 line of condulet boxes. This line has been placed on the market to meet the demand for fittings adapted for use with 0.5 to 1-inch conduit in installations where the fittings must be of uniform size and design.

Chicago Mica Company, Valparaiso, Ind., makers of "Micabond" insulation, reports a constantly increasing demand for its products. This company makes quality mica product for electrical use, and numbers among its customers the largest users in the United States. The company is at present working night and day to keep up with the demand, and is making plans to increase its facilities, in order to take care of the increasing business.

Walker Vehicle Company, Chicago, Ill., has added to its 1916 line of Chicago electrics, two new models termed "Edison Models." These are four-passenger, rear-seat drives, of closed-car construction. The new body construction is low hung, presents conventional lines, all angles and sharp corners having given way to curved design. The company is offering to the purchasers of electric cars in Chicago the opportunity of adopting rental battery service by selling to those who desire this service 1916 models at a material reduction from the list price. By this policy the purchaser of the electric car can rent complete battery service at a minimum charge per month and need not stand the investment that is necessary when he purchases a battery with the car. Furthermore, the new rental service which is now offered in Chicago, by several battery concerns, covers the entire maintenance and repair expense incident to the hardest use that batteries can be given. It is believed that this new system will prove one of the greatest economy factors introduced for the user of electric cars, particularly to those desiring longest mileage. Indications are that in the near future this system will be available in all parts of the country to users of electric cars.

The Cutler-Hammer Manufacturing Company.—Arthur Simon, of the engineering department, gave a talk on magnetic solenoid apparatus before the Engineering Society of Milwaukee February 16, in which the characteristics of direct and alternating-current solenoids were discussed. The effect of "coneing the plunger" and peculiarities in design and construction were brought out. The talk was illustrated by numerous charts and samples of solenoid brakes, contactor-type switches and magnetic gear shift for automobiles, manufactured by his company. The talk was concluded with a 1,000-foot moving-picture reel which showed a Cutler-Hammer high duty lifting magnet at work at the plant of the Inland Steel Company, Indiana Harbor, Ind.

The General Electric Company, Schenectady, N. Y., has prepared a very interesting exhibit of its railway appliance products for the National Railway Appliances Association Convention to be held in the Coliseum, Chicago, Ill., March 20-23. The exhibit will include PenDell automatic substation equipment for maintaining a continuous supply of power on a transmission or service line when two or more sources of electric supply are available; a standard-section-type switchboard for electric garages, train lighting and baggage truck charging, and general battery charging purposes; vacuum-tube lightning arresters; a display of enameled resistance units; indoor and outdoor-type air-cooled transformers for low-voltage signal lighting and portable testing instruments.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has received and signed a number of contracts since the New York Automobile Show. Among these are contracts for starting equipment for the Daniels Motor Car Company, Reading, Pa., and the H. A. Lozier Company. Contracts have been signed for distribution of Westinghouse equipment for Ford cars with the Motor Parts Company, in New England, New York and Easton Pa.; Shuler Rubber & Supply Company, New Orleans, La., in Louisiana and Southern Mississippi, and the Richardson Garage, Baltimore, Md., in Northwestern Maryland. S. F. Dupree, Jr., representative of the automobile equipment department, and in charge of Ford equipments, is now on an extended tour of the South and Middle West.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

CABINETS.—C. & P. Electric Works, 92 Hayden Street, Springfield, Mass.

Sheet-metal cabinets for switches, cutouts and panelboards, including type S cabinets for C. & P. barrier cutouts and panels.

Listed January 11, 1916.

CORD CONNECTORS, For Fuseless Attachment Plugs.—The Chelton Electric Company, 314 Armat Street, Philadelphia, Pa.

Catalog Nos. 1000 and 1001.

Listed February 1, 1916.

FITTINGS FOR CONDUIT BOXES, Supports.—Metal Specialties Company, 710 R. A. Long Building, Kansas City, Mo.

Stamped steel supports with holes for mounting screws, adapted to permit the adjusting and securing of outlet boxes at walls or ceilings.

Listed December 17, 1915.

FIXTURES.— Franks Manufacturing Company, 1524 Fourth Avenue, Rock Island, Ill.

This device is an adjustable fixture for mounting on sewing machines. The stem is threaded in a metal ball held by springs in a metal base and is adjustable in any direction within established limits.

Catalog Nos. 90, 94, 96.

Listed February 1, 1916.

FUSELESS ATTACHMENT PLUGS.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Separable attachment plugs, having porcelain or composition bases or caps. Trumbull, 660 watts, 250 volts, catalog No. 792.

Listed February 1, 1916.

FUSELESS ATTACHMENT PLUGS.—Weber Electric Company, Schenectady, N. Y.

Non-separable attachment plugs.

1 ampere, 250 volts; 3 amperes, 125 volts; catalog No. UF120, with switch rosette.

Listed February 3, 1916.

PANELBOARDS.—C. & P. Electric Works, 92 Hayden Street, Springfield, Mass.

Barrier panels made up of 2 and 3-wire main sectional plug-fuse cutout bases and end pieces and solid busbars. The bases have upturned edges to form a barrier around wiring gutter. C. & P. maximum capacity 40 circuits, 125 volts.

Listed January 12, 1916.

PANELBOARDS.—The Flint Electric & Manufacturing Company, 1400-12 Delgany Street, Denver, Colo.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters, and examined at factories and passed by Underwriters' Laboratories, have labels attached to each panelboard.

Listed January 18, 1916.

PICTURE MACHINES AND APPLIANCES.—Thomas A. Edison Inc., Orange, N. J.

Edison super-kinetoscope moving picture machine. Two types; one for hand operation, the other driven by a special motor and equipped with a mechanical speed controller and with an automatic device for stopping motor in event of breakage or of lack of tension on film.

Listed January 12, 1916.

RECEPTACLES, Candelabra and Miniature.—Weber Electric Company, Schenectady, N. Y.

Weber, 75 watts, 125 volts.

Candelabra. Cleat, catalog No. 2050.

Miniature, for decorative lighting systems, Christmas tree lighting outfits and similar purposes. For indoor use only. Cleat, catalog No. 2049.

Listed January 5, 1916.

RECEPTACLES, Standard. — The Adams-Bagnall Company, Cleveland, Ohio.

A. B. Keyless, porcelain shell. Fixture type, 660 watts, 250 volts, catalog No. 234.

Listed January 5, 1916.

ROSETTES, Fuseless.—Pass & Seymour Inc., Solvay, N. Y.

3 amperes, 250 volts, catalog No. 1999.

Listed January 5, 1916.

ROSETTES, Fuseless.—Weber Electric Company, Schenectady, N. Y.

3 amperes, 250 volts.

Cleat, catalog Nos. PG121, PG122, PG131, UG121, UG122, UG131.

Concealed, catalog Nos. PG123, PG124, PG125, PG130, UG123, UG124, UG125, UG130, UG135.

Combined cleat and concealed, catalog Nos. PG134, UG134.

Moulding, catalog Nos. PG126, PG128, PG129, PG132, PG133, UG126, UG128, UG129, UG132, UG133.

Conduit box, catalog Nos. PG127, PG137, PG139, UG127, UG136, UG137, UG138, UG139.

Listed February 2, 1916.

ROTARY CONVERTER.—Northwestern Electric Company, 611-15 West Adams Street, Chicago, Ill.

Martin rotary converter and emergency panel consisting of a rotary converter, transformer and switches whereby arc lamps may be connected either to an A. C. or D. C. circuit. 2.5 to 7.5 kilowatts, 110, 220, or 440 volts, 25, 30, or 60 cycles, A. C.

Standard when installed in a fireproof compartment, separate from moving picture booth.

Listed January 13, 1916.

SOCKETS, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Brass Shell.

Pull, 250 watts, 250 volts, catalog Nos. 171, 172, 173.

Listed January 7, 1916.

SOCKETS, Standard.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal shell.

Pull, 250 watt, 250 volts, catalog No. 4116.

Listed January 13, 1916.

SWITCHES, Fixture.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Single-pole; 3 amperes, 250 volts; 6 amperes, 125 volts; Catalog Nos. 7300, 7302, 7304, 7312.

Listed January 12, 1916.

SWITCHES, Oil Break.—Crocker-Wheeler Company, Ampere, N. J.

Oil switches for starting alternating-current motors of a 2 to 75 horsepower, 110 to 550 volts, type AX. Oil-immersed switches in metal cases, with no-voltage release coils and either with or without overload release devices.

Listed December 23, 1915.

SWITCHES, Pendant Snap.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Single-pole; 3 amperes, 250 volts, 6 amperes, 125 volts, catalog No. 7310.

Listed January 11, 1916.

SWITCHES, Surface Snap. — The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Single-pole, 3 amperes, 250 volts; 6 amperes, 125 volts; catalog No. 11014.

Listed January 19, 1916.

SWITCHES, Surface Snap. — The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Single-pole; 6 amperes, 125 volts, 3 amperes, 250 volts; catalog No. 7320.

Listed January 10, 1916.

TIME RECORDING SYSTEM.—Gisholt Machine Company, Madison, Wis.

A time register system consisting of a master clock with a contact device, the closing of which actuates registers located in various parts of buildings. Periodograph. 3 amperes, 250 volts.

Standard for use when wired in accordance with Class C specifications of National Electrical Code.

Listed January 12, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. HARRY W. M'DOWELL has been elected president of the Lambertville Water Power Company, Lambertville, N. J.

MR. JOSEPH WOODWARD has been appointed city electrical superintendent of Nicholasville, Ky., succeeding MR. EDWARD GLASS. The city operates an electric lighting plant.

MR. CHARLES L. RYDER, JR., and MR. GEORGE F. GRAVES have organized the Ryder & Graves Electrical Company, Plainfield, N. J. The company will engage in electrical engineering work.

MR. JOHN A. BENSEL, former state engineer and surveyor, state of New York, has been appointed to superintend the development of a municipal hydroelectric plant for the city of Oswego, N. Y.

MR. SAMUEL INSULL, president of the Commonwealth Edison Company, Chicago, Ill., addressed a joint meeting of the Electrical League of Cleveland and the Cleveland Advertising Club at the Hotel Statler March 1.

MR. S. G. THOMPSON, formerly in the electric vehicle department of the Public Service Company, Newark, N. J., is now special transportation engineer for the White Motor Vehicle Company, Cleveland, O.

MR. W. E. PLAYTER has recently been appointed superintendent of the Collinsville plant of the Southern Illinois Light & Power Company. Mr. Playter at one time was superintendent of the Mayfield Water & Light Company, Mayfield, Ky.

MR. T. L. MILLER, formerly in the purchasing and car maintenance department of the Toledo (O.) Railways & Light Company, has been appointed manager of the New York office of the Sangamo Electric Company, 50 Church Street.

MR. R. G. HOWE, formerly with the Otis Elevator Company, and MR. F. C. WHITNEY, with the Enterprise Electric Company, have severed their connections with their respective firms and have formed the Elevator Service & Electric Company, in Grand Rapids, Mich.

MR. E. C. JOHNSTON, formerly assistant purchasing agent of the Columbus Railway, Power & Light Company, Columbus, O., has been appointed purchasing agent of the East St. Louis & Suburban Railway, East St. Louis, Ill., and will have charge of all storerooms.

MR. ANDREW F. POPE, of Hull, Mass., has been appointed manager of the Hull municipal electric light plant, and succeeds MR. HARRY B. WILLARD, who has had charge of the plant almost from the time it started, about 22 years ago. The change in management took place March 1.

MR. N. G. NICOLL, formerly in charge of the specialty department of the Cutler-Hammer Manufacturing Company in eastern territory, has resigned to become manager of the Rubes Electric Devices, Inc., 220 Taffe Place, Brooklyn, N. Y. The latter company has recently been incorporated.

MR. ELMER A. SPERRY, president of the New York Electrical Society and a member of the Naval Consulting Board, spoke before the Society February 25 on "The Principles and Operation of the Gyroscope." The application of the gyroscope as a stabilizer for water and air craft was illustrated.

DR. EDWARD P. HYDE, director of the Nela Research Laboratory, National Lamp Works of the General Electric Company, Cleveland, O., is delivering a series of lectures on problems concerning illumination before the engineering faculties and students of a number of universities in the Middle West. Dr. Hyde is prominent in the world of science, being president of the United States National Committee of the International Committee on Illumination, vice-president of the International Commission on Illumination, past president of the Illuminating Engineering Society, and a member of the American Institute of Electrical Engineers, American Physical Society, American Electrochemical Society, Illuminating Engineering Society, Franklin Institute and the American Gas Institute.

Edward P. Hyde.

MR. M. B. BENSON, who was elected president of the newly organized Lake Superior Electrical Company, Superior, Wis., is the inventor of a flashlight system of signals for use on vessels, to be manufactured by the company. The new concern will do electrical manufacturing and contracting, making a specialty of marine and dock installations of electrical apparatus.

MR. GEORGE S. QUINAN has been appointed engineer of the Puget Sound Traction, Light & Power Company, Seattle division, in charge of the engineering department. Under the head of this new department will be grouped all engineering except that done by the Stone & Webster Engineering Corporation, and such minor engineering as may be found impracticable to separate from the operation.

MR. ERNEST S. COWIE, president and treasurer of the E. S. Cowie Electric Company, former president of the Missouri Association of Electrical Contractors, has been elected president of the Kansas City Automobile Tire & Accessory Dealers' Association. The new secretary, MR. A. J. BURNS, is also an electrical contractor. The latter is secretary of the Missouri State and of the Kansas City Electrical Contractors' Associations.

MR. EDWARD J. CHENEY, electrical engineer of the Public Service Commission, Second District of New York, spoke on "The Regulation of Public Utilities" at a meeting of the Schenectady (N. Y.) Section, A. I. E. E., February 23. Mr. Cheney told why public utility corporations are regulated and the problems involved, and described the activities of public service commissions in seeking to secure justice for the public and utility corporations.

MR. MAX LOEWENTHAL, a well known consulting and manufacturing electrical engineer who has for several years made his headquarters upon the Pacific Coast, has become connected with the Dohrmann Commercial Company, of New York and San Francisco, in an advisory capacity as an electrical specialist. The company operates a number of merchandising establishments and Mr. Loewenthal's work will be to establish electrical departments where they are not now in existence, and to reorganize those already operating.

MR. W. C. WING, Chicago sales manager of the Franklin Electric Manufacturing Company, of Hartford, Conn., is recovering from the almost fatal accident which he suffered at Barrington, Ill., on February 12. Mr. Wing, in stepping from the station wagon, was thrown between the wheels and badly injured. After a splendid fight his relatives and the physicians were able to bring him back to consciousness, and he is now resting quietly at the home of W. R. Topliff at Barrington, where it is expected it will be necessary for him to remain for several months.

OBITUARY.

MR. JOHN M. ESHLEMAN, lieutenant-governor of California, and formerly president of the Railroad Commission of that state, died at Indio, Cal., on February 28, in his fortieth year.

MR. GEORGE E. MILLER, general superintendent of the Lehigh Valley Transit Company, died in Allentown, Pa., February 22, aged 49 years. Prior to accepting the Lehigh Valley company superintendency Mr. Miller was superintendent of the Union Electric Company, Dubuque, Iowa.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

Advance Information Gathered From Every Section of the Country Showing the Extent of Spring Construction Work to Be Undertaken by Electric Light and Power, Electric Railway, Telephone and Telegraph and Industrial Corporations of Every Description

NORTH ATLANTIC STATES.

PORTLAND, ME.—The Cumberland County Power & Light Company will develop a water-power site owned by the company on the Saco River at Hiram, Me. A 3,000-kilowatt unit will be installed, together with the necessary power-plant equipment, and 20 miles of transmission line will be erected. The total cost will be about $300,000. A. H. Ford is vice-president and general manager of the company.

RUMFORD, ME.—The Rumford Falls Power Company will begin the construction of a new concrete dam early in the season. The new dam will be located several hundred feet nearer the falls than the present one. A new power station with about four times the generating capacity of the present station is being planned.

BELMONT, MASS.—The municipal electric light department, E. P. Taylor, manager, will make an expenditure of about $5,000 during the year for extensions to its distributing system.

BOSTON, MASS.—The Edison Electric Illuminating Company, C. L. Edgar, president, besides making the general extensions necessary to the growth of business, will, during 1916, build one or two substations and increase its transmission lines to some extent.

BOSTON, MASS.—The Eastern Massachusetts Electric Company was recently incorporated, with a capital stock of $250,000, by Charles H. Tenney, president, D. Edgar Manson, vice-president, Elihu A. Bradley, treasurer, and these with Howard T. Sands, directors. It is proposed to build a steel tower transmission line to connect the plants of three operating companies under Charles H. Tenney & Company's management, viz., the Suburban Gas & Electric Company, Revere, Malden Electric Company and Salem Electric Lighting Company. These plants are at a distance of about 12 miles between the farthest stations. By tying them together a more efficient use of the co-ordinated properties would result. Large increases in the capacity of the generating station at tidewater in Salem are also projected. A hearing was recently held by the Gas & Electric Light Commission on the proposed stock issue.

BROCKTON, MASS.—The Edison Electric Illuminating Company, A. F. Nelson, manager, will make arrangements to increase the capacity of its main power plant. An addition to the building will be erected, a 10,000-kilowatt turbogenerator with necessary auxiliaries installed, the bus construction rearranged and additional boiler equipment will be installed. It is planned to start work in a few weeks.

CONCORD, MASS.—The municipal light department has been requested to submit a proposal for furnishing electric power to the Strathmore Worsted Mills. About 500 horsepower would be required.

HOPKINTON, MASS.—Electric pumps will be installed at the municipal pumping plant.

LEE, MASS.—The Lee Electric Light Company is extending its transmission lines to a point about a mile beyond East Lee.

LONGMEADOW, MASS.—The town lighting committee is considering the installation of an electric lighting system in main streets here.

PALMER, MASS.—The Central Massachusetts Electric Company has recently secured a franchise for the town of Hampden and is making arrangements to extend its lines to that town. The company contemplates furnishing service for at least 50 street lamps and about 70 house-lighting customers and expects to begin service about June 1.

PEABODY, MASS.—This town will soon consider the question of increasing its municipal electric light plant. Increasing power load makes it necessary to add materially to its capacity, and it is proposed to install an 800-kilowatt exhaust steam turbine, or two 500-kilowatt units, with cooling tower. The present plant, with a rated capacity of 800 kilowatts, was recently subjected to a peak load of 1,150 kilowatts. Purchased power from a neighboring company may be considered, as an alternative to increasing the steam plant. A tie line with the plant of the Salem Electric Lighting Company is maintained for mutual benefit, and has been found advantageous on several occasions. The manager of the Peabody plant is Warren D. King.

PITTSFIELD, MASS.—The Pittsfield Electric Company is considering the extension of its service to Richmond, a distance of nine miles.

SPRINGFIELD, MASS.—Plans are being prepared by McClintock & Craig, architects, of this city, for an extension to the United Electric Light Company's power plant here. The plant will be designed to ultimately replace the old one, and will contain the most modern equipment, including turbogenerator, with jet condenser, coal and ash handling apparatus and auxiliaries.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company, Arthur B. Lyle, general manager, contemplates the installation during 1916 of a 45,000-kilowatt maximum-rated turbine with accessories, entailing an expediture of approximately $400,000.

WOONSOCKET, R. I.—The Blackstone Valley Gas & Electric Company, which is under Stone & Webster management, A. F. Townsend, local manager, contemplates the erection of a 13,000-volt transmission line and will build an addition to its power plant for the housing of high-tension transformers and switchboard equipment. Changes in the switchboard equipment of the present station will be necessary. The total cost of the new work will be approximately $60,000.

BRIDGEPORT, CONN.—The United Illuminating Company, of which C. A. Paul is manager, is arranging to make a 30-per-cent increase in its boiler and turbine room capacity. Two batteries of 1,200-horsepower boilers and a 7,500-kilowatt turbine will be installed. The material for these additions has already been purchased.

NEW BRITAIN, CONN.—The United Electric Light & Power Company, of which George F. Atwater is superintendent, is building about five miles of 11,000-volt transmission line from the Housatonic Power Company's power plant here to the Brick yards in Berlin. The line is being built for the purpose of supplying all large power customers in New Britain, and a transformer station will be built to step-down the voltage to 2,300 volts for the use of smaller power customers. From the substation of the Housatonic Power Company to the United Electric Light & Water Company's substation the 11,000-volt circuits will be in duplicate.

NEW HAVEN, CONN.—The Housatonic Power Company of New Haven has filed a petition with the Public Utilities Commission for approval of the method of construction of a power transmission line from its powerhouse at Bull's Bridge, through the towns of New Milford and Sherman to the New York state line.

AUBURN, N. Y.—The Empire Gas & Electric Company, which serves the towns of Auburn, Geneva, Lyons, Clyde, Newark, Palmyra, Weedsport, Phelps, Waterloo and Seneca, will undertake the following construction work this spring: Rebuild its 500-kilowatt hydroelectric power plant at Lyons, installing new water wheels and generating equipment; build a 1,200-kilowatt outdoor substation at Geneva; substitute motor-driven centrifugal pumps for the present reciprocating boiler feed pumps in the generating stations at Auburn and Geneva; install feeder regulators in its various generating stations and substations, install additional alternating protective devices throughout the terriory served. H. L. Coleman is general manager of the company and L. C. Reynolds is general superintendent and engineer.

GLEN FALLS, N. Y.—The Adirondack Electric Power Corporation, contemplates the rehabilitation of its properties at the following points: At Utica, N. Y., where the company has a 6,000-kilowatt steam turbine station, 8 Franklin boilers may be replaced at a cost of about $150,000. At Ballston Spa, the company will build a new substation which will furnish service to the town of Ballston and will be used as a switching station on the company's 30,000-volt transmission system. The new station will be built for 60,000 volts and its cost will be about $50,000. The construction work at Utica and Ballston Spa will be done by the Stone & Webster Engineering Corporation, Boston, Mass. For the hydroelectric plant at Spier Falls, the Adirondack Company will be in the market for one or two 6,000-horsepower water wheels. The minimum expenditure for the new work at this station is estimated at $50,000. W. A. Butterick is manager of the company.

MORAVIA, N. Y.—The Moravia Electric Light, Heat & Power Company contemplates the installation of an 80-horsepower oil engine and generator as an auxiliary to its water power plant. L. C. Reynolds of Auburn, N. Y., is consulting engineer for the company.

NEW YORK, N. Y.—The United Electric Light & Power Company, of which Frank W. Smith is vice-president, does not contemplate any construction work other than ordinary installations on consumers' premises during 1916, with the possible exception of the installation of additional incoming and outgoing feeders at its Forty-fifth Street substation.

NIAGARA FALLS, N. Y.—The construction of a new power transmission line by the Niagara, Lockport & Ontario Power Company to supply the Union Carbide Company of this city with 20,000 additional horsepower was begun recently. The length of the line will be about eight miles.

ONEONTA, N. Y.—The Oneonta Light & Power Company has made application to the Public Service Commission to extend its distributing system to Oneonta Junction and to a section in West Oneonta. Application was also made for authority to issue $65,000 in capital stock.

OSWEGO, N. Y.—The Municipal Water Service Commission, John D. Higgins, chairman, is making arrangements for the construction of a municipal power plant.

OTSEGO, N. Y.—The Town Board has voted in favor of the installation of a lighting system, which will be made by the Colliers Heat & Lighting Company.

ALTOONA, PA.—The Penn Central Light & Power Company, which is under the management of Day & Zimmerman, Philadelphia, Pa., E. B. Greene, general superintendent, expects to do the following construction work during 1916: Pole line extensions in various municipalities, about $17,000; 6,600-volt transmission line and substation equipment in Cambria County, about $31,000; 6,600-volt transmis-

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sion line and substation equipment in Huntingdon County, about $39,000; 6,600-volt transmission line and substation equipment in Mifflin County, about $43,000; 45,000-volt transmission line and substation equipment in Cambria County, about $32,000; 45,000-volt transmission line and substation equipment in Mifflin County, about $7,000; 45,000-volt transmission line and substation equipment in Blair County, about $33,000; additional generating equipment in its Williamsburg and Warrior power plants about $300,000. The new generating equipment in the power plants will consist of turbogenerators, boilers and auxiliaries.

ERIE, PA.—City Engineer Briggs is preparing an estimate of the cost of extending the low and high-tension conduit systems in State Street.

HARRISBURG, PA.—Four electric service companies were given state charters recently. Three of them are to operate in Cambria County and will have offices in Portage. The fourth will supply power to Upper Alsace Township, Berks County. The Cambria County companies each have a capital of $5,000. The incorporators are W. H. Trexell, High Sparks; J. Pearce, R. Pearce and M. Pearce, Portage. The companies are the Cassandra Light Company, Portage Light & Power Company and Portage Township Light & Power Company. The fourth company is incorporated by S. D. Warriner, R. H. Wilbur and H. F. Baker, Philadelphia.

HOLTWOOD, PA.—The Pennsylvania Water & Power Company is considering plans for extensions to its hydroelectric plant here during 1916.

PITTSBURGH, PA.—The Duquesne Light Company will install during the summer two units at its Brunots Island generating station, which now has a capacity of about 100,000 horsepower. Additional equipment will be installed during the year at this plant.

TITUSVILLE, PA.—The installation of an ornamental lighting system on business streets is being considered here. If the merchants will purchase the standards the city will maintain the lamps. F. C. Johnson is superintendent of the municipal plant.

BORDENTOWN, N. J.—The Board of City Commissioners is considering the installation of new tungsten street lamps.

BUTLER, N. J.—The Fire Department, Samuel K. Owen, chief, is negotiating for the installation of an electric fire alarm system.

DOVER, N. J.—Electric light and power properties of the Eastern Pennsylvania Power Company at Dover, Bernardsville, Far Hills, Wharton and vicinity, have been acquired by the New Jersey Power & Light Company, recently organized. The new company is planning for the erection of a large generating station at Dover, to cost about $200,000. W. S. Barstow is president of the New Jersey company.

FREEHOLD, N. J.—The Monmouth Lighting Company has requested a franchise at Freehold and vicinity. The company is planning improvements and extensions to its system.

HACKETTSTOWN, N. J.—A hydroelectric power plant on Pequest Creek is planned by George Z. Williams, Independence Township, on a site recently acquired.

HIGHTSTOWN, N. J.—Borough officials are investigating the question of a municipal electric lighting plant.

NEWARK, N. J.—The Board of Public Utility Commissioners has granted permission to the Public Service Railway Company to issue $7,500,000 in stock for construction work.

PERTH AMBOY, N. J.—The Public Service Company will install an underground conduit system in the downtown district, to cost about $30,000.

PERTH AMBOY, N. J.—The Raritan Copper Company has prepared plans for an addition to its power plant.

TRENTON, N. J.—The Board of City Commissioners will install a new street-lighting system in Stacy Park, to cost about $15,000.

WILMINGTON, DEL.—The Wilmington City Electric Company is seeking permission to erect a transmission line in the vicinity of Brandywine.

SOUTH ATLANTIC STATES.

BALTIMORE, MD.—Chief Engineer Hendrick has submitted to Mayor Preston plans and specifications for the proposed hydroelectric plant in the Jones Falls Valley to supply energy in that part of the city.

WASHINGTON, D. C.—The Potomac Electric Power Company, of which L. E. Sinclair is general superintendent, contemplates making extensions to its Bennings power plant, in which will be installed one 15,000-kilowatt, 25-cycle, 6,600-volt Curtis steam turbine. In connection with this unit, there will be installed in 30,000-foot Worthington condenser with necessary auxiliaries. Work will be under the supervision of the J. G. White Engineering Corporation of New York City.

RICHMOND, VA.—The Virginia Railway & Power Company has contracted for the addition of a 12,500-kilowatt unit for its Reeves Avenue station at Norfolk, Va., to be installed during the coming summer. The company will make the necessary extensions to its transmission lines and distribution system for taking care of the anticipated growth of business. C. B. Buchanan is general manager of the company.

STUART, VA.—W. H. Clark has been granted a franchise to furnish electric service here. He is planning a hydroelectric development on Mayo River.

BLUEFIELD, W. VA.—The Appalachian Power Company, besides making the necessary extensions to its transmission and distribution lines to take care of new customers during the year, will build about 20 miles of 13,200-volt transmission line and may possibly install an 88,000-volt step-down substation during the latter part of the year. Herbert Markle is general manager of the company.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company contemplates the erection during 1916 of a $60,000 terminal station at Clarksburg, to be used for passenger and express stations and general offices. The company will build three miles of railroad from O'Neill to Wolf Summit and three-quarters of a mile connecting its Wilsonburg line to the Fairmont and Clarksburg interurban lines. Smith Hood is vice-president of the company.

HUNTINGTON, W. VA.—The consolidated Light, Heat & Power Company expects to build a second transmission line from Kenova, W. Va., to Ashland, Ky. The line will be about 9 miles long and will cost about $20,000. W. R. Power is superintendent of the lighting and commercial departments.

WHEELING, W. VA.—The Wheeling Electric Company has started on the construction of a new power house designed to ultimately contain two 30,000 and four 35,000-kilowatt generators which will be installed during the coming summer, the remaining units to be purchased as they are required. Sargent & Lundy, consulting engineers, Chicago, Ill., are doing the engineering work for this plant. The company is now working on a steel-tower high-tension transmission line to connect the new plant with the city of Canton, O., a distance of about 60 miles. The proposed voltage of the new line is 75,000 volts. J. B. Garden is vice-president of the company.

KERNERSVILLE, N. C.—A municipal electric lighting plant is being considered by citizens here.

DURHAM, S. C.—The Durham Traction Company probably will install a 300-kilowatt rotary converter and additional switchboard equipment.

FLORENCE, S. C.—The Carolina Central Electric Company expects to build 12 miles of 13,200-volt transmission line during the next 60 days. The line will be of wood pole construction. F. G. Godfry is general superintendent of the company.

LATTA, S. C.—A municipal electric lighting plant will be built here during the summer. T. W. Berry is one of the commissioners having charge of the plans.

ACWORTH, GA.—This city has voted to issue bonds for enlarging and improving the municipal lighting system. F. G. Hall is chairman of the Water and Light Commission.

ATLANTA, GA.—The electric light committee of the City Council, of which W. H. Johnson is chairman, has recommended the installation of a number of new arc lamps and incandescent street lamps.

BRUNSWICK, GA.—Improvements to the municipal electric lighting plant are being planned. A motor-driven compressor and a motor-driven or turbine-driven centrifugal pump will be installed. E. R. Adams is superintendent of the plant.

COMMERCE, GA.—The establishment of electric lighting plant is under consideration by Mayor Hood and other city officials.

M'RAE, GA.—The city will hold an election March 20 to vote on the question of issuing bonds for a new power plant.

STATESBORO, GA.—The city will improve the municipal electric lighting plant here. A 250-horsepower boiler with stokers will be installed. Additional lightning arresters will also be purchased. Dan R. Gould is superintendent of the plant.

MIAMI, FLA.—The Miami Traction Company is making plans for large extensions to its railway and interurban system.

ST. PETERSBURG, FLA.—The Peninsular Engineering & Electric Company is planning to install an electric lighting plant at Melbourne, Fla.

NORTH CENTRAL STATES.

AKRON, O.—The Northern Ohio Traction & Light Company intends making the following improvements during the year: Installation of two 20,000-kilowatt turbogenerators in its main generating station; one 1,500-kilowatt rotary converter and transforming equipment in its High Street substation, and equipping a new light, power and railway substation in East Akron. Some of the equipment for these installations has been purchased. The company at the present time is building 14 miles of new transmission line, part of which has been completed. Other sections of the transmission system will be rebuilt during the year. J. G. Swain is general superintendent of power and shops.

ALLIANCE, O.—The Alliance Gas & Power Company, W. J. Rose, general manager, has recently closed contracts for a 2,000-kilowatt turbogenerator, condensing equipment and cooling tower, at a cost of about $60,000. Installation will be made in 90 days.

CINCINNATI, O.—The Union Gas & Electric Company, of which W. W. Freeman is president, expects to begin work in the near future on the construction of a new generating plant which will be the property of the Cincinnati Gas & Electric Company, but will be constructed under the supervision of the Union Company as lessee. The plans provide for an ultimate capacity of 150,000 kilowatts and the initial installation of turbines and auxiliaries will have a capacity of 60,000 kilowatts. The initial expenditure will be approximately $4,000,000. No contracts have as yet been awarded for any of the work.

CLEVELAND, O.—The Cleveland & Sharon Railway Company of Cleveland will build an electric line from Middlefield, in Geauga County, to Lockwood, Trumbull County. Representatives of the company appeared before the State Utilities Commissi[illegible] [illegible]umbus and asked authority to issue stock and securities. It is proposed to issue $195,000 bonds and $75,000 stock. The estimated cost of the road is $261,000. C. A. Black is president and C. H. Felton, secretary of the company.

COLUMBUS, O.—The municipal light plant will be enlarged and the Board of Local Improvements will make recommendations for the necessary extensions.

LOCKLAND, O.—A delegation appeared before the City Council of Lockland, which is a suburb of Cincinnati, and urged that measures be taken to grant a new lighting franchise to either the International Agricultural Company or the Union Gas & Electric Company.

COLUMBUS, IND.—The City Council has voted to build an electric lighting plant at a cost of $20,000.

FT. WAYNE, IND.—It is reported that officials of the Fort Wayne plant of the General Electric Company are planning to erect four new buildings during the coming summer.

FT. WAYNE, IND.—The Ft. Wayne & Northern Indiana Traction Company has filed with the Board of Public Works, a proposal agreeing to take over the lighting of the city and guaranteeing a saving of $395,000 over present prices on a ten-year contract.

INDIANAPOLIS, IND.—The Indianapolis Light & Heat Company, Thomas A. Wynne, vice-president, has begun the construction of a new power plant that will ultimately cost about $4,000,000. The new plant will be on the site of the old plant. A 5,000-kilowatt turbogenerator, which will use steam at 250 pounds and 200 degrees superheat, will be installed in July. This unit and some of the equipment for the new plant has been purchased.

WABASH, IND.—In order to give citizens of this city the best possible lighting system obtainable, members of the City Council, in company with a representative of the Wabash Water & Light Company, will make a trip to several cities in the eastern part of the state which are lighted with the same system that has been proposed for this city.

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WASHINGTON, IND.—The Electric Works, of which C. E. Dove is manager, will build a short transmission line during the summer, the cost to be approximately $500.

WESTPORT, IND.—The citizens of Westport will hold an election March 21 to decide whether they wish a municipally owned electric light plant.

ALTON, ILL.—The Council will advertise for bids for the purchase of a franchise to furnish city lighting.

AURORA, ILL.—The police committee of the City Council will ask for permission to advertise for bids for 50 new police alarm boxes.

AURORA, ILL.—The Aurora, Elgin & Chicago Railroad Company will install a 60-cycle frequency set at its Batavia power plant and will make a number of track extensions during 1916. L. B. Judson is district manager of the company.

BELLEVILLE, ILL.—Plans for construction of an ornamental lighting system around the public square are before the Board of Local Improvements. The estimated cost is about $81,000.

CANTON, ILL.—The Canton Gas & Electric Company has recently placed orders for one 400-horsepower boiler, coal and ash-handling system, overhead coal bunkers and conveyor with traveling weigh-hopper, all of which will be installed within the next few months. During 1916 the company contemplates the installation of a 2,000-kilowatt turbogenerator, a large cooling tower, coal-unloading apparatus and an artificial ice plant.

CHICAGO, ILL.—The Chicago & Northwestern Railroad has authorized the construction of 54 miles of automatic block signals between Wiscona and Fond du Lac, Wis. J. A. Peabody, superintendent of signal systems, Chicago, Ill., is drawing up the plans.

DANVILLE, ILL.—Bonds in the sum of $20,000 have been authorized to acquire a municipal light plant.

GALESBURG, ILL.—The Galesburg Railway Light & Power Company, of which R. T. Carley is general superintendent, will install during 1916 two 500-horsepower boilers, coal handling equipment and other boiler room apparatus. An 800-kilowatt direct-current railway unit will also be installed.

GIBSON, ILL.—The contract will soon be let for cluster lights for Sangamon Avenue.

HILLSBORO, ILL.—The Southern Illinois Light & Power Company, J. J. Frey, president, intends to build a three-phase transmission line from Greenville to Pocahontas, Ill., and wire the latter city, calling for an expenditure of about $27,000. At the power plant at Collinsville, Ill., which has a capacity of 1,500-kilowatts, the company expects to install a cooling tower of 2,000-kilowatt capacity and coal and ash handling apparatus. The total expenditure at this plant will be about $125,000. The company has recently incorporated the Saline Electric Company, in the southern part of the state, and will build a transmission line from Eldorado to Ridgeway, Ill., and wire the latter city, the total expenditure to be about $40,000.

PEORIA, ILL.—The Illinois Traction System, H. E. Chubbuck, vice-president, will extend the boiler house facilities at Champaign, installing two 500-horsepower boilers, conveyor system for coal and ash, a bunker system for the new boilers and 1,500-kilowatt turbogenerator with the necessary auxiliary equipment. At Danville, the company contemplates the installation of a 4,000-kilowatt turbogenerator, an extension of the engine room and of the power plant building, installing complete condensing equipment for the generator, including circulating pump, pipe lines, etc. At La Salle, it is proposed to rebuild the boiler room, install two batteries of 500-horsepower boilers, install a 2,750 or 4,000-kilowatt turbogenerator with the necessary condensing and circulating equipment, switchboard and electrical equipment to serve same, together with two installations of 2,000-kilowatt transformers designed for 33,000-volt transmission.

ROMEO, ILL.—The Public Service Company of Joliet may install a lighting system here.

RUSHVILLE, ILL.—The Council has granted a franchise to the Central Illinois Public Service Company. The company will install a lighting system here, and will furnish power for commercial purposes.

WARREN, ILL.—The Warren Light & Power Company, G. W. Scheidecker, president, is contemplating the installation of additional generating equipment. The company expects to extend its line to Gratiot and South Wayne, Wis.

DATES AHEAD.

New England Section, National Electric Light Association. Question-Box convention, Boston, Mass., March 7 and 8. Secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Building, Milwaukee, Wis.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

MORENCI, MICH.—The question of issuing $30,000 electric light bonds will be submitted to a vote on March 13.

ZEELAND, MICH. — The Consumers Power Company will rebuild the system in this city and is planning the extension of the service from the city to the Highland Golf Club on West Leonard road.

DENMARK, WIS.—The Denmark Light & Power Company has been incorporated with a capital of $15,000 by J. F. Eng, H. A. Dumdey and others.

LA CROSSE, WIS.—The State Railroad Commission recently authorized the Wisconsin-Minnesota Light & Power Company of La Crosse to issue $150,000 in bonds to pay for improvements and extensions in its property in this state.

MADISON, WIS.—The Janesville & Madison Traction Company, organized to build an interurban railroad from Janesville to Portage, by way of Madison, recently notified the State Railroad Commission it had secured financial backing to enable it to construct its road and that it would ask in a short time for authority to issue securities for the money to be used in building the line. J. E. Jones of Portage is promoting the new road.

MANITOWOC, WIS.—The Public Service Commission has authorized the Oslo Power & Light Company of Manitowoc to issue $5,000 additional stock, the money to be used in improving its plant.

NEOSHO, WIS.—The Neosho Electric Company has been incorporated with a capital of $6,000 by E. J. Labuwi, Mayme Labuwi and others. The company will operate an electric lighting plant in this city.

OCONTO, WIS.—Arrangements are nearly completed for the purchase of the Oconto Electric Company's equipment by the People's Land & Manufacturing Company and the consolidation of the two plants. T. A. Pamperin, of the Peoples Land & Manufacturing Company, states that as soon as the arrangements are all completed, his company will begin the work of improving its plant and equipment. Some of the machinery now used by the Oconto Electric Company will be moved to the People's Land & Manufacturing Company's auxiliary plant, and new boilers and other machinery will be installed.

RACINE, WIS.—The indeterminate electric lighting franchise offered to the city by the Milwaukee Electric Railway & Light Company in place of the present franchise has been accepted by the City Council.

WAUKESHA, WIS.—The Waukesha Gas & Electric Company will build a two-story fireproof office building costing about $25,000. Contract for the building was awarded to Dwinnell & Laughlin of that city and work has already been started on the building. H. B. Atkin is manager of the company.

FERGUS FALLS, MINN.—The Otter Tail Power Company, C. B. Ridder, manager, is considering plans to extend its lines to Underwood, Battle Lake, Deer Creek and intervening points.

LAKE PARK, MINN.—The electric light plant here was damaged by fire recently. Repairs will be made immediately.

MINNEAPOLIS, MINN.—The Minneapolis General Electric Company will erect an addition to its present building on Fifth Street. It will cover a frontage of 22 feet, the company having purchased the property recently. General Manager R. F. Pack stated that no plans have been prepared and that the company may build a two-story addition at first.

PLUMMER, MINN.—Bids will soon be received for the purchase of electric equipment for the electric light plant here.

PRESTON, MINN.—It is reported that the Root River Power & Light Company is planning the construction of a $25,000 auxiliary plant here.

ST. PAUL, MINN.—The St. Paul Gas Light Company, of which Paul Doty is vice-president and general manager, contemplates making the following electric plant additions during 1916: Service warehouse and garage to cost about $130,000; line and pole extensions to cost about $100,000; extensions to the underground system to cost about $40,000, new electric meters to cost about $30,000. These expenditures are more in the nature of the regular construction work done by the company each year, though they include some special work for 1916.

WADENA, MINN.—The citizens have decided to install a white way system on principal business streets here.

ALEXANDER, IOWA.—The Iowa Falls Electric Company has been granted a franchise to operate in this city and Coulter, Iowa.

DUBUQUE, IOWA.—The Union Electric Company will construct a number of short transmission lines and will make the necessary extensions of primary circuits and increases in the number of transformers, meters, etc., to take care of the growth of business during 1916. E. M. Walker is general manager of the company.

CAMBRIDGE, IOWA.—W. A. Curtis, owner of the local lighting plant, is planning to make transmission-line extensions.

IMOGENE, IOWA—The question of issuing bonds for the construction of a municipal electric light plant will be submitted to vote of the people.

JEFFERSON, IOWA — The Jefferson Electric Company, Percy Gray, manager, contemplates the installation of underground wiring for electroliers to be erected during the summer.

KEOKUK, IOWA—The Keokuk Electric Company is planning to make a number of improvements to its properties during the coming summer. Power-house and track facilities will be improved. When the Keokuk-Hamilton bridge is completed a new trolley and supports will be erected on the structure.

MAQUOKETA, IOWA—The Maquoketa River Power Development Company has been organized here with a capital of $50,000 by Robert M. Rogers and L. B. Jessup.

MUSCATINE, IOWA—Improvements entailing an expenditure of approximately $30,000 are to be made at the power plant of the Muscatine Lighting Company during the present year, according to H. C. Blackwell, superintendent of the company. Plans for the improvements which are the most extensive ever considered here are being formulated and it is proposed to make requisition for the materials at once. New boilers, new steam turbines, new condensers and other machinery are to be installed. The plant itself is to be completely remodeled.

RED OAK, IOWA—The Red Oak Electric Company, of which E. P. Steen is general manager, will build a substation and distribution system in the town of Hancock during the next two months at the cost of about $2,500. The company will also build 11 miles of 33,000-volt transmission line from Tabor to Sidney at the cost of about $12,000. The switchboard at the Red Oak power plant will be remodeled at a cost of $1,000.

WATERLOO, IOWA—The Citizens Gas & Electric Company has been granted a new 25-year franchise. The company will expend over $500,000 for labor and material in Waterloo between now and January 1, 1917, and completely erect and equip a high-voltage electric power plant which

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will furnish light and power not only to Waterloo but to several other cities. Austin Burt is manager.

BROOKFIELD, MO. — The Brookfield Electric Light Company contemplates the erection of a new boiler room during the next few months and will probably install a new 350-horsepower boiler. Percy W. Markham is manager of the company.

GORIN, MO.—Piles & Brown, who own the local electric lighting plant, will install additional generating equipment.

KANSAS CITY, MO.—Forty-seven ornamental trolley-pole bracket lights will be placed on Broadway. James Stannard is chairman of the Light Committee.

MT. VERNON, MO.—An expenditure of $8,500 will be made to remodel the electric lighting plant in this city.

OREGON, MO.—The St. Joseph Transmission Company, of which M. R. Martins is general manager, is making plans to construct 50 miles of transmission line and develop 1,000 horsepower.

ST. CHARLES, MO.—The American Light & Power Company, F. E. Murray, local manager, is making plans to extend its transmission lines to Wentworth and Wright City.

ST. LOUIS, MO.—The Union Electric Light & Power Company contemplates the installation of a 20,000-kilowatt turbogenerator which has been contracted for with the General Electric Company. The necessary boilers and other power plant accessories will be provided for this unit.

SEDALIA, MO.—The City Light & Traction Company will rebuild a portion of its downtown feeder system and will make a number of extensions in the outlying districts. The company will also electrify its ice plant. H. D. Truesuff is treasurer.

WENTZVILLE, MO. — The American Light & Power Company, F. E. Murray, district manager, St. Charles, Mo., is planning to construct an electric lighting system here.

COUNCIL GROVE, KANS.—The Council Grove Ice, Light & Power Company, G. W. Harlan, president, will build a six-mile extension of its transmission lines.

DODGE CITY, KANS.—The Midland Water Light & Gas Company has recently purchased material to build 30,-miles of 23,000-volt transmission line to serve two or three neighboring towns. The company has also purchased a new switchboard and will probably buy a new generating unit complete, the latter to be about 250-kilowatt capacity. Otto Theis is manager of the company.

ELLIS, KANS.—The Municipal Lighting Department, R. C. Hall, superintendent, is planning to install a 100-kilowatt, 2,300-volt alternator and other generating equipment.

HIAWATHA, KANS.—The Hiawatha Light, Power & Ice Company is preparing to install additional generating machinery to provide energy for proposed extensions to its service.

HUTCHINSON, KANS. — The United Water, Gas & Electric Company is planning to extend its electric service to the towns of Kent, Buhler and Inman.

LA HARPE, KANS.—James MacDonald has made application for a franchise to furnish La Harpe with electric service for lighting and power.

MANHATTAN, KANS.—James F. Johnson, representing interests said to be located at Lincoln, Neb., is securing water rights on the Blue River northward from Manhattan, with the purpose, it is reported, of building four dams for the generation of electrical energy for supplying small towns and rural communities.

MEADE, KANS.—The Meade Light & Power Company is planning the installation of two small generating units.

OLATHE, KANS.—Bonds in the sum of $50,000 have been voted for a municipal lighting system.

PERRY, KANS.—The municipal power plant, F. W. Bettys, superintendent, will probably install a 35-kilowatt, engine-driven generating unit.

SALINA, KANS.—The Salina Light, Power & Gas Company will install a 1,250-kilowatt turbogenerator with surface condensors, a 25-kilowatt turbine-driven exciter, additions to switchboard, a 600-horsepower water-tube boiler and 1,700 feet of double pipe line for the condensing water service. These improvements will be made during the spring. J. E. Harsh is general manager of the company.

WICHITA, KANS.—The Kansas Gas & Electric Company, of which H. S. Sladin is manager, plans the construction of 10 miles of 60,000-volt transmission line and 6 miles of 22,000-volt transmission line, the total cost of which will be about $25,000. The company also plans to construct several outdoor 60,000-volt substations of about 400-kilowatt capacity, each costing about $14,000. The company's plant at Cherryvale will be enlarged to make provision for an additional 300-kilowatt unit at an estimated cost of $18,000. Additional construction work of an extensive nature is also contemplated, but plans have not been entirely formulated.

OMAHA, NEB.—The Omaha Electric Light & Power Company has submitted a proposal to the City Council for the maintenance of the street lighting system for five years. The plan contemplates the installation of 786 additional lamps, some of which will be extensions to the ornamental system.

SYRACUSE, NEB.—J. A. Martz, of Lincoln, is preparing specifications for a $6,000 electric lighting plant for this city.

YORK, NEB.—The York Gas & Electric Company, J. B. Harvey, general manager, has under construction about 32 miles of 33,000-volt transmission line and has ordered material for 50 miles of similar construction to be done during the summer. The company contemplates the installation of additional boiler, engine and generating equipment in its present plant, the construction work to be completed by fall.

NORTHVILLE, S. D.—Plans are being prepared for the erection of municipal lighting plant here.

TIMBER LAKE, S. D.—S. J. Simonson has been granted a 20-year franchise to operate an electric lighting plant here.

DAZEY, N. D.—A proposition to secure electric service for this city is being considered by the citizens. E. A. Duff and J. E. Jacobson are circulating a petition.

DUNN CENTER, N. D.—Plans have been drawn and equipment will be ordered for an electric lighting plant to be installed in a mill to be erected here by C. L. Smith.

HAZLETON, N. D.—Plans are being made by the local lighting company for increasing the capacity of the electric lighting plant.

SOUTH CENTRAL STATES.

BOWLING GREEN, KY.—The Kentucky Service Company will install a 1,000-kilowatt, 2,300-volt turbogenerator at its Hopkinsville plant. At the Bowling Green plant two 625-kilowatt, 2,300-volt turbogenerators will be installed. These units have been purchased and will be installed during the summer. D. Fitch is general manager of the company.

FULTON, KY.—The Kentucky Light & Power Company has been organized here by O. L. Foster, C. M. Goheen and E. S. Hodgman. The capitalization is $250,000.

GLASGOW, KY.—The Glasgow Electric Light & Ice Company, B. G. Dickinson, manager, will install additional equipment in its power plant.

LOUISVILLE, KY.—The Louisville Gas & Electric Company, of which Donald McDonald is manager, will build an addition to its Waterside power plant and will install at 15,000-kilowatt turbogenerator with complete equipment of boilers, condensers and other auxiliaries. In addition, the company will build a new circulating water supply system for condensing purposes. This will consist of two nine-foot-square tunnels, each 700 feet in length, extending from the station to the Ohio River, with suitable screen chamber on the station property. The total cost of the work will be approximately $1,000,000.

MAYFIELD, KY.—The city is to act on a proposition to issue bonds for the purchase of the Mayfield Water & Light Company.

PRINCETON, KY.—The Princeton Light Company, through W. J. Holman, was the purchaser of the franchise for light and power service in Caldwell County.

RUSSELL SPRINGS, KY.—The business men are in favor of a municipal lighting system. S. Wilson is enterested in the plan.

NASHVILLE, TENN. — The Tennessee Power Company has formulated plans for its proposed hydroelectric development on Caney Fork River, near Great Falls, Tenn. Construction will include a dam across the river and a tunnel to convey water through a mountain to the power house, the initial installation to develop 10,000 horsepower. The ultimate plans are for a capacity of 40,000 horsepower. Plans are also being considered for another hydroelectric development, this plant to be located on the Ocoee River.

ANNISTON, ALA.—It is reported that the Alabama Power Company will build another electric furnace here.

BIRMINGHAM, ALA.—The City Commission is considering the establishment of electric light plant for south side of the city. Julian Kendrick, city engineer, has charge of the plans.

HURTSBORO, ALA.—Extensions to the municipal power plant and waterworks system will be made to cost $6,000.

LUCEDALE, MISS.—Mayor C. E. Ward is considering plans for the erection of an electric lighting plant here.

PINE BLUFF, ARK.—The Pine Bluff Company, of which Byron C. Fowles is general superintendent, will spend about $30,000 during 1916 for track extensions.

ALGIERS, LA.—The Algiers Railway & Light Company, of which H. D. Emmon is general manager, will make additions to its rolling stock and improvements to its power plant facilities.

GLENNORA, LA.—T. P. Joseph, of White Castle, La., has submitted plans to the City Council for an electric lighting plant here.

LEESVILLE, LA.—The Leesville Light & Waterworks is planning to install a 125-kilowatt, 2,300-volt, direct-connected, engine-driven alternator. W. K. Ferguson is superintendent.

NEW ORLEANS, LA.—The municipal grain elevator, to be constructed here by the port of New Orleans at a cost of $700,000, will have all its moving apparatus driven by electricity. The F. E. Newbery Electric Company, Houston, Tex., A. T. Vick, manager, has secured the contract for the electrical work, which will cost $37,000, exclusive of electrical appliances.

VILLE PLATTE, LA.—The Town Council is considering ways and means to provide funds for the erection of an electric lighting plant.

HENNESSEY, OKLA.—F. H. Tathwell contemplates purchasing the Hennessey Electric Power & Ice Company's plant, which is operating under lease. The company will be re-organized, an addition to the lower plant erected and new equipment installed.

MUSKOGEE, OKLA.—Mayor Franklin Miller has been authorized to employ an electrical engineer to ascertain the physical cost of the lighting plant of the Muskogee Gas & Electric Company. The plant may be purchased by the city.

SHAWNEE, OKLA.—The Shawnee Gas & Electric Company, C. S. Thompson, general manager, expects to install a new turbine of approximately 1,000-kilowatt capacity and condensing apparatus of the jet type to go with same. The company will rebuild part of its transmission system during the summer, material for this work having been purchased.

WISTER, OKLA.—Bonds in the sum of $7,000 have been authorized for a municipal electric lighting plant.

WOODVILLE, OKLA.—The city is planning to vote on $8,000 bonds to construct an electric lighting plant. Claude D. Jackson, president of the Board of Trustees, is in favor of the establishment of a municipal plant.

BENJAMIN, TEX.—J. C. Copeland will install an electric light plant in this city.

DALLAS, TEX.—Mayor Henry Lindsley has declared in favor of offering a new franchise to parties who will construct a street railway system and electric light plant in competition with the existing properties of the Stone & Webster Engineering corporation of Boston, Mass. If this plan is not adopted he may submit a proposition for the city to purchase these public utilities.

DALLAS, TEX.—The Texas Power & Light Company is making preparations to connect its north transmission line substation at Jenkins to the Trinity Heights substation on the south transmission line. The company will also build a line from Trinity Heights to Forney, which will serve several towns between Trinity Heights and Terrell and will also furnish electricity to Terrell. The Terrell Electric Company, as announced in the issue of February 5, will build the line from Terrel to Forney to connect with the Texas Power & Light Line. The connection between the north and south transmission lines of the Texas Power & Light Company will be the second connection and will make a complete line from Denison to Thorndale, Tex., a distance of about 300 miles.

HEDLEY, TEX.—The Texas Southern Electric Company contemplates the establishment of an electric light plant or a transmission line. Consult A. L. Chase.

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Clarendon, Tex., is manager of the company.

HEREFORD, TEX.—A municipal power plant is being planned for this city.

KERRVILLE, TEX.—The Kerrville Electric Light, Heat & Power Company, T. Holdsworth, manager, is installing an oil engine and other equipment.

McKINNEY, TEX.—The Texas Power & Light Company has recently started work on a new substation which will serve this city. The local municipal electric plant was recently sold to the company.

PLAINVIEW, TEX.—Extensions to the lighting system here are being contemplated by the Texas Utilities Company.

RIO GRANDE CITY, TEX.—An electric lighting plant will be installed here in the near future.

SAN ANGELO, TEX.—The San Angelo Water, Light & Power Company is having plans made for the construction of a large central electric power station here. It will also build a system of power transmission lines to towns in this section and to the different farms for operating irrigation pumping plants.

WICHITA FALLS, TEX.—A new turbine will be installed in the plant of the Wichita Falls Electric Company. Electric service from the Wichita Falls plant is now being given to the towns of Electra, Iowa Park and Burkburnett.

WESTERN STATES.

LAMBERT, MONT.—A committee has been appointed to make investigations to determine the cost of installing a municipal electric lighting plant and water works system in Lambert.

TROY, MONT.—The power site and water rights of the company owning the Lake Creek Falls power project has been sold to Leo Greenough and associates, controlling the Banner and Bangle mines. A transmission line will be built to the mines for power and lighting purposes.

BOULDER, COLO.—Extensive improvements are contemplated by the Western Light & Power Company to its plants, involving an expenditure of about $140,000.

DENVER, COLO.—Work is now under way for extensive improvements to the lighting system of the Denver Gas & Electric Light Company, which will involve an expenditure of about $160,000. The plans provide for a three-phase, four-wire, grounded-neutral, 4,000-volt system, replacing the single-phase, 2,000-volt system now in use. New equipment, including switchboard, is being installed at the West Side and Lacombe Stations.

PUEBLO, COLO.—The Arkansas Valley Light & Power Company, of which W. F. Raber is vice-president and general manager, expects to build an addition to the power plant at Canon City, installing a 7,500-kilowatt steam turbine, together with transformers, switchboard, boilers, condensers and coal and ash-handling apparatus. The company will also build 25 miles of high-tension transmission line from Canon City to the Cripple Creek district and 25 miles of transmission line in the Arkansas Valley east of Pueblo. The total expenditure will be approximately $500,000.

TRINIDAD, COLO.—The Trinidad Electric Transmission, Railway & Gas Company, of which Franklin P. Wood is manager, has recently closed a contract with the Colorado Fuel & Iron Company for additional power. The former company will make an expenditure of about $200,000 for generating equipment and transmission lines, and the Fuel Company will spend about $100,000 for substation work, motors, rotary converters and other equipment.

ALBUQUERQUE, N. M.—The City Electric Company will order additional rolling stock for the new University line, which will be put in operation June 1.

CASA GRANDE, ARIZ.—As the result of an election this city will have a municipal light, water and ice service. Bids for the construction of the plant will be called for soon.

FLORENCE, ARIZ.—At an election to be held March 11 the proposal to issue $50,000 in bonds for the installation of a municipal electric-light plant and water-works system will be submitted to the voters.

HOLBROOK, ARIZ.—The application of James J. Shumway for a franchise to construct an electric light and power plant in Snowflake to serve the towns of Taylor, Shumway and Snowflake will be heard by the Supervisors of Navajo County on March 6.

HAILEY, IDAHO.—I. E. Rockwell, of Bellevue and D. F. McGee, chief engineer of the consolidated power and electric plants in Southern Idaho, have been making a tour of the properties in Idaho with a view of extending the Shoshone power line through to Hailey.

TWIN FALLS, IDAHO.—The Great Shoshone & Twin Falls Water Power Company, Twin Falls, contemplates rebuilding its distribution lines, owing to the consolidation of the properties of the Electric Investing Company. Connection of primary lines between two companies is also contemplated.

EPHRATA, WASH.—C. A. Logg has announced his intention of equipping an electric light plant and furnishing service to this community.

EVERETT, WASH.—A notice has been filed with County Auditor, by J. L. Fountain, of Seattle, representing, it is reported, a British Columbia syndicate, appropriating 10,000 cubic feet of water per second on the Sauk River, same to be used for hydroelectric development. According to reports, the British Columbia company plans early construction at the site.

SPOKANE, WASH.—Announcement has been made by the East Caledonia Mines Company that the gasoline power now in use is to be replaced by a complete electrically driven outfit.

BAKER, ORE.—The City Engineering Department has been instructed by City Commissioners to immediately prepare plans for the installation of a cluster lighting system in the business district of the city, current for the new system to be supplied by the municipal lighting plant.

EUGENE, ORE.—The City Council will shortly receive bids for materials for the installation of an ornamental lighting system on Eighth Avenue, from Willamette to Pearl Streets. The work of installation will be handled by the Water Board.

OPPORTUNITY, WASH.—D. W. McDonald was recently re-elected director of the Modern Electric Water Company, which recently held a meeting of stockholders in this city. It is reported that the company plans the installation of electric and other improvements. A. B. Hauk is superintendent.

PORTLAND, ORE.—The Pacific Power & Light Company, which operates a steam and hydroelectric system in Oregon and Washington, plans to spend about $260,000 in plant account during the year. Of this sum approximately $75,000 will be spent for ordinary service extensions in the electricity, gas and water departments, and approximately $80,000 additional for miscellaneous extensions. The largest single items of importance will include the reconstruction of Moxee substation, North Yakima, Wash., to a standard outdoor type, including additional transformer capacity, at a cost of about $6,000. The company expects to reconstruct its Naches-North Yakima 2,500-volt transmission line and raise the voltage to its standard of 66,000 volts, at a cost of about $15,000. The reconstruction of woodstave pipe lines at the Walla Walla River power plant will cost about $15,000, and $2,000 will be allowed for the reconstruction of the substation at Sunnyside, Wash. The overhead system at Astoria, Wash., will be reconstructed at a cost of $8,000. Some of the work outlined is already under way and the company hopes to get its new construction work completed before the summer is over.

SILVERTON, ORE.—The Willamette Valley division of the Portland Railway, Light & Power Company has signed contracts for lights with residents of East Silverton and the work of extending the lines will begin at once.

BAKERSFIELD, CAL.—The Pacific Power & Light Corporation was the only bidder for a power line franchise to supply the Kernville district, and it was granted the franchise by the County Supervisors.

DEL REY, CAL.—A road lighting system will probably be established here.

PARLIER, CAL.—An election will be held March 14 to decide the question of establishing a municipal electric lighting plant.

PETALUMA, CAL.—The special election held last week in the Cinnabar district for the purpose of forming a public highway lighting district carried.

PORTERVILLE, CAL.—It is declared here that the Porterville Northeastern Railroad proposes to extend its lines north from Adobe station and run a long semicircle to skirt the foothills, connecting with the Visalia electric at Merryman station, the plan being to operate the lines electrically.

LOS ANGELES, CAL.—The City Attorney has been authorized by the City Council to begin condemnation proceedings for the acquiring of a right of way for the construction of electric power lines in the San Fernando Valley.

SAN FRANCISCO, CAL.—The California-Oregon Power Company, which represents a merger of a number of power companies in which J. D. Grant is interested, is planning to raise funds to complete its power plant at Copco, on the Klamath River. Over $1,000,000 has already been expended on the plant.

SAN FRANCISCO, CAL.—According to John A. Britton, general manager of the Pacific Gas & Electric Company, with the advent of spring the company will put to work many more men on its construction undertakings in Placer County, where approximately 200 men are employed at present. He says the work in that section will be completed by November 1 of this year, barring any unlooked for delays.

STOCKTON, CAL.—The Western States Gas & Electric Company, Samuel Kahn, vice-president and general manager, will spend between $50,000 and $75,000 in the general work of extensions and improvements during 1916.

CANADA.

ST. STEPHEN, N. B.—The substitution of nitrogen lamps for the arc lamps now in use in Fredericton is being considered, and one of the alternative propositions made by the Fredericton Gas Light Company would involve, if accepted, the purchase of a new dynamo, two transformers, two rectifiers and other supplies.

MONTREAL, QUE.—The Montreal Public Service Corporation is planning extensive improvements to its power plant.

AMHERSTBURG, ONT.—The Town Council is considering extensions to the lighting system.

NIAGARA FALLS, ONT.—The Ontario Power Company is planning to construct another pipe line and increase its capacity to 180,000 horsepower, with the addition of two generating units. The pipe line, which will be constructed by the company itself, will be about 6,000 feet long and will parallel the two present lines. It will be of concrete, 18 feet in diameter. When the contemplated improvements are made the equipment of the Ontario power house will include 16 units. The largest unit now in operation has a capacity of 14,000 horsepower.

Proposals

ELECTRIC-LIGHT POSTS.—Sealed proposals will be received by the South Park Commissioners, Fifty-seventh Street and Cottage Grove Avenue, March 15, for furnishing and delivering cast-iron electric light posts and other cast-iron electric fixtures for use in Grant Park, Chicago. Address J. F. Neil, secretary.

WIRING.—Sealed proposals will be received by the Board of Administration in its office in the Capitol Building, Springfield, Ill., March 7, for electric light and power wiring and conduit work, etc., for the power house of the Chicago State Hospital, Dunning, Ill. Plans and specifications may be obtained upon application to Martin C. Schwab, consulting engineer, Mallers Building, Chicago, Ill.

WIRING AND FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m. March 27, 1916, for a conduit and wiring system and lighting fixtures for the pure food and drug laboratories, at the United States appraiser's stores, New York, N. Y., in accordance with drawings and specification, copies of which may be had at the Supervising Architect's office or at the office of the Supervising Chief Engineer, U. S. Customhouse, New York, N. Y., in the discretion of O. Wenderoth, Supervising Architect.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9,346—Brooklyn, N. Y., miscellaneous interior communication cable and single and twin-conductor wire. Schedule 9,351—Brooklyn, N. Y., 150 signaling searchlights. Schedule 9,353—Charleston, S. C., 750 feet three-conductor cable, 950 feet paper-insulated, lead-sheath cable and miscellaneous duplex cable. Bidders desiring to submit proposals should make application for schedules to the Bureau or Purchasing Office nearest to navy yard, where delivery is to be made.

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Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20087. INCANDESCENT LAMP MACHINERY.—A commercial organization in the United States has transmitted an inquiry from a man in Mexico who desires to communicate with American manufacturers of machinery for making incandescent electric lamps. He also desires quotations on glass globes for lamps, caps, carbon filaments for incandescent lamps, and glass tubes in which the wire filament is placed.

NO. 20156. TELEPHONE EQUIPMENT.—An American consular officer in Costa Rica reports a possible market in his district for telephones, equipment and supplies. The names of possible purchasers of such articles may be obtained on application to the Bureau or its district offices.

NO. 20181. ELECTRICAL EQUIPMENT.—An American consular officer in Portugal writes that a firm in his district is in the market for machines used in the cork industry; electrical equipment, such as installation material; windmills suitable to produce electrical energy; peroxide of lead used in making storage batteries, and celluloid in plates. Catalogs, quotations and full information are desired immediately. Correspondence should be in French, Portuguese, or Spanish.

NO. 20191. ELECTRIC METERS.—An American consular officer in India writes that a firm in his district desires to receive price lists from American manufacturers of meters for direct current, for use in a lighting system.

NO. 20,222. ELECTROLYTIC COPPER.—An American consular officer in the Netherlands writes that a firm in his district is in the market for electrolytic copper. Reference is given. Correspondence may be in English.

NO. 20,228. INSTRUMENTS, MACHINERY, ETC.—An American consular officer in India writes that a firm in his district desires to be placed in touch with American manufacturers and exporters of motors, generators, switchboards, incandescent mazda standard and half-watt lamps, transformers, and meters.

NO. 20,237. ELECTRICAL MACHINERY.—An American consular officer in India reports that a Government official in that country desires to be placed in touch with American manufacturers of electrical, iron and steel, and wood-working machinery; agricultural implements and hydroelectric machinery, for use in educational and agricultural institutions in India.

NO. 20,243. ELECTRICAL SUPPLIES.—An American consular officer in Spain reports that a man in his district desires to purchase, at wholesale, supplies of small articles for electrical installation. Reference is given. Correspondence should be in Spanish.

New Incorporations

MARION, S. D.—The Heib Electric Service Company. Capital, $5,000. Incorporators: John Heib and others.

MEMPHIS, TENN.—The Street Electric Company. Capital, $10,000. Electrical supplies. Incorporators: R. A. Street, W. S. Counsell and others.

NEW YORK, N. Y.—Yorkville Electric Appliance Company. Capital, $10,000. Incorporators: J. Hochman, H. P. Karlindecker and R. Hoffman, all of New York City.

CHICAGO, ILL.—The Vesta Battery & Equipment Company. Capital, $10,000. Manufacture batteries and lamps. Incorporators: W. S. Perry, N. C. Croshaw and P. C. Kollauf.

WILMINGTON, DEL.—General Latin-American Corporation. Capital, $3,000,000. Develop public utilities in Latin-American countries. Incorporators: S. D. Townsend, Robert Pennington and E. V. Topkis, of Wilmington.

NEW YORK, N. Y.—Hill Insulating & Manufacturing Corporation. Capital, $25,000. Manufacture insulation, accessories and auto parts. Incorporators: R. R. Hill, 302 Convent Avenue; Abbott Leach and C. G. Vogel, of New York City.

New Publications

BOILER TUBES.—Technical Paper 114 of the Bureau of Mines, Washington, D. C., is entitled "Heat Transmission Through Boiler Tubes," by Henry Kreisinger and J. F. Barkley. Methods and results of temperature measurements and heat conduction are given.

AMERICAN NEWSPAPER ANNUAL AND DIRECTORY.—N. W. Ayer & Son, Philadelphia, Pa., have issued the 1916 edition of its annual, which is a reference book for information pertaining to newspapers, magazines and trade or class publications.

THE WELDING ENGINEER.—L. B. Mackenzie, under the name of The Welding Engineer Publishing Company, 220 South State Street, Chicago, has begun the publication of a monthly periodical entitled *The Welding Engineer*. The yearly subscription is $2.00 in United States, Canada and Mexico.

SHOT FIRING.—Technical Paper 108 of the Bureau of Mines is entitled "Shot Firing in Coal Mines by Electricity Controlled From Outside," by H. H. Clark, N. V. Breth and C. M. Means. The various systems are described, recommendations made and suggested specifications given. Cost figures are given.

THE MONAD.—The American Association of Engineers, 29 South LaSalle Street, Chicago, Ill., has begun the publication of a monthly periodical called *The Monad*. The first issue, dated February, 1916, contains the proceedings of the convention held in December. The subscription price to non-members is $1.50 per year.

BUREAU OF LONGITUDES.—The "Annuaire pour l'an, 1916," published by the Bureau des Longitudes, Paris, France, has come to hand. It contains the usual tables and also a special illustrated article by M. G. Bigourdan on "La pression barométrique moyenne et le régime des vents en France." The price is 40 cents.

MAGNETIC ALLOYS.—The University of Illinois *Bulletin* No. 83 of the Engineering Experiment Station contains "Magnetic and Other Properties of Iron-Silicon Alloys, Melted in Vacuo," by Trygve D. Yensen. This is approximately the same material presented to the American Institute of Electrical Engineers at the St. Louis meeting last October.

Financial Notes

The Nashville Railway & Light Company, at its annual meeting, reported that the gross income for the year was $2,143,902, while gross expenses were $1,886,921. The net earnings of $256,981 were a decrease of about $8,000 in comparison with 1914. The decrease lay in the railway department, the lighting department showing an increase of $4,359.

Lee, Higginson & Company, Harris, Forbes & Company and Kissel, Kinnicutt & Company have purchased $1,000,000 Manhattan Railway Company consolidated (now first) mortgage four-per-cent bonds, due 1990, and are offering them at a price of 93 and interest, to yield 4.31 per cent. These bonds were sold to refund $1,000,000 New York Elevated Railway debenture 5s, due March 1, and practically close the consolidated mortgage of the Manhattan Railway Company.

The Wagner Electric Company for the year ending Dec. 21 showed gross and net earnings the largest in its history, net profits totaling $615,475, or 33.9 per cent on the capital of $1,800,000, compared with $259,328, or 17.5 per cent, in 1913, and $265,335, or 14.7 per cent, in 1914. Surplus after all charges and dividends was $1,195,902, of which $610,475 was added in 1915. All retiring directors were re-elected. The special stockholders' meeting unanimously approved the proposed increase in capital to $2,000,000 and plans of the directors for distributing the increase.

Announcement is made that the $12,500,000 capital stock of Detroit United Railway Company has been listed on the Detroit Stock Exchange. The stock is also listed on the New York, Montreal and Cleveland exchanges. The company has the lowest capitalization of any of the large street-railway systems of the country, and while it has made many extensions and greatly enlarged its holdings in the last few years, there has been no increase in its outstanding stock, much of the new work having been cared for out of income.

The Kentucky Public Service Company has given the city of Frankfort, Ky., $32,000 in government bonds to redeem $32,000 of first-mortgage bonds on the plant of the company, and, in addition, a 5-per-cent premium, amounting to $1,000, and a semi-annual interest installment of $480 until 1920. The company recently stated to Mayor Rupert that it desired to take advantage of the present good bond market and to give only first-mortgage security and for that reason wished to discharge the city's lien. The gas and electric bonds draw six per cent and the government bonds three; so the company is, therefore, binding itself to pay the city the difference in semi-annual payments until the bonds will have expired.

The United Gas & Electric Corporation, through the Fidelity Trust Company of Philadelphia, has called for payment April 1 at 100.5 and interest all notes outstanding of the issue of $4,500,000 due April 1, 1918. Retirement of the notes will be made from a portion of the proceeds of $5,000,000 United Gas & Electric Corporation six-per-cent 30-year bonds recently sold to Bertron, Griscom & Company and Reilly, Brock & Company. The $5,000,000 six-per-cent 30-year collateral trust bonds which United Gas & Electric Corporation has sold to New York and Philadelphia bankers are a part of an authorized issue of $15,000,000, dated April 1, 1915, of which $10,000,000, including those just sold, have been issued and $8,461,000 are outstanding in the hands of the public. The remaining $5,000,000 are held to be issued for future corporate requirements under the restrictions of the mortgage, and of the issued bonds $1,539,000 are held in the treasury of the corporation. The collateral behind the bonds is approximately $32,276,600 par value of the common and preferred stocks of subsidiary companies.

Dividends.

	Term	Rate	Payable
Am. Pw. & Light	Q	1%	Mar. 1
Chicago City Ry	Q	2%	Mar. 30
Chicago Tel	Q	2%	Mar. 31
Colo. Power, com	—	1%	Apr. 15
Colo. Power, pf	Q	1.75%	Mar. 15
Con. Gas. El. Lt. & Pw., Baltimore, com	Q	1.75%	Apr. 1
Con. Gas. El. Lt. & Pw., Baltimore, pf	S	3%	Apr. 1
El Paso Elec	Q	$2.50	Mar. 15
Louisville Trac	Q	1%	Apr. 1
Louisville Trac., pf	S	2.5%	Apr. 1
Mont. Power	Q	0.75%	Apr. 1
Mont. Power, pf	Q	1.75%	Apr. 1
National Carbon, pf	Q	1.75%	.....
National Carbon, com	Q	2%	Apr. 5
Ottawa Lt., Ht. & Pw	Q	1.5%	Apr. 1
Ottawa Lt., Ht. & Pw	—	1.5%	Apr. 1

Reports of Earnings.

COMMONWEALTH EDISON COMPANY.

Net earnings for the fiscal year ended December 31, 1915, amounted to 10.09 per cent

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Feb. 28	Feb. 21
American Tel. & Tel. (New York)	127⅝	127¼
Commonwealth Edison (Chicago)	143	144
Edison Electric Illuminating (Boston)	248	248
Electric Storage Battery common (Philadelphia)	64⅞	66
Electric Storage Battery preferred (Philadelphia)	64⅞	66
General Electric (New York)	169	171
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	6⅝	7¼
Massachusetts Electric preferred (Boston)	36	37
National Carbon common (Chicago)	180	182
National Carbon preferred (Chicago)	—	122
New England Telephone (Boston)	136	136½
Philadelphia Electric (Philadelphia)	27¾	28
Postal Telegraph and Cables common (New York)	80	80¾
Postal Telegraph and Cables preferred (New York)	67	67½
Western Union (New York)	88¼	88⅝
Westinghouse common (New York)	64⅝	66½
Westinghouse preferred (New York)	76¼	76

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on the stock, which compares with 9.11 per cent in 1914.

	1915.	1914.
Oper. revenue	$20,882,327	$19,060,196
Oper. exp., inc. dep.	12,895,218	12,008,640
Net oper. revenue	7,987,108	7,051,556
Taxes and mun. comp.	1,582,039	1,492,265
Oper. income	6,405,069	5,559,291
Other income	114,393	217,762
Total income	6,519,462	5,777,053
Less int. on bonds	1,890,000	1,600,000
Available for div.	4,629,462	4,177,052
Dividends paid	3,667,110	3,534,562
Bal. carried to sur.	962,352	642,400

VIRGINIA RAILWAY & POWER.

	1915	1914
December gross	$503,449	$443,651
Net earnings	280,143	231,346
Total income	287,710	237,645
Surplus after taxes, rentals and interest	145,669	105,007
Balance after depreciation	137,336	96,674
Six months' gross	2,785,966	2,632,706
Net earnings	1,478,014	1,370,685
Total income	1,528,505	1,411,140
Surplus after taxes, sinking fund and interest	670,957	600,877
Balance after depreciation	620,957	550,877

PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS.

Net income for the fiscal year ended Dec. 31, 1915, was 15.77 per cent on the preferred stock and 7.51 per cent on the common. This compares with 14.84 per cent and 6.79 per cent, respectively, earned in 1914. Following is a comparative income account:

	1915.	1914.
Gross earnings	$ 6,903,228	$ 6,656,899
Expenses	3,749,370	3,656,685
Net earnings	3,153,857	3,000,214
Bond and note interest	1,492,280	1,461,262
Net income	1,661,577	1,538,752
Div. paid on pfd. stk.	455,280	455,280
Div. paid on com. stk.	528,287	503,125
Surplus	678,010	580,347
Appropriated for amort. and dep. reserve	450,000	400,000
Bal. carried to sur.	228,016	180,347

NIAGARA FALLS POWER.

Niagara Falls Power Company reports as follows for the fiscal year ended Dec. 31, 1915:

	1915	1914
Gross earnings	$2,685,598	$2,636,031
Expenses and taxes	788,760	773,483
Net earnings	1,896,838	1,862,548
Non-operating income less non-operating deductions	165,848	103,390
Total income	2,062,687	1,965,938
Interest, etc.	1,034,629	996,395
Surplus	1,028,058	969,543

EAST ST. LOUIS & SUBURBAN.

	1915	1914
December gross	$ 238,667	$ 213,997
Net after taxes	97,393	105,137
Surplus after charges	34,411	33,389
Twelve months' gross	2,466,969	2,623,827
Net after taxes	993,377	1,007,613
Surplus after charges	237,062	305,664

ALABAMA POWER COMPANY.
(Alabama Traction, Light & Power Subsidiary.)

	1915	1914
December gross	$ 108,738	$ 77,751
Expenses and taxes	42,731	36,556
Net earnings	66,007	41,195
Twelve months' gross	1,041,148	619,809
Expenses and taxes	402,542	312,346
Net earnings	638,606	307,463

PORTLAND RAILWAY LIGHT & POWER.

	1915	1914
December gross	$ 482,938	$ 514,493
Net after taxes	227,658	259,010
Surplus after charges	44,834	76,036
Twelve months' gross	5,511,345	6,273,171
Net after taxes	2,437,717	3,009,288
Surplus after charges	229,361	836,610

CUMBERLAND COUNTY POWER & LIGHT.

	1915	1914
December gross	$ 224,254	$ 203,510
Net after taxes	85,031	79,241
Surplus after charges	19,325	16,718
Twelve months' gross	2,636,364	2,513,620
Net after taxes	1,130,577	1,056,600
Surplus after charges	338,163	297,741

PHILADELPHIA RAPID TRANSIT.

	1915	1914
December gross	$2,213,472	$2,074,522
Net	975,804	871,858
Surplus	160,307	64,853
Six months' gross	12,416,972	11,945,123
Net	3,457,036	5,046,402
Surplus	561,243	198,447

Electrical Patents Issued February 22, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,172,244. Insulating Material. C. M. Abott, assignor to S. Cabot, Boston, Mass. Fire-proof insulating stud, having pair of covering sheets of sulfate of soda paper stock with incombustible, insulating filler between.

1,172,277. Sanitary Mouthpiece Protector for Telephones. E. R. Gorman, West Haven, Conn. Covering of separately detachable layers of fabric.

1,172,282. Protector for Fusible Conductors. W. Handley and O. M. Nickerson, Madison, Me. Casing for upright fuse.

1,172,286. Key-Operating Attachment for Electric-Light Sockets. E. G. Hayne, Ottawa, Ill. Adapts for pull operation.

1,172,294. Relay. C. L. Krum, assignor to Morkrum Co., Chicago, Ill. Details of polarized device.

1,172,301. Electrical Welding. T. E. Murray and H. R. Woodrow, New York, N. Y. Machine has roller electrodes and adjustable table for welding overlapping parts.

1,172,302. Electrical Welding. T. E. Murray, New York, N. Y. Machine with roller electrode for making circular line welds.

1,172,322. Protective Device for Electric-Cable Joints. P. Torchio, New York, N. Y. Has pervious layer saturated with insulating fluid between inner and outer sheaths. (See cut, next page.)

1,172,347. Holddown for Storage Batteries. B. Ford, Philadelphia, Pa. For clamping boxes in position.

1,172,354. Portable Lamp. W. E. Grote, New York, N. Y. Arm and lamp may be slid into and out of portable box.

1,172,364. Combination Lighting and Ignition Switch. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Interlocking arrangement.

1,172,365. Automatic Telephone Exchange. A. Katz, assignor to Siemens & Halske, A. G. Berlin, Germany. Trunk lines are tested before selection.

1,172,366. Automatic Telephone Exchange System. O. Kirby, assignor to Automatic Electric Co., Chicago, Ill. Control of trunk selection by subscriber in metallic circuit-controlled trunking system.

1,172,371. Switchboard. H. F. Krantz, assignor to H. F. Krantz Mfg. Co., Brooklyn, N. Y. Arrangement of bus bars and switches.

1,172,377. Car-Door Signal System. J. F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Co., Albany, N. Y. Grounded signal circuit closed if any door is open.

1,172,382. Telephone Attachment. H. C. Merritt, Jr., Tuckahoe, N. Y. Accessory carrier for attachment to desk set.

1,172,384. Timer and Distributer. D. E. Moulton, Pierre, S. D. For ignition; structural details.

1,172,395. Electric Signal for Automobiles. R. B. Rudy, Niagara Falls, N. Y. Electromagnetically operated direction-indicator and tail-light.

1,172,402. Telephone Trunking System. C. E. Stephenson, assignor to Automatic Electric Co. Arrangement for placing guarding potential at one end of trunk when other end is seized.

1,172,409. Electric Window Closing Device. W. B. Uffert, Hampstead, N. Y. Gravity closing sashes held open by electromagnetically released catch.

1,172,431. Train Control System. A. Cansale, Scranton, Pa. Special arrangement of track, sub-rails, car circuits, etc., in train-stop system.

1,172,459. Thermostatic Controller for Gas Water-Heaters. H. Jarvis, Ontario, Canada. Thermostatically and electromagnetically controlled gas valve.

1,172,468. Apparatus for Sterilizing Water. R. M. Leggett, assignor to The Neal Armstrong Co., Akron, O. Employs alternating current.

1,172,470. High-Tension Switch. C. R. Lininger, Chicago, Ill. Outdoor line switch with special provision for preventing ice and sleet from interfering with operation.

1,172,515. System of Distant Selection and Control by Means of Electromagnetic Waves. L. B. Clark and R. A. Clark, assignors to Clark Brothers Wireless Selection & Control Co., Phoenix, Ariz. Receiving apparatus comprises motor-driven switch controlled by the receiving relay.

1,172,517. Stator for Alternating Electric Current Machines. J. Lassen La Cour, Vesteras, Sweden. Has rows of winding slots at different distances from air gap.

1,172,522. Lamp Holder and Reflector. E. F. Guth and R. V. Owen, assignors to Luminous Unit Co., St. Louis, Mo. Lamp socket supported in neck of insulating reflector.

1,172,523. Railway Marker. J. F. Haddock, St. Louis, Mo. Electric lantern, with adjustable bull's-eyes of different colors, repeated at will of operator.

1,172,526. Selective Signaling System. J. B. Harlow, assignor to Western Electric Co., New York, N. Y. Impulse-selected semaphores at way stations operated from despatching station and answer-back means.

1,172,536. Trolley Stand. W. H. Kilbourn, Greenfield, Mass. Trolley drops laterally to safety position when wheel leaves wire.

1,172,539. Electrically Controlled Meter System. J. W. Lattig and C. L. Goodrum, assignors to Western Electric Co. Call register system for automatic telephones.

1,172,541. Tank Sounder. P. F. McDonnell, J. Brunner and T. Thompson, Cleveland, Ohio. Electric indicator of depth of liquid in hull of ship.

1,172,568. Method of and Apparatus for Securing Constancy in the Light of Vacuum Tubes. F. Schroter, Berlin, Wilmersdorf, Germany. Method of rendering inactive the impurities in the light-giving gas.

1,172,581. Motor-Driven Compressor. H. W. Cheney, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Vertical motor shaft, horizontal cylinders.

1,172,583. Starter and Light Control for Motors. W. H. Collier, Nashville, Tenn. Switch mechanism for controlling starting, ignition and lights of automobile, mounted on steering post.

1,172,585. Selector Switch. H. F. Dobbin, assignor to Western Electric Co. Arrangement of brushes and contacts in automatic switch for telephone lines.

1,172,586. Storage Battery. J. W. East, Teague, Tex. Plates formed of perforated tubes.

1,172,597. Process of Producing Dephosphorized High-Grade Pig Iron. P. L. T. Heroult, New York, N. Y. Phosphoric blast-furnace pig iron treated in electric furnace.

1,172,604. Snap Clamp or Grip for Electrical Conductors. T. F. Johnson, Atlanta, Ga. Connected to cable end and adapted to grip overhead conductor.

1,172,608. Train Control Apparatus. R. M. Kaufman, Pittsburgh, Pa. Speed control operated according to track conditions and train speed.

1,172,614. Telephone Lock. J. E. Lavalley, Portland, Ore. Collar about standard of desk set locks hook down.

1,172,630. Rotary Converter. O. H. Pieper and A. F. Pieper, Rochester, N. Y. Alternating side connected in by speed-controlled switch.

1,172,635. Lock for Socket Shells. R. A. Schoenberg, New York, N. Y. Prevents disconnection of bayonet point.

1,172,642. Humidifier. C. Subert, assignor to Sanifacient Humidor Co., Chicago, Ill. Air-circulating motor has current "flashed" on it by thermal device.

1,172,649. Lighting Fixture. F. W. Wakefield, assignor to F. W. Wakefield Brass Co., Vermillion, Ohio. Bowl and socket support.

1,172,650. Water-Level Indicating System and Apparatus. A. B. Walton, Lorain, Ohio. Single indicator connected with contact device in any one of several compartments.

1,172,658. Attachment for Telephone Desk Sets. L. D. Allen, Chicago, Ill., assignor of one-half to A. W. Heath, Chicago, Ill. Releasable clip for holding down receiver hook.

1,172,694. Multiple Connector. A. L. Flint, E. Weymouth, Mass. Multiple plug

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and socket device has means for forcing members apart.

1,172,698. Ignition Apparatus for Combustion Engines. V. A. Fynn and B. Dick, assignors to Wagner Electric Mfg. Co., St. Louis, Mo. Combination of electromagnetic and mechanical interrupters.

1,172,704. Socket for Incandescent Electric Lamps. G. A. Harter, Chicago, Ill. Shell held in body and connected to terminal by metal cast onto shell and into recess of body.

1,172,705. Motor Controller. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Master-switch-controlled electroresponsive switches for connecting alternating motor with alternating source for driving and direct-current source for dynamic braking with automatic no-voltage and mechanical brake.

1,172,706. Automatic Means for Correcting the Registration of Meters. F. W. Hild, Portland, Oregon. Connection between constantly-driven friction disk and register controlled by index hand.

1,172,713. Signaling Horn. M. R. Hutchinson, assignor to Lovell McConnell Mfg. Co., Newark, N. J. Electromagnetically operated diaphragm with provision for giving successive, different sounds.

1,172,757. Electric Heater. A. O. Bailey, assignor to Gold Car Heating & Lighting Co., New York, N. Y. Mounted in car seat.

1,172,760. System of Call Distribution. H. M. Bascom, assignor to American Telephone & Telegraph Co., New York, N. Y. Automatically connects telephone set with idle call circuit.

1,172,771. Ignition System. B. Dick and V. A. Fynn, assignors to Wagner Mfg. Co. Modification of No. 1,172,698.

1,172,786. Trolley Base. C. E. Gierding, assignor to Ohio Brass Co., Mansfield, O. Pole pivoted on longitudinally movable, spring-pressed support.

1,172,821. Method of Running and Apparatus for Protecting Electrical Machines. G. Meyer and A. Kuehns, assignors to Siemens Schuckert Werke G. M. B. H., Berlin, Germany. Protective device adjusted to load capacity of machine in response to speed adjustment.

1,172,826. Paneiboard Cabinet. R. H. Olley, assignor to Crouse-Hinds Co., Syracuse, N. Y. Manner of securing panel and lining strips.

1,172,845. Gearing for Starting Mechanism. J. A. Struthers, assignor to The Tri-Unit Electrical Co., Jersey City, N. J. Connects dynamo machine with engine fly wheel.

1,172,852. Electric Fire Alarm. J. L. Weathers, Shelby, N. C. Fuse-restrained contacts enclosed in combustible material.

1,172,880. Thermostat. W. L. Denio, Rochester, N. Y. Details of thermally controlled contacts.

1,172,885. Apparatus for the Production of Oxygen and Hydrogen Gases. G. Halter, assignor to Davis-Bournonville Co., New York, N. Y. Electrolytic cell having anode completely enclosed in porcelain separator above and asbestos sack below surface of electrolyte and having outlet for oxygen.

1,172,887. Electrolytic Plant. G. Halter, assignor to Davis-Bournonville Co. Modification of above.

1,172,890. Storage Battery Indicator. K. Knudsen, Grand Rapids, Mich. Gas indicator on automobile dash.

1,172,893. Starting Device for Explosive Engines. O. F. Lippincott, Kenesaw, Neb. Sparking plug comprises an explosive powder.

1,172,909. System for Auto-Vehicles. A. D. Scott, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Dynamo machine driven by direct current for starting and then delivering alternating current.

1,172,910. Mandrel for Winding Coils. A. D. Scott, assignor to Varley Duplex Magnet Co. Collapsible mandrel with special strand-guiding means.

1,172,921. Automatic Counting Machine. G. W. Yost, Palisade Park, N. J. Counter controlled by article-operated contacts.

1,172,926. Insulating Substance. L. C. Bassford, assignor to General Electric Co., Schenectady, N. Y. Central strip of open weave fabric has mass of vegetable fibres pricked through, pressed and treated with water-proof and fire-proof coating.

1,172,928 and 1,172,929. Electric Switch. T. A. C. Both, assignor to R. A. Schoenbers, New York, N. Y. First patent: Two-push-button wall switch. Second patent: Simple two-push-button rosette structure.

1,172,932. Electrolytic Cell. W. C. Bucknam, assignor to Davis-Bournonville Co. Modification of No. 1,172,885.

1,172,944. Dynamo-Electric Machine. E. F. Collins, assignor to General Electric Co. Structure and excitation of direct-current machine.

1,172,953. Adapter. J. T. H. Dempster, assignor to General Electric Co. Details of device having standard base with miniature socket and transformer between.

1,172,956. Brake-Applying Mechanism. R. B. Dickard, Austin, Tex. Electromagnetic control of brake-operating arm.

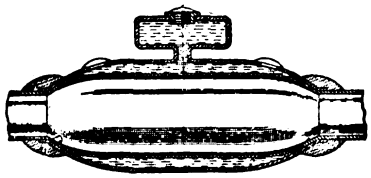
1,172,961. Protective Device. S. Dushman, assignor to General Electric Co. Electric-discharge device with constant current up to certain voltage is de-energized when current in rectifier in parallel with the device rises abnormally.

1,172,962. Electromagnetic Switch. J. Eaton, assignor to General Electric Co. Differentially wound magnet.

1,172,963. Insulator. A. J. Engelhardt, New Orleans, La. Pin insulator with special wire-securing clamp.

1,172,965. Bearing for Wheels. C. M. Feist, Sioux City, Iowa. Special trolley wheel bearing.

1,172,968. Synchronous Dynamo-Electric Machines. L. Fleischmann, assignor to



No. 1,172,322.—Protective Device for Cable Joints.

General Electric Co. Starting means for rotary converters.

1,172,972. Protective Device. J. J. Frank, assignor to General Electric Co. Arrangement of inductive windings and electrolyte.

1,172,980. Electric Lamp Socket. G. W. Goodridge and G. B. Thomas, assignors to Bryant Electric Co., Bridgeport, Conn. Details of pull socket.

1,172,990. Protective Device. L. A. Hawkins, assignor to General Electric Co. Modification of No. 1,172,961.

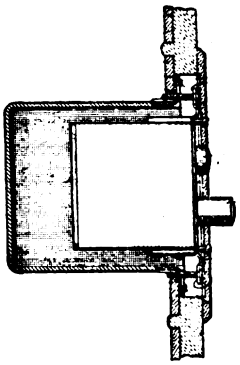
1,173,004. Electrical Apparatus. W. Kockling, assignor to General Electric Co. Special transformer winding producing zig-zag insulating and cooling passage between the coils.

1,173,005. Electrode. C. R. Krueger, assignor to General Electric Co. Luminous arc-light electrode.

1,173,040. Switch Mounting and the Like. H. R. Sargent, assignor to General Electric Co. For flush wall-switches. (See cut.)

1,173,052. Ignition Means for Gas Burner. C. E. Smith, Vernon, Canada, assignor of one-half to H. Lang, Vernon, Canada. Spark-plug circuits controlled from automobile dash.

1,173,058. Remote Control of Dynamo-Electric Machines. H. R. Summerhayes,



No. 1,173,040.—Switch Mounting.

assignor to General Electric Co. Starting rotary converters.

1,173,065. Vibrator. G. Vande, Los Angeles, Cal. Electromagnetic massage implement.

1,173,072. Automatic Fire Alarm System. W. Z. Wilkinson, Baton Rouge, La. Thermally controlled audible and general alarm and signal for indicating building.

1,173,079. Selective Tuning System. E. F. W. Alexander, assignor to General Electric Co. Method of selecting sustained oscillations of given frequency from disturbing oscillations differing in frequency.

1,173,084. Motor Car Protector. H. W. Beecher, Makanda, Ill. Key-controlled ignition and starting switches and steering shaft latch.

1,173,089 and 1,173,090. Dynamo-Electric Machine. S. R. Bergman, assignor to General Electric Co. First patent: Structure and winding of field of direct-current machine. Second patent: Arrangement of exciting and compensation windings in direct-current machine.

1,173,094. Tertiary Winding. L. F. Blume, assignor to General Electric Co. For transformers.

1,173,095. Party-Line Key. A. J. Carter, assignor to Kellogg Switchboard & Supply Co. Rocking and plunger keys interrelated for mutual restoration.

1,173,096. Lightning Arrester. F. S. Chapman, assignor to National Electric Specialty Co., Toledo, Ohio. Discharge melts solder which closes gap in ground connection.

1,173,099. Test Connector. J. Davis, Bloomington, Ill. Detachable clamp for temporarily connecting conductors.

1,173,121. Vehicle-Signaling Device. E. M. Rosenbluth, Philadelphia, Pa. Control and arrangement of electric direction-indicating lamps, audible signal and license-plate illumination for automobiles.

1,173,123. Automobile. E. M. Rosenbluth. Modification of above.

1,173,153. Dynamo Electric Machine. E. W. Stull, assignor to Allis-Chalmers Mfg. Co. Structure and arrangement of field member with commutating poles.

Patents Expired.

The following United States electrical patents expired on February 28, 1916:

620,110. Vehicle Lamp. J. W. Eisenhuth, New York, N. Y.

620,111. Cut-Out. E. B. Ellicott, Chicago, Ill.

620,117. Arc Lamp for Electric Lighting. D. Gertin, Corning, N. Y.

620,144. Multiphase-Current Transformer. E. L. K. F. Kahlenberg, Berlin, Germany.

620,172. Secondary Battery. G. Philippart, Paris, France.

620,196. Electric Time Switch. H. O. Swoboda, New York, N. Y.

620,197. Coin-Controlled Electrical Apparatus. R. W. Taylor, Sr., Chicago, Ill.

620,214. Carbon Holder for Electric Arc Lamps. S. Bergmann, New York, N. Y.

620,239. Electric Motor Suspension. G. Gibbs, Philadelphia, Pa.

620,254. Four-Tub Electric Bath. C. Schnee, Carlsbad, Austria-Hungary.

620,256. Means for Suspending Electric Motors. S. H. Short, Cleveland, Ohio.

620,257. Means for Suspending Motors. S. H. Short, Cleveland, Ohio.

620,283. Regulating Transformer. E. W. Cowan and A. Still, Bowdon, England.

620,302. Automatic Cut-Out for Electrical Transformers. W. J. Greene, Cedar Rapids, Ia.

620,305. Leuring Iron. W. S. Hadaway, Jr., New York, N. Y.

620,306. Electrically Heated Tool. W. S. Hadaway, Jr., New York, N. Y.

620,307. Process of Forming Magnesia Insulation upon Conductors. W. S. Hadaway, Jr., New York, N. Y.

620,308. Incandescent Arc Light. W. S. Hadaway, Jr., New York, N. Y.

620,309. Electric Fuse. W. S. Hadaway, Jr., New York, N. Y.

620,326. Electric Recording Apparatus. C. L. Jaeger, New York, N. Y.

620,327. Electric Recording System. C. L. Jaeger, Maywood, N. J.

620,333. Direct-Current Motor and Method of Operating Same. B. G. Lamme, Pittsburgh, Pa.

620,334. Direct-Current System of Electrical Distribution. B. G. Lamme, Pittsburgh, Pa.

620,335. Method of and Means for Varying Speed of Direct-Current Motors. B. G. Lamme, Pittsburgh, Pa.

620,336. System of Electrical Distribution and Regulation. B. G. Lamme, Pittsburgh, Pa.

620,343. Rotary-Transformer Regulation. R. D. Mershon, New York, N. Y.

620,365. Means for and Method of Electromotove-Force Regulation. N. Rowe, Wilkinsburg, Pa.

620,404. Electric Railway. L. M. Aspinwall, Pittsburgh, Pa.

620,440. Telephone Switch. W. D. Gharky, Philadelphia, Pa.

620,466. Process of Utilizing Spent Battery Solutions. J. Lones, Smethwick, England.

620,473. Electrical Machine. G. F. Martin, Corydon, Ind.

620,479. Sheet-Metal Trolley Wheel. G. E. Mettinger, Jr., Cleveland, Ohio.

620,491. Telephone Switchboard. J. M. Overshiner, Elmwood, Ind.

620,513. Combined Lighting and Alarm Device. J. Thorsen, North Aurora, Ill.

620,514. Potential Regulator for Dynamos. A. A. Tirell, Whitefield, N. H.

620,537. Coin-Controlled Mechanism for Electric Meters. W. F. Browne, New York, N. Y.

620,547. Signal System. E. L. Hall and G. Hall, Providence, R. I.

620,549. Electric Railway. J. F. Munsie, New York, N. Y.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, MARCH 11, 1916. No. 11.

EDITORIALS

PROSPERITY REFLECTED IN SPRING CONSTRUCTION PLANS.

In an effort to determine with some degree of accuracy to what extent the prevailing note of prosperity would be reflected in plans for spring construction, a comprehensive survey was made among light and power companies embodying requests for advance information on contemplated extensions and improvements. In our augmented "Current Electrical News" section of March 4, we presented a copious analysis of this information, with the hope that, in addition to presenting opportunities for the sale of equipment and material, some satisfaction could be gained from such a formidable array of evidence of prosperity.

There are two outstanding features of the situation as presented by construction plans already decided. Of first importance is the fact that the electrical industry is enjoying a period of unquestionable prosperity. Of nearly equal importance is the fact that there is not the slightest feeling among leaders in the industry that this prosperity is predicated on an abnormal industrial condition and is therefore only temporary. In fact, just the opposite view must be taken, as the nature of the work planned, involving as it does, millions of dollars, bears every evidence of permanency. Lines are being constructed to entirely new territory, generating stations are being rehabilitated, and new buildings are made necessary by unusual expansion. That so much is being done even in the face of high prices for labor and material serves to emphasize our optimistic view.

From the industrial standpoint there is one particularly salient feature which is emphasized by the glowing reports of new power business. For years power engineers and salesmen have been reiterating the advantages of flexibility as one of the most pertinent to the prospective power user. In these strenuous times when factories are straining every nerve to fill orders, when additions and extensions, and sometimes practically new factories have to be built over night, central-station power is coming into its own. Nor is flexibility the only advantage being demonstrated. With overtime operation the rule, economy of central-station service becomes at once apparent.

It is gratifying, of course, to see such evidences of prosperity in our own industry, but it is also extremely pleasing to see the extent to which electricity is contributing to the prosperity of other industries.

WIRING FOR THE FUTURE.

In the many campaigns which will be undertaken this month to popularize wiring of the home, it should be borne in mind that the wiring to be installed is not merely for today or tomorrow, but will be used for many years to come. The needs of the future should be anticipated. These may reasonably be assumed to include the use of many current-consuming devices which are not under consideration at the present time, and the provision of outlets for connecting such devices should unquestionably be made. Sometimes the mere suggestion of this future need to the house owner will be sufficient to insure its incorporation in the wiring plans; in other cases an earnest talk by the contractor's representative or the central-station solicitor will be necessary to convince him that the additional expenditure is wise.

There are three elements interested in the wiring of the residence, the occupant, the contractor who does the work, and the central station. It is to the advantage of all three that the wiring be adequate for the future as well as the present. To the central station it means greater consumption in the future, and perhaps also at once. To the contractor it means a larger contract. To the owner of the home it may mean little at present, when his only thought is to secure electric lighting, but it will mean much in the future, when his conception of electric service has been broadened to include a variety of heating and motor-driven devices. Often the deciding factor in the purchase of these devices will be the facility of applying them. There will be a disinclination to call the wiring contractor in a second time, and there will be the knowledge that the total cost is less when a complete job is made of the installation in the first place.

Full discussion of these features will induce many house owners to spend a little more in the first place in order to secure facilities that will be satisfactory in the future. It will at once be realized, for instance, that a single socket in a room will soon be found inadequate. While a plug cluster may make operation of some device possible without eliminating the electric light, it is likely to interfere with the glassware and involve a troublesome extension cord. Table lamps and floor lamps are introduced largely on the score of beauty and to fulfill their mission should be connected to wall or floor outlets, as the dangling cord from a ceiling fixture may largely destroy the desired effect. Similarly, fans, sewing-machine and washing-machine motors and innumerable other devices, require wall or base-

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board receptacles. A realization of all of these things should result in the exercise of some foresight and more ample provision of facilities.

Where strict limitation of the expense is the ruling consideration in an installation, the appeal for adequacy will probably fall upon deaf ears, but where a deferred-payment plan has been inaugurated, there is seldom a good reason why this consideration should be controlling. It might even be good policy for the central station to extend the period of instalment payments wherever the number of outlets exceeds a specified number. Of course it would not be well to discourage the prospective user of electric lighting from putting in a minimum lighting equipment if this seems to be the only possibility, but every encouragement should be given to secure an installation which will prove more satisfactory in the future and which will mean a greater revenue to the central station.

COURTS AND COMMISSIONS.

The question has more than once arisen as to the jurisdiction of public service commissions over utility companies whose affairs are in the toils of a court. For instance, if a company is in the hands of a receiver, appointed by the court, is it thereby placed beyond the reach of statutes which have been enacted for the purpose of regulating the rates, the service, or other operations of the utilities within the prescribed territory? The Chicago and Oak Park Elevated Railroad is a utility operating under a receiver appointed by a federal court. When the receiver refused to carry out orders of the Public Utilities Commission of Illinois, that body seemed to feel powerless to do anything in the matter. The question in that particular case was left unsettled.

The Supreme Court of Kansas has recently handed down a decision which gives an answer to this question. The Independent Gas Company, operating under a receiver, was involved in this case. The court held that receivers operating a utility are under the control of the commission to the same extent and in the same manner as the owners of the utility would be if they were operating the utility. It ruled that the commission, and not the court appointing the receiver, has power to fix rates. This ruling appears reasonable, and no doubt is just as applicable to service as to rates, and in Illinois as in Kansas.

The idea that persons possessing peculiar duties, privileges and responsibilities are thereby placed in a different position from others in regard to matters outside this particular field, is a pernicious one and needs curbing at every opportunity. It manifests itself in the disregard by officials of foreign governments for automobile speed regulations, in the illegal acts of many police officials, and in dozens of other ways. If those who find it safe to disregard law would be punctilious in observing it, we should have a much higher respect in this country for both the law and those to whom its enforcement is confided.

SAFEGUARDING ELECTRIC SERVICE BY AVOIDING CARELESSNESS.

The study of the causes of several electrical fires occurring during the past year indicates the continued importance of avoiding careless installation and handling of equipment. The safety of electrical service is undisputed, but occasional lapses on the part of operating employees, construction forces or users lead to minor troubles which easily might have been avoided. Thus, in changing over electric service from overhead to underground, in one case connections were wrongly made in the street, the neutral wire entering the building being connected to one of the outside wires in the street. The result was that the current entered over the neutral wire, passed over the ground wire to the water service, overheating the ground wire and burning off its insulation. The circuit was opened by the burning of the ground wire, but no other damage was done. In another instance the solenoid coil of a remote-control switch was overheated to the smoking point, due to carelessness in holding in a push button operating the switch and permitting current to flow continuously in the coil. No fire occurred outside the inclosing cabinet, which was fireproof.

A slight fire in a motion-picture booth was caused by an employee, with two reels of films, each inclosed in a metal box as required, attempting to operate a jack-knife switch. The metal box of one of the reels came in contact with the live parts of the switch, causing a short-circuit which melted holes in the box and set the film on fire. The damage was confined to the destruction of one film, about 1000 feet in length, and the wetting down of the booth by extinguishers. Mishandling of an oil can at the terminals of a one-twelfth-horsepower, six-volt, ten-ampere starting motor on an automobile led to a short-circuit across the motor terminals, with ignition of gasoline vapor and about $300 damage to the car.

In another case, an attempt to fasten a wire behind the terminal post of a rheostat whose binding screw had become lost, led to the formation of an arc through vibration, and ignition of adjacent paper. Improper temporary repairs in connection with restoration of service to a 0.5-horsepower motor was the verdict in another case. Again, a loose connection on the neutral wire of a three-wire set of feeders where the latter were attached to the service cutout and switch led to sparking and the burning of a wooden platform below. Secure attachment of wiring at lugs is a vital necessity of first-class service. Arcing through dampness in an installation of knob-and-tube work resulted in the burning of a few inches of wire, and a defectively insulated joint in wiring at a wall-bracket outlet led to the ignition of gas when the joint was jarred by a passing train into contact with a gas pipe.

Troubles of this character are entirely preventable,

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and emphasize the importance of intrusting installation work only to approved persons or firms; of common-sense handling of equipment; and of avoiding amateur methods of extension and repair in cases where standard methods might be utilized.

ELECTRIC HEATING OF BUILDINGS.

The electrical method of heating buildings has a number of obvious advantages. It can be closely controlled, requires no attendant, does not vitiate the air, causes no dirt and leaves no refuse. It is equally applicable to a hot-air system or a radiating system. With respect to the latter it has the advantage over steam and hot-water systems that the radiators may be made self-luminous. This appeals especially to those who have been accustomed to open fires.

While electric heaters have been largely used as auxiliaries, their introduction as the main dependence for heating large buildings has been very limited. The principal installations of the kind in this country have been in the West, where hydroelectric energy is available. The heaters are usually placed in the basement, and the hot air distributed to the different rooms. This greatly simplifies the electrical installation, as compared with placing a radiator in each room. The hot-air system has the disadvantage, with respect to direct radiation, that a higher air temperature must be maintained, and consequently more power used. Where radiation falls directly upon the individual, a cooler atmosphere is equally comfortable, and at the same time a higher relative humidity can be maintained, which is another element of comfort. This element in heating is better recognized in England than in this country, and perhaps accounts somewhat for the greater popularity of radiant heaters in that country.

To secure the most economical use of electric energy in heating, the assistance of automatic thermostatic control is essential. This statement might be made with reference to any system of heating, but it is especially important in the case of electric heating because the unit of heat usually costs more from this source and because electric current adapts itself especially well to automatic control. The amount of electric power necessary for heating a building will depend upon a number of variables, such as atmospheric conditions, proportion of window space and frequency of air renewal. From one to two watts per cubic foot of air space has been found satisfactory. In severe climates the higher figure should be allowed, and dependence placed upon the control features to prevent the use of an excessive wattage. Even where thermostatic control is not adopted, there should be sufficient steps in the range of control to adapt the consumption to mild weather.

ELECTRIC COOKING IN TEXAS.

While the cost of electric heating is not found to be the prime consideration in its introduction, any more than cost decided the early introduction of electric lighting, so also cost competition with fuel is found to be a minor consideration in the introduction of electric cooking. Except as to the occasional hobby of the wealthy, cost always has been and no doubt will continue to be, one element influencing the applications of electric service. But it is by no means the controlling element. Naturally, trial installations prove most popular where cost comparisons are favorable, and hence electric cooking and house heating have both made greatest progress in those parts of the West where coal is expensive and gas is not available.

The introduction of electric cooking is, however, by no means confined to such territory as the above. Its extension in the East is progressing rapidly, and especially so where central stations are alive to the desirability of this load, are making rates appropriate to the load-factor and diversity-factor of such customers, and are pushing campaigns for its introduction. Many parts of the South already have made substantial progress in this development, and what can be done in face of the competition of cheap fuel is indicated by an article in this issue which relates the experience of a Texas company in some missionary work of this kind. The summer season naturally points the argument for electric cooking, and an expansive development in this territory is looked for when warm weather sets in. Some active publicity and sales work is required here, as in all other introductory endeavor, to secure the greatest results; but the preliminary results secured during the advance work in an off season augur well for the coming campaign, and add weight to the statement that comparative fuel costs are not the deciding element in the problem.

ELECTRICALLY HEATED CLOTHING.

An application of electric heating which has been brought into the lime-light by the European war is in warming the human body. Electrically heated blankets, chauffeurs' gloves, and similar devices have been on the market for some time, usually adapted to sources of current which do not require to be carried about the person. Soldiers are of course subject to unusual exposure during winter weather, and often under conditions which forbid exercise.

It is reported that the Teutonic soldiers have been supplied with clothing in which a resistance wire is woven to constitute a heating element. As the longest periods of inaction are represented by waiting in the trenches, it is not necessary to have individual supply, but cables are run in the trenches and connected to the nearest power plant, and the individual soldiers connect themselves to these cables.

Such preparation would no doubt add greatly to the comfort of the men in the trenches, but when the cost and the likelihood of rapid deterioration and early renewal of such clothing is considered, it seems unlikely that any large number of soldiers have been thus equipped.

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Happenings in the Industry

Manufacturers Licensed to Use Resistance Wire—Program for Convention of Wisconsin Electrical Association—Electrics at Boston Automobile Show—Ohio New-Business Managers to Meet—Data on Rail Joints and Bonds—Novel Alaska Power Development—Dallas Utility Problems—Minnesota Electrical Association Meeting—Miscellaneous News Notes

Heating-Device Manufacturers Licensed to Use Resistance Wire.

The Hoskins Manufacturing Company and the General Electric Company, owners of the Marsh patent, No. 811,-859, have licensed the following manufacturers of electric heating devices to use nickel-chromium wire as a resistance element: American Electrical Heater Company, Cutler-Hammer Manufacturing Company, Hotpoint Electric Heating Company, Hughes Electric Heating Company, Landers, Frary & Clark, Pelouze Manufacturing Company, Simplex Electric Heating Company, and S. Sternau & Company. Two companies at present using this wire do not appear among those licensed.

Although this licensing arrangement goes into effect at once, royalties will not be collected, it is thought, until some time next fall, when it is expected that the prices of all heating appliances using nickel-chromium wire will necessarily be increased. This action is taken since many of those non-licensed had orders booked for delivery at present prices far into the future.

It is stated by the owners of the patent that they do not intend "to proceed against any dealer, jobber or central station with respect to resale of infringing devices in the past, provided that such dealer, jobber or central station in the future purchases devices embodying the inventions of these patents made by the Hoskins company, the General Electric Company or their licensees authorized to make such devices, and does not purchase or deal in infringing devices except to dispose of reasonable stocks now on hand."

The Driver-Harris Wire Company, manufacturer of nichrome wire, a nickel-chromium wire used largely by heating-device manufacturers, stated that it was still in conference with the owners of the patent, and that so far no final decision had been made regarding which manufacturers of nickel-chromium wire should be licensed.

Program for Convention of Wisconsin Electrical Association at Milwaukee, March 16 and 17.

The Wisconsin Electrical Association's annual convention will be held in the Club Room of the Hotel Pfister, Milwaukee, Wis., on March 16 and 17, 1916.

March 16 will be a joint session with the Wisconsin Gas Association. The Wisconsin Gas Association's convention begins on March 15.

The following is a list of subjects on which papers will be presented:

"The Attitude of the Wisconsin Railroad Commission on Security Issues," by Harold L. Geisse, secretary, Railroad Commission of Wisconsin; "A Review of State Legislation During the Past Session," by John B. Sanborn, of Sanborn & Blake, Madison, Wis.; "Methods of Taxation of Public Service Companies in Wisconsin and Why Taxes Have Been Increasing Annually," by T. E. Lyons, member Wisconsin Tax Commission; "Outdoor Substations," by H. W. Young, president, Delta-Star Electric Company; "Rates for Residence Electric Service," by A. C. Babson, manager, Wisconsin Gas & Electric Company, Watertown; "Street Lighting Rates and Contracts," by G. W. Van Derzee, assistant to vice-president, the Milwaukee Electric Railway & Light Company; "Two Years' Experience One-Man Car Operation," by R. M. Howard, general manager, Wisconsin Railway, Light & Power Company, Winona, Minn.; "The Telephone Company and the Electric Utility," by H. O. Seymour, general manager, Wisconsin Telephone Company, Milwaukee.

The following subjects will be presented for discussion: "The National Electrical Safety Code," by S. B. Way, vice-president, the Milwaukee Electric Railway & Light Company. This discussion will be in conjunction with the Wisconsin Electrical Association's Committee on Overhead Distribution. "Automatic Current-Limiting Circuit-Breaking for the Protection of Railway Feeders and Rotary Converters."

The entertainment feature of the Association will be a banquet in the Fern Room of the Hotel Pfister at 7 p. m., on March 16. Speakers of national reputation will be present. Lou J. Beauchamp, famous Chautauqua lecturer and humorous philosopher, will be the principal speaker of the evening.

George Allison is secretary-treasurer of the Association.

Extensive Showing of Electric Automobiles and Trucks at Boston Automobile Show.

Novel and attractive incandescent lighting effects are a feature of the Boston Auto Show, which opened March 4 and closed March 11. Twelve-inch brass globes studded with electric lamps of various colors were suspended from the center of arches between bays, and lines of lamps outline the roof structures.

The General Vehicle Company's exhibit included a 7,000-pound truck, painted in white. There was also a one-ton chassis, for demonstrating the method of transferring the batteries and the type of drive.

The D. C. Tiffany Company, New England distributors of the Ward Special service wagon, showed a 750-pound wagon, selling for $875, for which it is claimed that the user is able to get business in territory that cannot be reached by horse-drawn vehicles. The Ward can be charged, stored and washed for $20 a month, whereas it costs about $30 a month to keep a single horse and wagon. The vehicle carries a 42-cell Ward battery and a heavy-duty, series-wound motor which drives through the propellor shaft to the rear axle. It is claimed that the vehicle will run 40 to 45 miles on a single charge. A Westinghouse automatic charging outfit is offered for $70, by D. C. Tiffany Company.

Two Detroit electric coupes and one Milburn coupe were shown by E. Y. Stimson, Boston agent. The vehicles are all 5-passenger capacity, the Milburn being notable for its light weight. The Detroits are single and duplex drive, respectively, and are of handsome lines.

In connection with the show, Boston truck dealers featured the low costs of operating this type of delivery service for coal and other heavy merchandise. New England is very progressive in adopting this type of delivery. Nearly all the large coal companies around Boston use

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the electric for short hauls. One coal company operates eight 6-ton trucks and is abandoning the use of horses. The company claims that inside a 2.5-mile radius the electric is more economical than a gasoline truck. One of its 6-ton electric trucks delivered 84 tons of coal in 9 hours, at a total cost of only $15—less than 20 cents a ton delivered, including all expenses. It made 14 trips, with a total mileage of 34 for the day. The same amount of work was done per hour than was formerly accomplished by two two-horse teams, with four men, in 3.5 hours. Another Boston coal firm operates its electric trucks 18 hours per day, with two shifts, one of the sets of batteries being kept on charge during the day for the night shift, and vice versa.

Dealers in auxiliaries who exhibited were the American Storage Battery Company, Pettingell-Andrews Company, Wetmore-Savage Company and the Barnstead Electric Water Still Company, Boston.

Ohio New-Business Managers to Hold Important Meeting.

A very interesting program has been arranged for the convention of new-business men to be held in Springfield, O., on March 15, under the auspices of the Committee on New-Business Co-operation, of the Ohio Electric Light Association. There will be an address of welcome by Weare Parsons, general manager of the Springfield Light, Heat & Power Company and this will be followed by a number of extremely pertinent papers dealing with important topics. After the business session a visit will be made to the plant of the Robbins & Myers Company.

The following is the program in detail:

Paper, "The Golden Rule in the Utility Business," by E. Burt Fenton, publicity manager, W. S. Barstow & Company, New York City; paper, "The Value of Residential Business to the Central-Station Company," by G. A. Lowther, Sandusky Gas & Electric Company; paper, "Results Obtained from Kitchen Service Installations," by T. F. Kelly, commercial manager, Dayton Power & Light Company; address, "Salesmanship," by F. B. Hutchinson, sales manager, The Kelly-Springfield Motor Truck Company; paper, "Electric Industrial Trucks," by C. E. Ogden, representative, Walker Vehicle Company, Cincinnati, O.; paper, "Solving the Heating Problem and Securing the Power Business," by A. C. Shepherd, Cleveland Electric Illuminating Company.

J. E. North, of the Springfield Light, Heat & Power Company, is chairman of the committee.

Data on Rail Joints and Bonds.

"Modern Practice in the Construction and Maintenance of Rail Joints and Bonds in Electric Railways" is the title of Technologic Paper No. 62 just issued by the Bureau of Standards, Department of Commerce. The paper is largely a compilation of information in the nature of data and opinions submitted by 42 electric railway companies who answered inquiries sent out by the Bureau.

Analysis of the data shows that soldered bonds have been demonstrated to be unsuccessful and are now practically obsolete while all other types of standard bonds are capable of giving good results, but only when carefully installed.

Loose rail joints are shown to be the most prevalent cause of bond failures and as a result there appears to be a marked tendency toward the adoption of improved methods and materials in their construction. The adoption of various types of welded joints to take the place of the common bolted joint appears to be in progress in most of the larger cities. The whole problem of track bonding is shown to be in a state of evolution owing to new inventions and recent improvements in methods of construction and as a result complete standardization of these practices cannot be expected for some time to come.

The character of track bonding is determined largely by the necessity for good operation and the prevention of stray currents which have a corrosive action on underground pipes. Economic considerations are shown to be of secondary importance.

Bottom of Alaska Lake Dynamited to Connect It with Power Plant.

From Juneau, Alaska, comes information that one of the most intricate and daring tasks in the annals of mining engineering was completed in Juneau, on February 15, by the Alaska-Gastineau Mining Company, of which D. C. Jackling is vice-president and general manager. The task consisted of boring a tunnel 1,200 feet long through a mountain, installing a 42-inch pipe line two miles long, leading to the power house, installing turbines, erecting steel towers and power lines, and then exploding more than a ton of dynamite, which blew out the bottom of Annex Lake thereby connecting the lake to the generating plant of the company. The tunnel was completed within six feet of the bottom of the lake, when drills were installed, dynamite placed in the holes and exploded with an electric spark. The Annex Lake project added 12,000 horsepower to the generating plant of the Alaska-Gastineau Company, which now has a capacity of 18,000 horsepower. The cost of the project was in excess of $500,000, and the entire plant of the company, in operation at this time, cost more than $5,000,000. Annex Lake is one and one-half miles long and a quarter of a mile wide and about 200 feet deep. It is situated at Taku Inlet, 18 miles from Juneau. Aerial trams were built to transport the materials for the towers, and the wire for the transmission lines. The plan of tunneling through the mountain and tapping the bottom of the lake was conceived by D. C. Jackling, and was carried out under the supervision of Bart L. Thane, manager; H. L. Woolenberg, chief engineer, and Frank Frick, general foreman.

Utility Problem Will Be Put Before People.

By a vote of three to two the Commissioners of the City of Dallas, Tex., have voted to submit to the people at the April 4 election a charter amendment bearing on the utility problems of the city.

A "model franchise" will be submitted for approval. This will provide for service at cost and a fixed rate of return on the property of the electric light and street railway company. The franchise also places a valuation on the two properties and this valuation basis is the point on which the city officials and utility officials cannot agree.

It is possible that the utility officials will also submit a franchise to the people and present indications point to the probability of a sharp contest on the two franchises. Preliminary negotiations between the city officials and utility were reported in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 4, 1916.

Minnesota Electrical Association to Meet March 21-22.

The annual convention of the Minnesota Electrical Association will be held at the Radisson Hotel, Minneapolis, Minn., March 21 and 22.

Questions of public policy, new business, company methods and engineering will receive the attention of the delegates. Among the papers to be presented will be those on "Electric Cooking," "Rates for Electric Service," "Attitude of the Central Station Toward the Consumer," "Boiler Plant Efficiency," and "Rural Line Extensions." These papers will be fully discussed and commented upon.

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Miscellaneous NEWS NOTES

Los Angeles Jovians Hear Address.—Seward A. Simons, attorney, of Los Angeles, spoke on "Classic Mythology" before a meeting of the Jovian Electric League, Los Angeles, Cal., March 1. Henry F. Holland presided as president, with Fred C. Moon, chairman.

Safety Bulletin for Customers.—The Kansas City Light & Power Company is distributing to its residential customers copies of a bulletin dealing with safety and accident prevention, particularly as applies to electric service in the home.

Louisville Pays One Cent Energy Bill.—The smallest bill ever paid by the city or presented by the Louisville Gas & Electric Company has just been approved by the City Council and will be paid in due course by the city. It is for the net amount of 1 cent and has the signatures of seven city officials, including the Mayor. The company does not make a minimum charge for a meter-rental charge.

Radio Club Organizes.—The Louisville Radio Club, W. W. Smith, president, has been organized by men interested in electrical matters, both professional and amateur. The members will work principally for advancement of wireless telegraphy. Meetings are held at the offices of the Tafel Electric Company, 236 West Jefferson Street, at regular intervals and addresses delivered by experts on technical subjects.

Kentucky Electric Companies to Have Right of Eminent Domain.—Bills have been passed by the lower house of the Kentucky Legislature to permit electric companies operated by steam power to exercise the right of eminent domain, thereby placing them on a par with hydroelectric concerns; also a bill to give steam-operated companies the right to use the public roads, such as are now enjoyed by the water-power companies.

Plymouth Has New Lighting System.—Improved street lighting of the famous old town of Plymouth, Mass., was inaugurated March 1, when about 20 magnetite arc lamps on the main street were lighted for the first time. Chairman Eldridge pressed a button switch which turned the electricity on, and there were speeches by prominent citizens and an industrial parade. The energy is supplied by the Plymouth Electric Light Company.

Samuel Insull Honored at Dinner.—A dinner given to mark the recent election of Samuel Insull, president of the Commonwealth Edison Company, Chicago, Ill., as an honorary fellow of the Royal Colonial Institute of London, was given March 3, by Chicago Fellows of the Institute. This distinction of honorary membership has been conferred only five times during the organization's fifty years of existence. The Colonial Institute assumes in colonies a position similar to that of the Royal Society as regards science.

Design of Power-Station Buildings.—At a meeting of the Western Society of Engineers held in Chicago on March 6, James M. Hatch read a paper on "Power Station Buildings," this dealing particularly with the design of the structure itself and of the foundations for it. In this he urged that some consideration be given to architectural adornment which gives dignity to the power plant and has a commercial value as well. The cost of such additional artistic treatment may amount to an addition of one one-half of one per cent of the total cost of the plant. Mr. Hatch emphasized particular care in the study of the soil and drainage of the site of the plant upon which the nature of the foundations to be used must be determined. Among those who discussed the paper were Messrs. Hecht, Keller, Brandon, Walbridge, Steinman and Hatch.

Submarine Cable to Nantucket.—A submarine telephone cable is to be laid during the coming summer, to connect the island of Nantucket, off the Massachusetts Coast, with the mainland.

Lecture on Illumination.—"Light, Shade and Color in Illumination" was the subject of a lecture given before the Lynn (Mass.) Section of the A. I. E. E., March 8, by M. Luckiesh, physicist, of the Nela Park Laboratory, Cleveland, O.

Merger of Public Service Corporations Approved.—The State of Pennsylvania has approved the merger of the following 13 companies, the new company to be known as the Northwestern Electric Service Company of Pennsylvania: The Middleboro Light & Power Company, the Fairview Township, the Girard Township, the Edinboro, the Venango Township, the Venango, the Woodcock Township, the Saegertown, the Pine Township, the Summit Township and the Linesville Township Light & Power Companies to merge with the McKean Township Light & Power Company. S. M. Hatch, Erie, Pa., is president; A. O. Chapin, Erie, is secretary, and Charles Fahr, Meadville, Pa., is treasurer.

Adjustment of Rates for Electric Lighting Urged.—The Massachusetts Legislative Committee on Public Lighting has heard a petition which asks for legislation to bring about a readjustment of lighting and power rates in the state, with a view to making them more uniform and consistent. Objection was voiced to the practice of some companies of charging 10 cents per kilowatt-hour for lighting and two cents for other uses, for electricity supplied from the same mains at the same time.

New Power Plant for Buffalo.—A steam power station of 60,000-kilowatts capacity is now under construction in Buffalo, N. Y., for the Buffalo General Electric Company. The installation will include three 20,000-kilowatt turbogenerators with five boilers of approximately 13,000 square feet of heating surface each, necessary steam and electric auxiliaries, coal-handling apparatus and trestle, and intakes and discharges for the condensing system. The Stone & Webster Company is doing the engineering.

Factory Lighting Code to Be Discussed.—A joint meeting of the Illuminating Engineering Society and the American Society of Mechanical Engineers will be held Tuesday evening, March 14, at 8:15 p. m., at the Engineering Societies Building, New York, N. Y. At this meeting the subject of a new code for factory lighting will be discussed. A committee of the Illuminating Engineering Society has prepared a code for factory lighting, intended to be used by factory owners to improve their lighting conditions, and by legislative bodies to serve as a basis for legislation which shall prescribe minimum values for different kinds of factory lighting. As this subject is also of importance to the mechanical engineers, the meeting has been arranged to discuss the subject from the standpoint of the two societies. C. E. Clewell, chairman of the committee that drafted the code, will give an outline of the preliminary work leading up to the formation of the code, the necessity for it, and a brief outline of its main points. L. P. Alford, for the American Society of Mechanical Engineers, will discuss the subject and bring out those points that seem most important from the mechanical engineering standpoint. Aside from these two speakers, other prominent members of legislative bodies, representatives of labor and those interested in factory operation will be present to add their discussions. The object of the meeting is to get as wide a diversity of opinion as possible so as to make the code valuable from a practical as well as engineering standpoint.

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Selling Ranges in Natural-Gas Territory

Comprehensive Electric-Range Campaign in Texas Results in 80 Sales During First Three Months and Many Prospects Are Available for Spring—Operating Data Show Average Cost Per Consumer to Be $3.00 Per Month

WHAT THIS ARTICLE TELLS YOU

How a territory was analyzed preparatory to initiating an electric-range campaign.

How interest was stimulated through a toy-range contest among the children.

How satisfaction is assured to users by having a demonstrator teach the proper use of the range in the home.

How the obstacle of cheap natural gas was overcome and 80 electric ranges sold in three months.

Seemingly a wave of electric-cooking thought is now sweeping the country. The immense amount of power business taken on by central stations during the past few years, business which as a whole has been secured at a low rate for energy, has helped central-station managers to realize that electric cooking is a desirable class of load and has such decided advantages that it can be secured at a rate which will be profitable both from the central-station and consumer standpoint. Electric-range advertising in national publications and in special sections by range manufacturers has also helped sell this idea to the central station, and the far-seeing manufacturers who started this advertising are now reaping the profits from investments so made during the past few years.

Naturally, the West, due to the low rates made possible by extensive water-power developments, took the lead in this new phase of electric business building, and much good work has been done in that section of the country. Low rates, high cost of fuel, and high cost of servant labor has helped the West in the development of the electric cooking load.

So strong, however, has been the wave of conviction that some sections where many difficulties are presented have taken up this question and are working it out to a successful solution.

Early last fall one of the utilities companies operating in Texas and serving several towns and communities, in all aggregating in population over 300,000, decided to do some exploitation work in this line and accordingly made preliminary investigations to determine the best method of procedure. Data were obtained from different parts of the country where work had already been done and with these data as a guide a study of the territory to be worked was made. In going over the field it was found that the following conditions would have to be met:

(1) Low cost of fuel in the majority of towns served. Many of these towns have cheap natural-gas fuel.

(2) The extensive use of inexpensive negro-servant labor.

(3) General lack of education on the part of the people of this section to the advantages of electricity in the household.

(4) Natural prejudice as to cost of operation of electric ranges due to small size of towns served and consequent rate for lighting purposes.

(5) High first cost of electric-range installation.

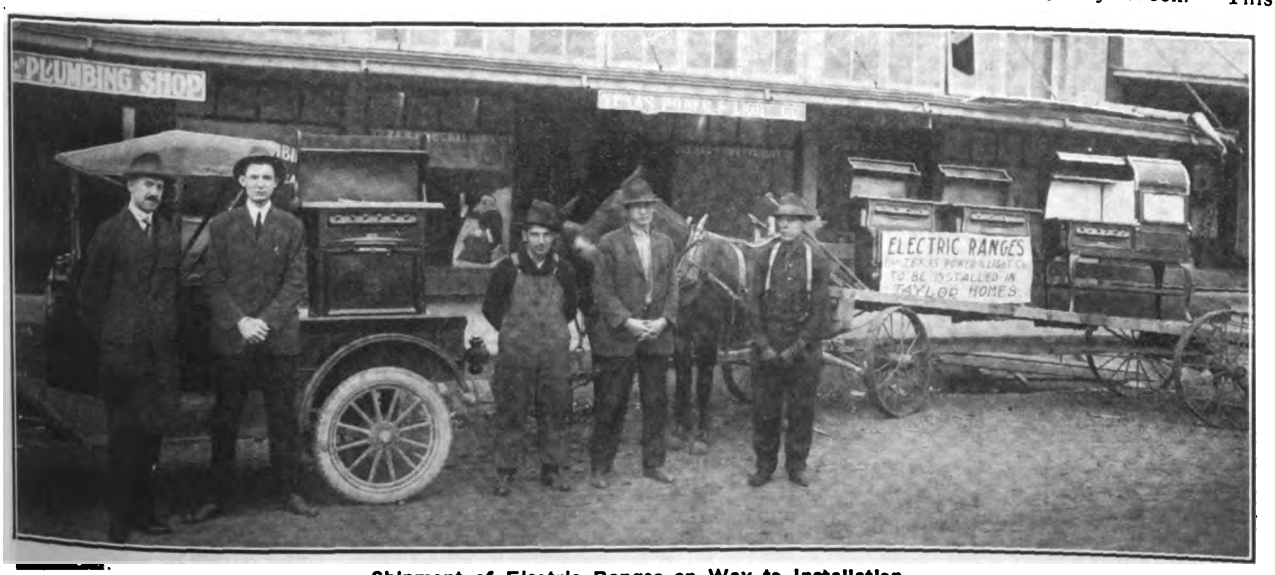
(6) Season of the year bad on account of fact a certain amount of heat needed for warming kitchen.

Viewing the whole situation it was decided that a regular campaign, in the usual meaning of the word, was not feasible and so the word "exploitation" was suggested as offering the best way to make a start. Accordingly, during the first few months' operation of the plan, no attempt has been made on a hard selling campaign, but on the other hand the company has tried to put in a few ranges in each town served and in this way lay the basis of a comprehensive campaign for the summer, naturally the best season of the year to push this business.

As a preliminary step and with the hopes of getting in touch with some live prospects a demonstration was held in October at the State Fair in connection with the other exhibits of the company. Two demonstrators were placed in charge here and everyone manifesting any interest in the subject was talked to and a considerable number of active prospects in various towns thus secured. These were followed up later.

Obtain Interest of Children.

Another educational move which created general interest was held during "Electrical Prosperity Week." This



Shipment of Electric Ranges on Way to Installation.

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After a Range Is Sold a Demonstrator Instructs the Housewife How to Obtain the Best Results.

was in the form of a "Toy Range Contest" which has been previously described in these columns. An illustration of one of the young winners is shown herewith. By getting the children interested in electric cooking it was hoped to indirectly interest their mothers and this ideal will undoubtedly bear fruit later. This toy range as an introduction to the larger electric range, in the writer's opinion, is one of the best ideas ever evolved. This same "toy" plan has also proved successful in the case of a well known make of vacuum cleaner. One of these little ranges was given away in each town where the company operates.

Coming back to the general plan of exploitation it was decided that on account of low fuel cost in many of these towns, economy of electric cooking would carry little selling weight and following the line of least resistance no towns having cheap natural-gas fuel were worked, except in a few isolated cases where prominent families who lived some distance from the gas mains were found. Little trouble has been found in securing this latter class of business as in most cases such families are well able to afford the first cost of installation as well as the operating cost which, as data below will show, is very reasonable.

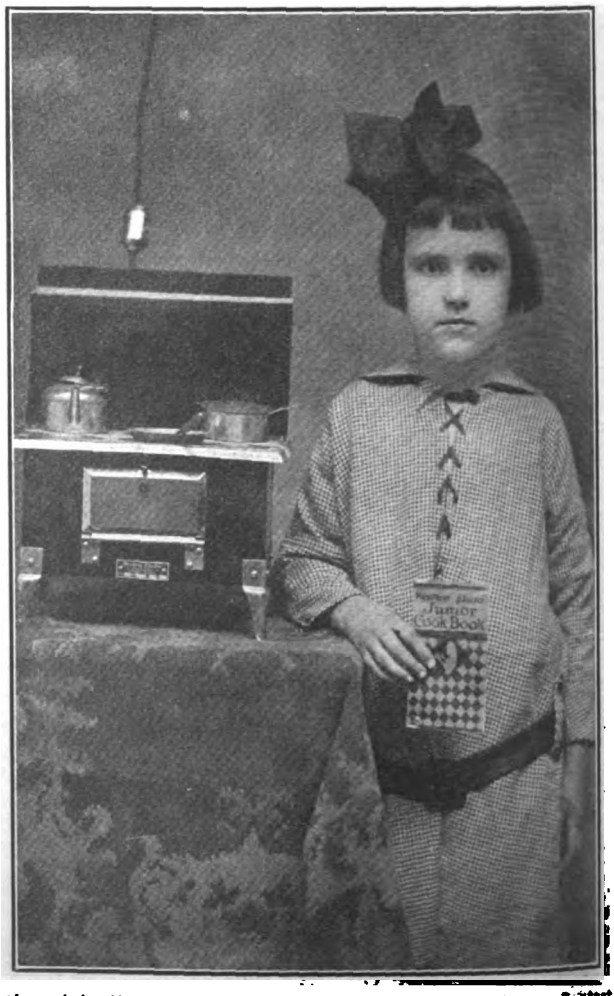
Three cooking rates were established, these being applicable to different installations. It is left to the choice of the customer which rate he will take, but this choice usually falls back on the company. As seen from the data the average net rate for residential business amounts to approximately three cents per kilowatt-hour.

Demonstrators Teach Use of Ranges.

The second difficulty, that of educating the servant, has been found to be not so hard as first imagined. In each branch town a local demonstrator, who works on commission, has been secured. It is the duty of these demonstrators, in most cases domestic-science instructors, to develop prospects and to make actual sales where possible. Their main work, however, is to keep in touch with prospects where ranges have been installed on trial and teach these prospects the proper use of the range. These ladies receive a commission for placing a range on trial and receive another commission if the sale is made. In connection with the servant problem some difficulty was met in preventing the servants from doing "boiling" on the top of a range. Boiled dinners are prevalent in many parts of the state, especially in the fall. To overcome this tendency which results in excessive current consumption, all ranges being sold are equipped with what is known by the manufacturer as "vegetable cookers." These cookers are sunk into the top of the range and have a steam casing around them. They take very little current and operate in a manner similar to the ordinary "fireless" cooker. All ranges sold have at least one of these cookers and many of them have three. The type which has three is more suitable for this territory.

No general educational work other than demonstrations has been attempted as yet, though an extensive campaign is now being planned to overcome this difficulty. When the first visit is made to a town by salesmen, a lady demonstrator goes with them and a demonstration held in the local office to serve as an introduction to that particular town. These demonstrations are advertised and if for no other reason than curiosity are well attended. It is up to the salesman to pick out the interested prospects and follow them up. One salesman and a lady demonstrator assisted by a manufacturer's representative have so far been doing all the work, but the company's regular house-wiring salesmen are being "broken" into the game, the idea being to make use of them in the spring campaign.

In order to overcome most easily the natural prejudice as to cost of operation, all ranges have been installed on



Interest in the Campaign Was Fostered by a Toy-Range Contest In Which the Grown-ups Also Participated.

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Form 195 ELECTRIC RANGE PROSPECT. 200-11-22-15.

Mrs._____ Type of Range
Address_____ R-1___ S-1___
Town_____ S-2___ S-3___

Number in family_____ Adults_____ Children_____
Circumstances: Excellent_____Good_____Poor_____
Probable number of payments 3_____6_____9_____12_____
Present fuel: Wood_____Coal_____Gas_____Oil_____
Demonstration promised _____
Given_____Probable date of sale_____
Has prospect an automobile? Yes_____No_____

Personal friend of,
Mrs._____Town_____
Why a prospect? _____

Date of calls _____
Literature sent _____

Form Used for Tabulating Data on Prospects.

30-day trial, the company standing the cost of installation in case the range is not purchased. While this method is expensive in that it requires a large stock investment and the cost of wiring in some few cases, nevertheless, in the long run, it is probably the most economical. Prospective users will not have a range installed on free trial unless they are reasonably sure of keeping it if it proves satisfactory. Sales are more easily made on this basis and the full confidence of the prospective user is obtained. This plan has been followed throughout all the work and while in some few cases ranges have been changed (another type substituted) 90 per cent of all trial installations made have resulted in purchases and in every case enthusiastic users. The spirit of co-operation and service suggested to a prospect when this plan is mentioned makes a strong appeal and in the work to be done this spring the company will no doubt profit by the recommendations of the customers already obtained. It was estimated that the average consumption of the residential user would be approximately 100 kilowatt-hours per month with a net bill of $3.00. The data given will show that this estimate has been very closely approached

Until the present time most of the families approached have been of the better class and those who could afford the initial cost of the range. However, a deferred-payment plan exists whereby payment can be made along with the light bill for a small amount each month. This has been found satisfactory.

Electric Water Heater as Adjunct.

Perhaps the biggest stumbling block has been the season of the year. Although the climate of Texas taking it the year round is comparatively mild, nevertheless heat is required during some of the winter months and this is usually the first question brought up. "How am I going to heat my kitchen?" This is a serious objection at such a time of the year and one which puts the salesman on his mettle. While "Cook and keep cool" can be the sales slogan in summer it does not apply in winter. When this question is brought up it is explained to the prospect that the electric range can hardly be used for heating the kitchen and a small wood or coal stove is suggested. This objection will of course not be met in the North and West where houses are steam-heated or heated from some central source. In some cases it is impossible to overcome this objection and all the satisfaction that can be obtained is to get the prospect's promise to go into the matter in the spring.

Another objection frequently met is the matter of heating water. It is probable that this objection will be stronger when the towns which have an artificial-gas or natural-gas supply are visited. A coil heater has been secured for this purpose, this heater being installed on one side of a double-throw switch so that it cannot be connected to the line while the range is in operation. This insures the company that the maximum demand on transformers will not exceed the maximum demand of the range.

In three months' time 80 ranges have been placed in service, and while some of these are still on trial, the trial period not having expired, the majority have been sold. These ranges represent installations in 21 different towns, so it will be seen that good distribution has been secured.

In the spring it is planned to make an aggressive campaign and with this object in view the names of all prospects in the territory are being secured together with a considerable amount of data which will be of interest in pushing the business. These data are turned in on "Prospect Cards," an illustration of one being shown herewith. This gives information which will be useful to the salesman in introducing himself and information which can be used to make a personal appeal in circular letters. Form letters will be used and postscripts containing personal points will be typed into these as they are filled in. By means of these cards the mailing list can be divided into almost any desired classification and letters which are definite and appeal to the particular prospect can be constructed and sent out. For example, a special appeal might be made to all prospects who use wood for fuel.

"Service," the essential of good business in public service work, has been recognized and accordingly a transformer is being put in on every range installation to insure proper voltage regulation. Of course, as the number of ranges increases the ratio of transformers to ranges will decrease. Good regulation, however, is absolutely necessary in the operation of electric ranges and this is a precaution which should be given careful consideration.

The data given herewith show results of operation in eight typical cases.

Operating Data.

(A) Type of range—low oven. Two hot plates, three cookers and oven burner. Capacity 6 to 15 persons. Total connected load, 3,500 watts. Total days operated 63. Kilowatt-hours used 294. Average net monthly bill $3.46.

(B) Type of range—low oven. Two hot plates, one cooker and oven burner. Capacity 6 to 12 persons. Total connected load 4,500 watts. Total days operated 45. Kilowatt-hours used 108. Average net monthly bill $1.96.

(C) Type of range—low oven. Two hot plates, one cooker and oven burner. Capacity 6 to 12 persons. Total connected load 4,500 watts. Total days operated 49. Kilowatt-hours used 195. Average net monthly bill $2.75.

(D) Type of range—low oven. Two hot plates, one cooker and oven burner. Capacity 6 to 12 persons. Total connected load 4,500 watts. Total days operated 37. Kilowatt-hours used 127. Average net monthly bill $2.66.

(E) Type of range—low oven. Two hot plates, three cookers and oven burner. Capacity 6 to 12 persons. Total connected load 3,500 watts. Total days operated 41. Kilowatt-hours used 136. Average net monthly bill $2.71.

(F) Type of range—low oven. Two hot plates, three cookers and oven burner. Capacity 6 to 15 persons. Total connected load 3,500 watts. Total days operated 56. Kilowatt-hours used 180. Average net monthly bill $3.11.

(G) Type of range—low oven. Two hot plates, three cookers and oven burner. Capacity 6 to 15 persons. Total connected load 3,500 watts. Total days operated 44. Kilowatt-hours used 143. Average net monthly bill $3.44.

(H) Type of range—low oven. Two hot plates, three cookers and oven burner. Capacity 6 to 15 persons. Total connected load 3,500 watts. Total days operated 45. Kilowatt-hours used 119. Average net monthly bill $2.77.

The general average kilowatt-hour consumption on these installations for 30 days is 103. The average net monthly bill for 30 days is $2.90. It is interesting to note that 62.5 per cent of these installations run below the average.

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Electricity in Shoe Manufacturing

A Discussion of the Advantages of Electricity in the Shoe-Manufacturing Industry with Special Reference to the Application of Electric Heat

Industrial Power Series—Article No. 157.

Shoe manufacturing is an industry in which great advancement in production has been brought about during the past 50 years. Early methods of shoemaking consisted entirely of hand processes. The itinerant shoe maker went about the country, stopping in the homes and there producing the shoes needed by the family.

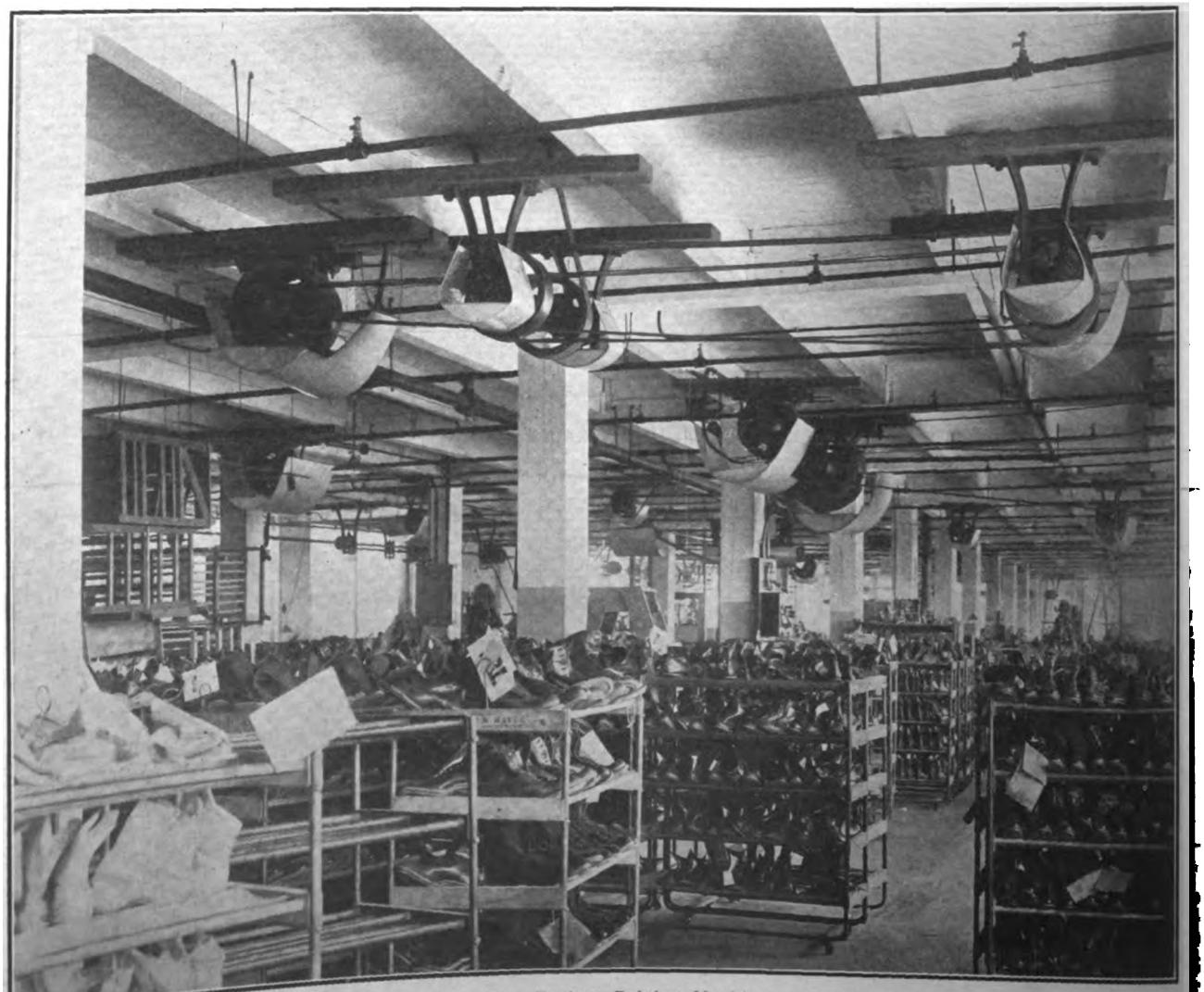
The early shoemaker who undertook the business of producing shoes for market cut the leather into parts which he distributed to people of the neighborhood, the latter making up the shoes at their homes. In this development of the industry, the men did the heavier parts of the work and the women did the sewing and other lighter processes.

About 1850 this "farming out" method of production gave way to centralized, factory production. At the present time the shoe making industry is so specialized that most parts are bought of manufacturers making a specialty of that part, the shoe factory being practically an assembling shop of the various parts into the completed shoe.

The use of electricity in shoemaking was originally confined to the means of drive for the various machines. During the past few years, the application of electricity has been extended, so that now there are nearly a score of shoe machines which have electrically-heated adjuncts. Among these are wax-pots on stitchers, backing presses, stamping and embossing machines, welters, bobbin winders, knurling machines, treeing irons, burnishers and tool and knife heaters. Principal manufacturers of these machines are the United Shoe Machinery Company, Beverly, Mass., and the Boston Last Company, Boston. The heating apparatus employed by the latter concern is the Simplex type, made by the Simplex Electric Heating Company, Cambridge, Mass.

Uses of the backing press, by which electric heat is applied to parallel disks between which cloth backing is glued to thin leather, giving the latter greater durability, have resulted in great savings, it being possible, as never before, to utilize scraps and practically waste pieces of leather. A Haverhill, Mass., shoe factory using a backing press finds the cost to be about one cent a pair.

One of the most active workers in the introduction of electric heating in shoemaking processes is Davis M. DeBard, of the Edison Electric Illuminating Company, of Brockton, Mass. In a recent issue of the Stone & Webster *Journal*, Mr. DeBard describes the process of



Group of Motors in Shoe Factory Driving Machines on Floor Above.

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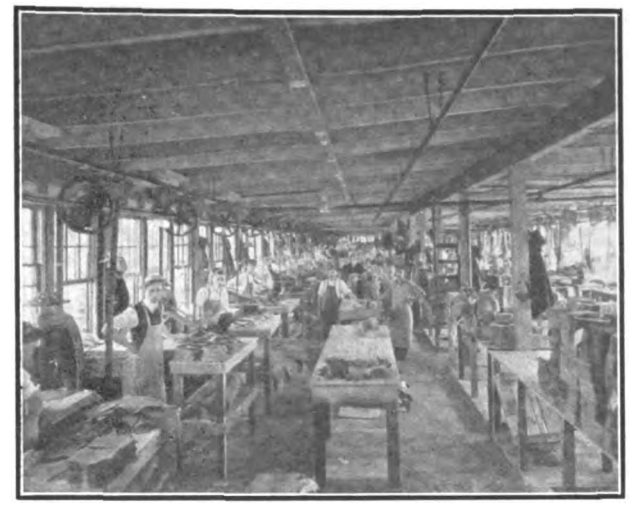
"Making" Room Showing Use of Racks.



Cutting Room of a Shoe Factory.

manufacture in his locality, which is one of the largest shoe-manufacturing centers in the world. A large share of the machinery drive is by electric motors, and the use of electrically heated machinery is rapidly increasing, displacing gas, steam, etc.

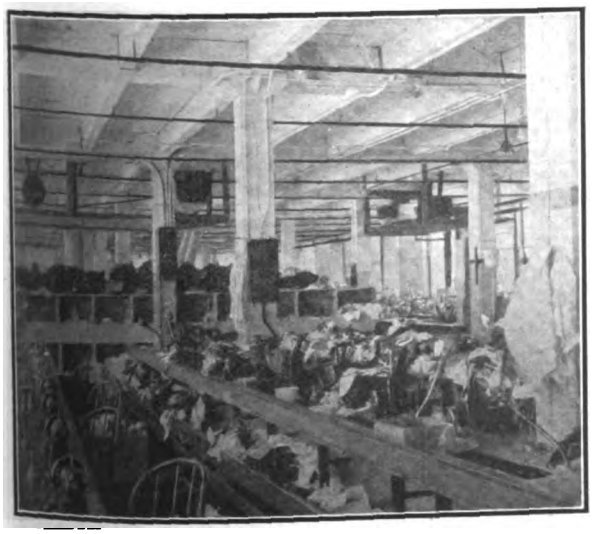
The departments of a shoe factory usually consist of cutting, stitching, lasting, making, finishing, treeing, dressing and packing rooms, the shoes going from one operator to another and from one department to another. Each operator performs one operation only, for which he is paid so much per pair. The racks start in the lasting room and continue in a straight line through the factory to the packing room, where 24 pairs are placed in a case for shipping.

To increase the output of a shoe factory, not planned for in the original layout, entails considerable expense, as the rows in each department must be pushed along to accommodate additional ones, keeping their same order so that the racks will follow the same straight line through the factory. The average shoe factory making 1,800 pairs of men's goodyear welt shoes per day requires approximately 50,000 square feet of floor space, 500 operators and 100 horsepower in motors. The layout of such a factory, with the number of kilowatt-hours consumed by each department per 100 pairs of shoes made, is given herewith.

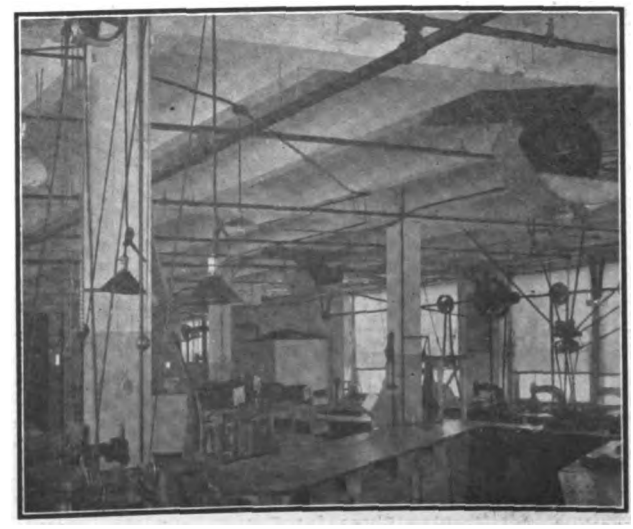
Reckoned at the average rate for such service from the central station, the cost of electricity used would be about one cent per pair. It has been difficult sometimes to interest shoe manufacturers in central-station power, because this item is such a small one in shoe manufacture. Formerly, it was necessary for shoe factories to have live steam for process work, *i. e.*, to heat glue, wax, etc., and to soften the upper leather when drawn onto the soles. The application of electric heat simplifies the central-station power salesman's problem, as the argument for steam drive is no longer as valid as before, and the heating of the factory can now be done by low-pressure steam, without the need of highly paid licensed steam engineers; and the heating problem is entirely absent six months of the year. The processes formerly calling for gas, *i. e.*, those of stamping and embossing, now are performed with electric heat; hence the whole problem of heat and power is reduced to the single factor, electrical energy.

MOTORS.

Department.	No.	Horsepower.	Kilowatt-hours per 100 Pairs.
Cutting room	1	7.5	2.9
	2	1	
Stitching room	7	1	4.8
	2	2	
Lasting room	1	3	.8
Making room	1	2	
	2	3	
	3	5	12.2
	1	10	
	1	7.5 (blower)	
Treeing and Dressing room	2	1	.3
Finishing room	1	2	
	2	5	6.3
	1	10 (blower)	
Sole leather room	1	7.5	2.9
Elevators	1	3	.9
	1	7.5	3.1
Electric heating	..	....	2.
Electric lighting	..	....	
Total	30	103	36.2



Group of Motor-Driven Eyelet Machines.



Group of Motor-Driven Die Cutters.

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Mr. DeBard describes, in the article mentioned, the important part electricity is playing in the production of rush orders received by Brockton firms for shoes for the armies of foreign countries. "One factory owner stated that he could not have taken an army order had he not had central-station service," he says. "In two instances the connected load has doubled and the normal output trebled in 30 days. In one instance a four-story addition to a factory 50 by 100 feet was started, completed and equipped within 15 days."

Some factory managers have claimed that shoes could not be produced at a profit with night work, because of the large number of skilled laborers, with excess wages, the exactness of work required, and for other reasons. There are, however, a large number of shoe factories at present operated almost continuously night and day. Lighting arrangments have been perfected, so as to facilitate work, and the central station also takes care of power requirements. In fact, the 24-hour load is raising the valley of several central-station curves remarkably.

A factory making army shoes has evolved the following interesting data:

SHOE FACTORY TEST.

Connected Motor Load—247.5 horsepower.
Connected Light Load—52 kilowatts.
Connected Heat Load—2.55 kilowatts.
Average kilowatt-hours used per 100 pair of shoes made, 16.45.

24-Hour Day.	Power, Kilowatt-hours.	Light, Kilowatt-hours.	Heat, Kilowatt-hours.	Total Kilowatt-hours.	Power, Maximum Demand Kilowatts.	Power, per Cent Load Factor.	Power, Average Power-Factor.	Light, Maximum Demand Kilowatts.	Heat, Maximum Demand Kilowatts.	Pairs Shoes Made.	Kilowatt-hours 100 Pair Shoes.
1	2,410	490	12	2,912	140	67	77.0	39.0	1.44	18,000	16.2
2	2,380	510	15	2,905	140	66	69.9	38.4	1.92	18,000	16.2
3	2,490	500	13	3,003	142	69	69.6	42.2	1.4	18,000	16.7
5	2,680	530	10	3,220	148	74	68.4	40.3	1.8	18,000	17.8
4	2,400	500	5	2,905	140	67	72.2	40.3	1.8	18,000	16.2
6	2,320	500	15	2,835	145	64	66.8	42.2	1.9	18,000	15.7
7	2,460	520	18	2,998	142	68	69.7	42.2	1.7	18,000	16.6
8	2,320	500	17	2,837	135	64	67.5	42.2	1.9	18,000	15.7
9	2,430	520	17	2,968	135	62	69.4	42.2	1.9	18,000	16.5
10	2,530	520	9	3,059	150	70	72.0	42.0	1.5	18,000	16.9

With a day and night shift, on the usual central-station power rate, the cost of electrical energy would be less than one-half cent per pair of shoes, which shows, by comparison with the data given above, to what extent maximum production reduces the net cost. Progressive central-station managers in shoe-manufacturing districts will do well to see whether electrical operation cannot be extended further along the lines of heating of machines, as well as in the direction of improved incandescent lighting, and universal motor-drive.

Candlepower Measurements of Series Gas-Filled Incandescent Lamps.

Considerable discussion has taken place of late as to the best method of rating the candlepower of incandescent lamps. That the horizontal candlepower is far from satisfactory is well known. Some test results were given by Ralph C. Robinson in a paper read at the midwinter convention of the Illuminating Engineering Society.

Several Mazda C lamps were made up for 6.6-ampere series circuits. They were of the so-called 80-candlepower type in the regular S-24½ bulbs. The filaments were spiralled in the form customary in this lamp but were mounted in four different positions. The object of the experiment was to determine the reduction-factor for the calculation of spherical candlepower from the mean horizontal candlepower. To make the lamps more nearly comparable, the filaments were all operated at the same temperature, 2,825 degrees Kelvin. To make the candlepower reading easier and more accurate, blue screens were inserted in every instance between the standard lamp and the photometer.

As is well known, the mean horizontal candlepower of gas-filled lamps cannot be determined by the usual method of rotating the lamp. For this reason, the candlepower was measured at every ten degrees around the lamp in a horizontal plane and the mean of these values taken.

The spherical measurements were made in a 50-inch Ulbricht sphere, using the same method to get a good color match as was used in the horizontal determinations.

The results obtained are tabulated below:

		Mean horizontal.		Spherical.		
Filament mounting.	Watts	Candle-power.	Watts per candle.	Candle-power.	Watts per candle.	Reduction factor.
V-shaped	66.2	100.7	0.66	82.5	0.805	0.82
Vertical	75.5	126.8	0.595	93.7	0.805	0.74
Horizontal	75.9	93.5	0.82	95.2	0.800	1.01
Diagonal	77.5	122.0	0.635	95.2	0.815	0.78

This table shows several very interesting results. First, the mean horizontal watts per candle are very different for the different filament mountings. This is due to the fact that the horizontal filament in certain positions is almost completely hidden by the lead wires, or by other portions of the filament, thus making the mean candlepower low. In the case of the vertical filament, very little is hidden at any point, so that the mean horizontal candlepower is high. The V-shaped and diagonal filaments are affected less than the horizontal, and hence their horizontal efficiency is better, although not so good as that of the vertical filament.

The watts per spherical candle are practically the same for the different types of filament.

Inspecting and Packing Shoes for Export in a New England Shoe Factory.

Shoe Factory Working at Night Supplying War Orders.

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Power-Customer Statistics in Massachusetts

An Interesting Analysis Showing Extent of Power Development in 24 Municipalities with Reference to Population, Energy Used and Rates

In our issue of February 26, 1916, there was presented a study of lighting customers of important central stations in Massachusetts, showing the relation between the number, and consumption of energy, of consumers in varying territories, with some reference to prices of commercial lighting.

Herewith is presented a table showing the nature of plant and the characteristics of territory, the population, number of customers for power, their average kilowatt-hour consumption and the relation of price to the lighting rate. A careful study of these figures shows that the number of kilowatt-hours of energy per power customer varies as widely as thirteen-fold; i. e., from a minimum of about 3,000 to a maximum of nearly 40,000 hours per year. The low figure is found in the case of a small steam electric plant serving a distinctly summer-tourist and "aristocratic" residential seaside city of about 20,000; while the high figure represents a plant which is linked in with a system of hydroelectric transmission, though generating locally in large part, and serving a community noteworthy for its diverse industries, in the operation of which motorized machinery plays an important part.

Other companies and plants which do a large power business are those of the central part of the state, all or most of which are connected with the hydroelectric system referred to, but having steam plants which are either kept in reserve for emergency service, or operated as auxiliaries, all or part of the time. These plants are characterized by overhead transmission systems, for the most part, with underground construction only in the local business centers. Such lines as those which tie the stations together are partly on private right of way, and operated at high voltages. It is to be noted that the number of power customers per 1,000 population is in almost exactly inverse ratio to the kilowatt-hours per customer, in a large majority of instances noted.

On the other hand, it is observed that the large urban centers, generally, have the largest number of power customers per 1,000, with correspondingly small number of hours used by each. This would indicate the prevalent use of a few, or single, motors by a large number of firms or individuals, whereas the opposite situation represents a few very large motorized establishments. The metropolitan area exemplifies this condition, the number of customers being comparatively large, and their use of current for power purposes relatively small. The yearly average for the Boston territory is about 3,200 kilowatt-hours per customer.

Textile centers are evidently, as yet, small users of central-station power, though there is a marked tendency toward the adoption of central-station drive in cotton and woolen mills. Notable examples of this are the Pilgrim mill at Fall River, Arlington mill at Lawrence, Naumkeag, Salem, and the recent decision of the proprietors of the Manomet mill, New Bedford, to equip a new mill with central-station motor drive. These are, however, exceptions to the general condition, that of steam or water-power propulsion. Shoe-manufacturing towns, however, show a good proportion of power customers, and consumption per customer is well above the average. Suburban residential communities in general call for power in small units, in connection with diversified trades.

A remarkable exception to the general rule is found in the case of Cambridge, which, though largely residential, is also an important manufacturing center. Here there are a large number of large power customers, central-station energy being applied to as widely diverse activities as pork-packing on the one hand, and text-book manufacture on the other hand, with the operation of Harvard in between.

The relation of power consumption to the whole population shows some interesting divergencies. The largest amounts are found in large centers having large industrial plants; while the averages reach their minimum in suburban residential and summer-resort communities. Textile cities, however, average low.

PLANT	Nature of Territory	Population	No. Power Customers	Kw. Hrs. Sold for Power	Kw. Hrs. per Customer	Kw. Hrs. per 100 Population	Power Customers per 1,000 Population	Average Power Rate, Cts.	Average Commercial Lighting Rate Cts.	Ratio of Power to Commercial Ltg. Rate Per Cent
Small Central Station Co.	Small Industrial City.	19,000	163	1,861,000	11,417	9,795	8.6	7-1.75	(11 cts.)	..
Large Steam Plant.....	Suburban Industrial..	105,000	445	6,166,000	13,856	5,865	4.2	2.725	8.573	32
Metropolitan Company...	Boston and Suburbs..	987,000	9,201	29,605,000	3,222	3,000	9.3	3.673	6.334	58
Medium Size Central Sta.	Shoe Mfg. Center.....	94,000	421	3,892,000	9,244	4,140	4.5	3.191	9.750	33
Distributing Co. for Hydro-Electric.....	Scattered Industrial...	28,000	40	1,112,000	27,800	3,971	1.4	1.812	13.112	14
Large Central Station....	Textile Mfg.....	126,000	209	6,707,000	32,091	5,323	1.7	1.969	8.316	24
Small Steam Plant.....	Diverse M'f'tures.....	38,000	121	4,833,000	39,942	12,719	3.2	1.725	11.066	15
Distributes Hydro Elec...	Few Large Mills.....	20,000	176	2,454,000	13,943	12,270	8.8	1.736	9.586	18
Municipal Plant.....	Large Paper Mfg. Cen.	58,000	272	8,013,000	29,459	13,813	4.7	1.838	5.935	31
Combination Gas & Elec. Co.....	Textile City.....	111,000	507	1,556,000	3,069	1,402	4.6	3.851	9.871	39
Med. Sized Steam Plant..	Textile City.....	125,000	436	4,373,000	10,030	2,498	3.5	2.934	8.229	35
Combination Company...	Shoe Mfg. City.....	105,000	445	3,969,000	8,919	3,780	4.2	2.434	8.371	29
Med. Sized Steam Plant.	Suburban Residential.	117,000	341	2,322,000	6,809	1,984	2.9	3.491	10.187	34
Small Steam and Distributing.....	Shoe Town.....	25,000	179	1,097,000	6,128	4,388	7.1	10-1.5	(15-12)	..
Large Steam.....	Textile City.....	107,000	368	2,037,000	5,535	1,904	3.4	2.662	8.839	30
Small Steam.....	Interior Industrial....	23,000	94	2,319,000	24,760	10,082	4.1	2.186	8.199	27
Small Steam.....	Diverse Industrial....	38,000	372	1,956,000	5,231	5,147	9.8	2.242	8.153	27
Small Steam.....	Residential & Tourist.	18,000	193	563,000	2,917	3,128	10.7	10-3	(14.4-9)	..
Steam Station.....	Suburb Res. and Small Ind.....	33,000	131	877,000	6,695	2,839	4.0	10-4.5	(13.3-10)	..
Med. Sized Steam Station	Residential Shoe and Textile.....	44,000	203	4,021,000	19,808	9,137	4.6	1.702	9.736	17
Steam Station.....	Residential and Summer Resort.....	28,000	85	374,000	4,400	1,336	3.0	4.5-1	(11-5)	..
Large Steam Plant.....	Intensely Industrial...	104,000	721	9,212,000	12,776	8,857	6.9	2.302	6.852	33
Large Steam Plant.....	Intensely Industrial...	149,000	614	13,957,000	22,731	9,367	4.1	2.096	7.345	28
Med. Sized Steam.....	Shoe Mfg. City.....	44,000	303	3,398,000	11,121	7,723	6.9	2.387	9.894	24

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Minneapolis Company Establishes Low Cooking Rate.

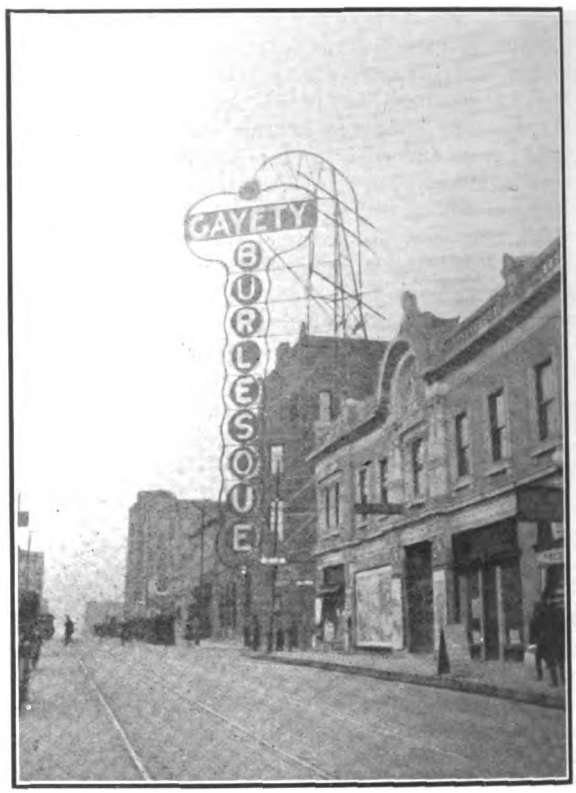
The Minneapolis (Minn.) General Electric Company has put in effect an electric cooking rate of 2.5 cents per kilowatt-hour, less 5 per cent for prompt payment. The rate applies to all electric current used in residences after the first six kilowatt-hours per room per month, all current used by the customer passing through the one meter. During the past several weeks the Minneapolis Company has been advertising preliminary to the sale of electric ranges. It is the intention to develop the electric cooking business of Minneapolis, where it is believed the substitution of electricity for other fuels in the kitchen will become popular within a short time. Various manufacturers of electric ranges are preparing to do a large business in Minneapolis during the coming summer.

Effective House-Wiring Appeal.

The Concord (N. H.) Electric Company, in featuring its house-wiring campaign, utilizes the idea of the brightness and warmth that are implied by an electrically-lighted home, particularly in the frigid winter climate of Northern New England. Art and argument combine to render the accompanying newspaper advertisement, which occupied a space five columns wide in the local newspaper, appealing to every householder in the Concord company's territory. The manager, Levin J. Chase, is widely reputed for the cleverness of his publicity output.

A special house-wiring offer is being made by the company during the campaign.

Attractive Advertisement Used in Concord House-Wiring Campaign.



New Kansas City Sign Visible in Four Directions.

New Kansas City Sign Visible in Four Directions.

The electric sign on the Gayety Theater, Kansas City, Mo., is one of the most striking in the city, and is designed to be visible from four directions, similarly to the electric sign on the Willis Wood Theater, previously described in these columns. The Gayety sign is 75 feet high and 26 wide, and contains 3,226 10-watt lamps on the 110-volt city circuit. It is mounted on a tower extending 45 feet above the roof, the tower having been built in Kansas City. The sign is equipped with a flasher, which spells out the words "Burlesque" and "Gayety," one letter at a time. All letters are five feet. The framework is mesh, the letters having solid background. The sign itself weighs about 3,000 pounds, the tower weighing about four tons. The tower rests on a roof space about 18 feet square, as shown in the accompanying illustration.

Activity at Lowell, Mass.

The Lowell Electric Light Corporation, Lowell, Mass., is delivering more energy regularly than ever before in its history, resulting largely from large power customers, several of whom are operating on a 24-hour schedule. During the past month the company has sold a large number of household electric utensils. Indications point to a good business in house lighting and appliances during the coming months.

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Pittsfield Company Offers Premium to Stimulate House Wiring.

In order to stimulate house-wiring before the rush period, the Pittsfield (Mass.) Electric Company is offering a six-pound electric iron as a premium for contracts calling for the wiring of already-built houses. The accompanying illustration shows an advertisement featuring this offer and giving the details of the campaign.

The schedule adopted for this campaign embodies the following features:

The following prices are only for single and double buildings outside of the first fire district and are based upon acceptance within 30 days from quotation and upon the use of iron conduit for the entrance from the outside of the building to the cellar and upon the use of either iron conduit or flexible armored cable for all wiring in the cellar.

No. 1. Iron conduit entrance and outlet or receptacle located in any room on the first floor anywhere except ceiling	$12.92
No. 1 and 1 outlet additional	16.56
No. 1 and 2 outlet additional	19.50
No. 1 and 3 outlet additional	22.50
No. 1 and 4 outlet additional	25.57
No. 1 and 5 outlet additional	28.69
No. 1 and 6 outlet additional	30.92
No. 1 and 7 outlet additional	33.18
No. 1 and 8 outlet additional	35.48
No. 1 and 9 outlet additional	37.82
No. 1 and 10 outlet additional	40.20
No. 1 and 11 outlet additional	41.85
No. 1 and 12 outlet additional	43.50
No. 1 and 13 outlet additional	45.15
No. 1 and 14 outlet additional	46.80
No. 1 and 15 outlet additional	48.45
No. 1 and 16 outlet additional	50.10
No. 1 and 17 outlet additional	51.75
No. 1 and 18 outlet additional	53.40
No. 1 and 19 outlet additional	55.05
No. 1 and 20 outlet additional	56.70
No. 1 and 21 outlet additional	58.35
No. 1 and 22 outlet additional	60.00
No. 1 and 23 outlet additional	61.65
No. 1 and 24 outlet additional	63.30
No. 1 and 25 outlet additional	64.95

In houses of mixed flooring the prices will be the same as given in the preceding table except as follows:

Located under double flooring, otherwise than hardwood, second or third story;	
Ceiling outlet	$1.00 extra
Switch outlet (controlling any center outlet)	1.00 extra
Located under hardwood flooring, single, double or triple, second or third story;	
Ceiling outlet	$3.00 extra
One switch outlet (controlling any center outlet)	3.00 extra
Additional switch outlets on same gang (controlling same center outlet)	1.50 extra

The cost of hardware and drop cords, to be added to the above items depending on the number of outlets, is as follows:

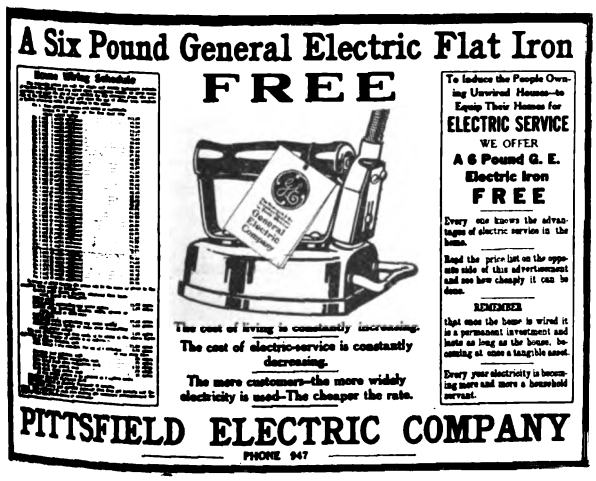
Push button switches, each	$1.00 extra
Push button 3-way switches, per set of 2 switches (3-way snap 50c)	2.75 extra
Porcelain base switches, each	.35 extra
Porcelain base Edison receptacles, each	.35 extra
Base board flush plate receptacles, each	1.15 extra
Drop cord, key socket, each	.60 extra
Drop cord, chain socket, each	.75 extra

(3-way switch outlets to be counted as 2 outlets each)

Minimum monthly payments, $2.00.

Maximum period of monthly payments, 12 months.

The above prices and monthly payment plan do not include any fixtures.



Advertisement of Pittsfield Company

Central Station Arranges Educational Lectures for Women's Clubs.

The New York City Federation of Women's Clubs has just announced an interesting course of free lectures to be given under the auspices of the Home Economics Committee. The course runs until the end of April and all of the lectures are to be held at the New York Edison Company's Bureau of Home Economics. On March 9, Mrs. Lily Haxworth Wallace, president of the National Associated Clubs of Domestic Science, talked on "Foods." On March 23, Mrs. Ray Balderston of Teacher's College, will talk about "Laundry Methods." The following Thursday, March 30, Dr. O. M. Leisser of the New York City Board of Health, will speak about "Beauty Hints and Patent Medicines." Mrs. Claudia Quigley Murphy, consultant in Home Economics, will discuss "Home Decoration" on the afternoon of Thursday, April 13, and Miss Helen L. Johnson, chairman of Home Economics General Federation of Women's Clubs, will speak on "Home Economics" on Thursday afternoon, April 27.

All of these subjects will be treated from a viewpoint of the latest developments and applications of electricity. The two which have already been held were largely attended and give promise of the popularity of the ones to come. After each lecture ten minutes is given to discussion followed by demonstrations and tea. The lectures were arranged by Mrs. Eugene J. Grant, president of the Federation of Women's Clubs, Mrs. Charles D. Hirst, chairman of the Home Economics' Committee, and Miss Ann Broome, manager of the Bureau of Home Economics of the New York Edison Company.

San Diego Utility Commended for Quick Work.

The San Diego Consolidated Gas & Electric Company has been commended by press and public for its remarkably quick work in restoring service after the recent floods in southern California. The San Diego *Herald* said:

"The prompt work of the public utilities companies in restoring their service after the recent flood should be a lesson to our city and county officials, who are still wondering where is the best place to begin the work of reconstruction. The Gas and Electric Company surpassed all the others in quick action; they were the first to replace their service in all the outlying sections, and within three days had mains and lines all restored, except that section which supplies Tia Juana."

Joplin Company Fosters Civic Pride

The Empire District Electric Company, Joplin, Mo., which recently prepared and published for free distribution a pocket map of Joplin, has recently added another item to its literature advertising that city. This is a card, bearing facts about the district and a few pointed suggestions for community activity, closing as follows:

"The motto of every man, woman and child in the district should be:

"I live in the district.

"I talk the district.

"I am the district.

"Pull together—awaken public spirit for a bigger, better, busier, brighter district."

Co-operative Advertising in Boston.

An entire Electrical Page was a feature of the *Boston Journal* of February 24, when leading manufacturers and contractors took advantage of the opportunity to set forth their specialties, the Boston Edison Company occupying a liberal amount of space.

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Electric Piano As a Field For Central Stations

Correlated Action on Part of Manufacturers and Utility Companies to Extend the Use of Electrically Operated Instrument—Load of 200,000 Horsepower Predicted

Concerted action to bring the merits of the electrically driven player-piano to the attention of the public is being made by the manufacturers of the instruments and recently the co-operation of the central-station industry has been secured through the Commercial Section of the National Electric Light Association. In an address made recently before the New York Electrical Society, Elmer A. Sperry, president, presented some interesting statistics which convey an idea of the enormous field for the sale of central-station energy if only a reasonable percentage of the number of pianos now in use were converted to electric operation. On the basis of one-tenth-horsepower motor for each piano, an ultimate load of 200,000 horsepower is available, when it is considered that there are at least 2,000,000 pianos used in districts now served by central-station lines.

To further the commercial exploitation of the electrically driven player-piano, as well as electrically operated talking machine, the National Electric Piano Makers' Organization Committee has been formed in New York City and on February 10 held a meeting at the Engineering Societies Building at which officials of the Commercial Section of the National Electric Light Association attended. It is the purpose of this organization to induce central-station companies to arrange for a display of the electrically driven player-piano in every central-station electric shop or display room. Referring to the possibilities in this direction an official of the piano manufacturers' organization stated that "every central-station should have on exhibition one or more examples of the several types of electrically driven player-pianos, or installable electric-player actions or electric-player devices that are going to prove to be real revenue produces for the electric light companies. The very purpose of the display rooms maintained at great expense by the electric light companies is to indelibly impress upon the mind of the public, in a given locality, the manifold uses of electric current in the home and surely the electrically driven player-piano represents the highest and most esthetic employment of electric energy.

"Another respect in which the electrical interests can further the sale and distribution of electrically driven player-pianos, and in so doing increase the public use of energy, is in advocating that use in their "house organs," which the electric-lighting company of each and every city publishes, and in illustrating the patent advantages of the electrically driven instrument over the foot-operated player of old.

If they were to call the attention of the public, for example, to the sostenuto effects that may be had from the hand-cut music roll when that roll is inserted in an electrically driven instrument and played by the mere turn of a switch they would show the tremendous advance which the electrically driven instrument has made upon the old-time player with its machine-cut rolls."

To further bring the electrically driven player-piano to the attention of the public through the medium of central stations, the piano manufacturers suggest that under their joint auspices concert demonstrations can be held in the various central-station show rooms.

That the central-station industry should take cognizance of the opportunity offered by the electric player-piano is the opinion of officials of the Commercial Section who have looked into the possibilities. It has been stated by prominent members of the National Electric Light Association that the action taken by the Commercial Section Executive Committee, in bringing the electrically operated instrument to the attention of the central-station interests in a most favorable light, would develop the featuring of the instrument by individual electric light and power companies under varying circumstances and conditions.

In certain instances a company would welcome the placing of one or more instruments in its local display room, and might even undertake the sale of instruments upon a commission basis, while in other instances the instruments would be incorporated in local electric light shows, in "electrical prosperity weeks" and like celebrations arranged to increase popular and local interest in the acquirement and use of electrical apparatus and devices, in which classification, of course, electrical players and talking-machines come.

In every instance the manager or technical assistant of a piano wareroom may call upon the local central-station company for the fullest advice and assistance in the working out of any minor problem as to current or of the superficial repair of motors, storage batteries or other electrical apparatus incorporated in a piano or talking-machine and for the "coaching" of salesmen in the elementary principles of electricity that enter into the sale of an instrument and its installation in a home that may, or may not, be already wired for electric service.

Correlated action on the part of the manufacturers and utilities seems to be assured.

The importance of the new art of the electrically driven player-piano is not at all appreciated. It might be said that the entire piano industry is now devoting its attention and energies to the subject.

On the assumption that there are 300,000 pianos made yearly in this country, a figure which is somewhere near the actual fact, and that the average piano remains in use at least ten or fifteen years, it will be seen that there are some four million pianos in actual service in the United States at the present moment.

Assuming that only half the population of the country is within reach of central-station circuits, it appears at once that at least two million pianos could be electrified.

Going one step further and allowing that each piano requires a motor of about one-tenth horsepower, and the average may be higher, this would represent a possible demand for 200,000 horsepower of central-station energy at some time during the day, steadily for two or three hours at a time.

Such a new demand is not to be despised, and this is one reason why the Commercial Section of the National Electric Light Association has been investigating the subject, with the idea, I am informed, of placing an electrically driven player-piano in every electrical showroom in the country. The subject, however, goes far beyond this, and interests the entire industry, not only in its electrical and scientific aspects, but because of the enormous new demand that it opens up for motors, switches, wires, control apparatus, and other elements and apparatus.—From an address by Elmer A. Sperry, president of the New York Electrical Society.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ANOTHER ANGLE ON THE WOOD-WASTE PROBLEM.

Factors to Be Considered by the Power Engineer.

Waste in a woodworking plant as a rule is listed by the power salesman as an insurmountable obstacle to a contract for central-station service. Generally, perhaps, the conclusion is unavoidable. The old problem looms as large as ever, and the man who can solve it will find a waiting welcome. Still it does not follow by any means that the sawdust pile and the heap of chunks constitute an impassable barrier in every case. In fact, the wise power salesman will consider each instance by itself and will investigate each plant as an individual proposition.

Take, for instance, the large number of dimension mills which cut rough lumber to sizes. Furniture factories, vehicle plants, etc., come under this classification. The waste here will ordinarily be more in the way of butts, chunks, ends, and slivers than of sawdust. That such concerns are practicable prospects for the central-station power salesman, can be shown by citing the experience of a certain Middle Western concern.

This is a dimension mill which is an adjunct of a large sawmill, working largely in imported timber. Much of the lumber produced is of lower grades, of course, and, in the board-measure market, would have brought unprofitable prices. In order to market this lumber as advantageously as possible the dimension mill was established. It works in kiln-dried lumber, and turns out pieces cut to more or less standard dimensions, for which there is a large and ready market.

For the first few years the company, directed by mill men who had always found it necessary to burn the waste in order to dispose of it, continued to throw this into the furnace. Occasionally calls for such fuel came in. Peddlers got to buying it and retailing it for kindling or fire wood. Little by little this trade grew and eventually the company adopted the policy of selling all the marketable waste and supplementing the sawdust and small scrap fuel with coal. Now this plant, selling the bulk of its waste, operates almost wholly on coal.

It is situated in a city of 300,000 or so and there is a considerable demand for the dried wood from the bakers who operate on the old basis and from householders who prefer wood for open fires or stoves. So, for some time now, the plant has been operated wholly on coal, except for the slight waste. And the system is being handled profitably, with a credit over and above the cost of the coal of from $350 to $500 a year. Besides this, the superior efficiency of the coal under the furnace, concentration of the fuel and greater ease of operating are additional advantages.

Of course this is a case where the market was present to take care of the waste—an essential condition. But the chances all the way along are that such a mill or a factory working in seasoned lumber would be located where there would be a market. In any event the likelihood of a market for a commodity of this kind being developed is usually good enough to justify at least a careful inquiry into the situation.

Should it develop that the mill management finds it can profitably dispose of its waste in such a manner and resort to coal for its fuel, that leaves the power salesman with a straightforward proposition. He has then a plant which is using steam, or by steam generating its own power, and a proposition of that kind has no terrors for the average power salesman.

Wood Waste in Sawmills.

Working around to the common, ordinary, garden variety of sawmill, cutting up logs into slabs, sawdust and commercial lumber, the proposition is quite different. Here the waste assumes a more serious aspect, because it is larger in proportion to the finished product of the plant. There are the big slabs with the bark on, the ends of the boards and the tremendous volume of sawdust. And, to make it worse from the point of view of finding a market, this waste, like the lumber, is often not only sappy and green but also water soaked from rain or long days of rafting down the streams.

No need to tell the power salesman, however, that getting rid of this waste is the first problem to be solved. Too many of them have lain awake nights trying to find the answer as to how to convert this waste into a marketable product and how at the same time to cash in on the idea. Not to suggest that this problem is not the biggest one nor to offer a practicable solution, it may be suggested, however, that sometimes the mere heaps of waste have been considered in themselves sufficient to stop the salesman when in fact the prospect was ready to consider central-station service.

Several agents or conditions favor the power salesman in the cases of sawmills which utilize their waste as a matter of course. In the sawmill department of the concern heretofore referred to, a typical state of affairs is disclosed. A large volume of timber is handled annually, with a propor-

TALKS TO POWER SALESMEN.

"Talks to Power Salesmen" is the subject of a series of three articles by C. H. Stevens, manager of the Power Bureau of the Edison Electric Illuminating Company, of Brooklyn, which will be started in our next issue. Mr. Stevens has organized one of the most comprehensive departments for the acquisition of power business known to the industry and the success of the Brooklyn company in building up such a creditable power load is largely attributed to the efficiency of this bureau. Mr. Stevens will explain the organization and operations of this department and give power salesmen and engineers much valuable information, based on his wide experience in securing difficult contracts. The initial article will deal with the "Equipment of the Salesman."

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tionately large volume of waste. The sawdust and the bulk of the slabs are mechanically conveyed to the furnaces which reduce them to ashes, for which there is generally a ready market, at least at a price which will get rid of them.

But the management of this property is convinced that it costs, in the way of heat and material consumed, as much to rid the waste of its sap and its water so that it will burn readily, as the resultant readily burning fuel is worth. Another way to state the proposition is that the whole volume of waste, considered as fuel, is only 50 per cent efficient. And there are times when it is necessary, in order to keep the steam up, to burn coal in the furnaces along with the sodden waste.

It means that the net efficiency of this waste, used as fuel, is low indeed. Coal or coke as poor in efficiency could not be given away.

Disposal of Refuse Capable of Solution.

For a long time the tanneries were classed among the forlorn hopes. They burned the tan bark under their boilers, to get rid of it, in the same way that the sawmills and woodworking plants are in a large measure doing now. The lead-mining and refining interests found a use for the bark and a tannery nowadays is an excellent prospect for the power salesman. The big, unconquered industry is nowadays the woodworking industry. That it would much prefer the electric drive is shown by the number of woodworking establishments which are putting in isolated plants.

These things being true, it follows that where a market to take the waste, even at cost of the substitute fuel, can be developed, central-station power service ought to appeal strongly to the mill owner. It could be figured in more than a few cases, that his profit would be an indirect one, through reduction of his investment in a power plant unduly large, because of the inefficient fuel. So to sell a woodworking concern it should not be necessary to have to show how the waste could be disposed of at a profit.

Referring to the dimension-stock mill cited above, it was stated by the management that even if the receipts for the waste sold did no more than almost equal the cost of the coal purchased for fuel the method of selling the waste and buying the coal would be preferred. With testimony such as this there is reason for the power salesmen to take heart.

The situation as to the use of waste for fuel is not the forlorn hope that it is sometimes represented to be. The methods in general use plague the woodworkers as much as they challenge the power salesmen. Mill owners themselves are keen to find ways of disposing of this waste other than by burning it in their power plants.

And the writer has been endeavoring to show here that the conditions more or less general as this time are such as to furnish the power salesman with a good toe-hold. He can use the information relating to the handicaps of waste as fuel as an entering wedge to what some day will be a big electricity-buying industry. It is a question only of a probably limited time until some ingenious lumberman, electricity salesman or other person comes forward with a practicable solution, at least in part.

Meanwhile each mill stands on its own bottom. The solution in each case is almost sure to be an individual one. Generally there is not a great deal of similarity between the character, extent and possible market of any one or more mills. And it should not always be necessary that the power salesman present the mill owner with a complete solution to the waste problem. A part-way solution might very readily be finished out by inclusion of the disadvantages to the mill owner which attend his efforts to utilize his waste as fuel.

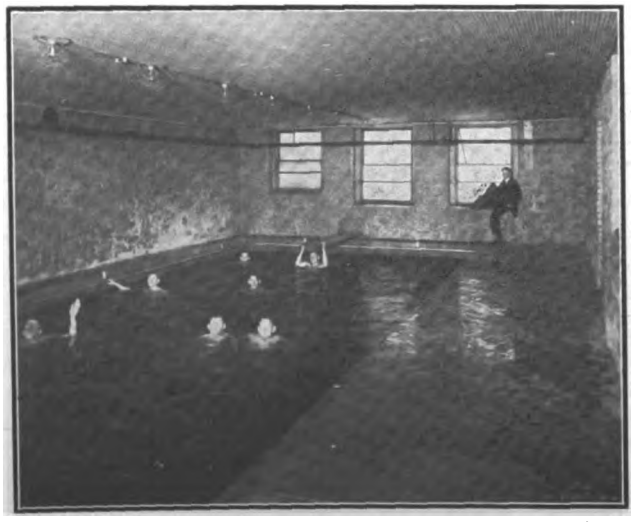
This much is probably true. The best lead to the contracts which will be written with mill owners after some generally applicable solution of the wood-waste problem is found, is very likely to be through the boiler room of the plant owner. Until then there are likely to be many chances for business when the salesman approaches his prospect along these lines.

Quarter-Horsepower Motor Saves $25 Per Month for Swimming Pool.

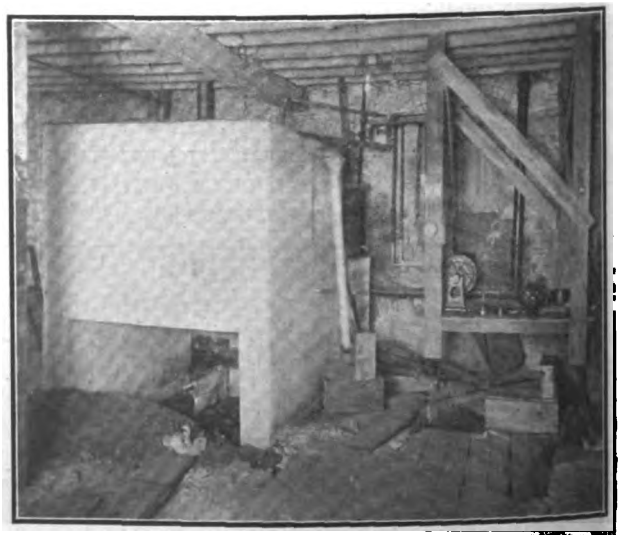
In Leavenworth, Kans., the Y. M. C. A. operates a popular swimming pool, and heretofore the water has been purified by allowing a stream of fresh water to flow into the tank, the overflow emptying into a sewer. The cost for the water under this system amounted to approximately $480 for 12 months. Under these conditions the Y. M. C. A. decided to discontinue the use of the pool during the winter.

In co-operation with the commercial department of the Leavenworth Light, Heat & Power Company, arrangements were made to install a filtering system whereby the overflow could be again used. Accordingly a one-quarter-horsepower motor operating a pump was installed for returning the water from a concrete settling tank back to the pool. This arrangement has proved entirely satisfactory and the cost has been reduced to $120 a year.

This is a novel and interesting application of electricity which is worth the attention of all central-station commercial managers for in almost every city there are several swimming pools in operation throughout the entire year and the opportunity for installing purifying equipment is appealing as well as economical in operation.



A 0.25-Horsepower Motor Pumps Overflow Back Into Tank.



Motor-Driven Pump Which Saves $25 Per Month in Water Bill.

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Muskogee Company Gives Quick Service in Emergency.

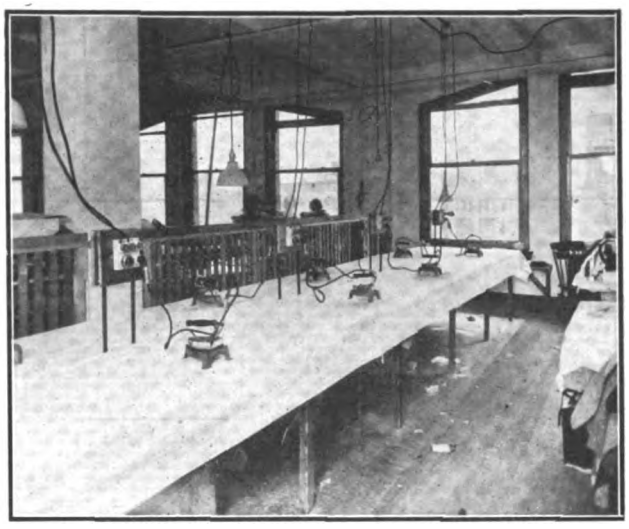
February 3 a fire destroyed the general shop building of the Midland Valley Railroad Company in Muskogee, Okla. The next morning application was made to the Muskogee Gas & Electric Company for temporary service. In order to do so it was necessary for the company to make a 2,000-foot extension of the electric distribution system and set seven poles. At 7 p. m., February 4, all work had been completed and service established for a ten-horsepower motor to operate the coal chutes and a 7.5-horsepower motor in the woodworking shop. A 40-horsepower motor was installed later for operation of the machine shop. It is probable a permanent contract will be secured.

Tobacco Company Uses Central-Station Service.

A contract has been signed by the Louisville Gas & Electric Company, with the Axton-Fisher Tobacco Company, Louisville, by which the tobacco company is putting on an additional load of 75 horsepower. Ordinarily tobacco handling establishments are closed doors to central-station salesmen for the reason that steam is an indispensable requisite to the manufacture of tobacco. The leaf must be moist in order not to shatter in the handling. The Axton-Fisher Company is not throwing out its isolated plant, but is supplementing the power from it. Rather than increase the steam and generating equipment which would be necessary in view of the rate at which the business of the concern is increasing, the company is turning to central-station service. It is an alternating-current plant throughout.

Increased Use of Electricity in Garment Trade.

Some interesting figures in connection with heating installations for industrial uses have been collected by the Heating Bureau of the New York Edison Company. The yearly report showed a gain in the number of articles installed of more than 20 per cent, and a gain in 50-watt equivalents of approximately 20 per cent. These figures, however, do not adequately represent the increased load on the lines when electric heating is being judged as a revenue producer. The reason is that the average heating appliance in commercial use is in service many more hours a day than an equal installation in lights. To prove this, an investigation was made of representative installations.

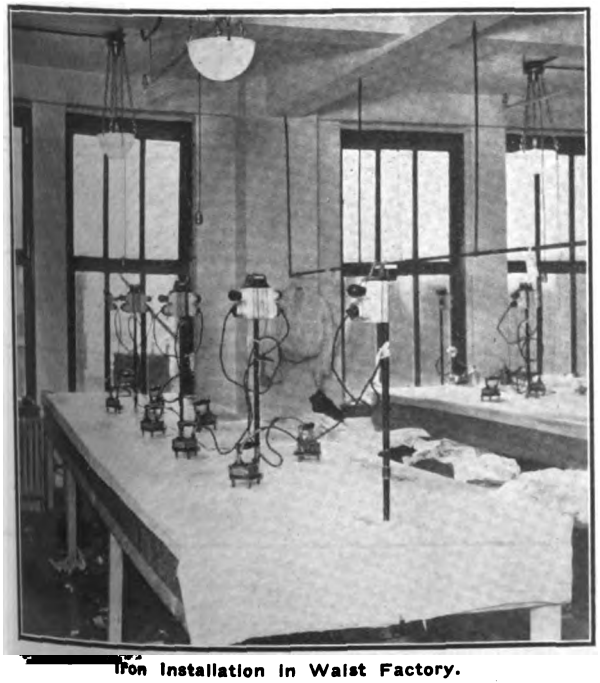


This Customer's Bills Average $486 Per Year for Ironing.

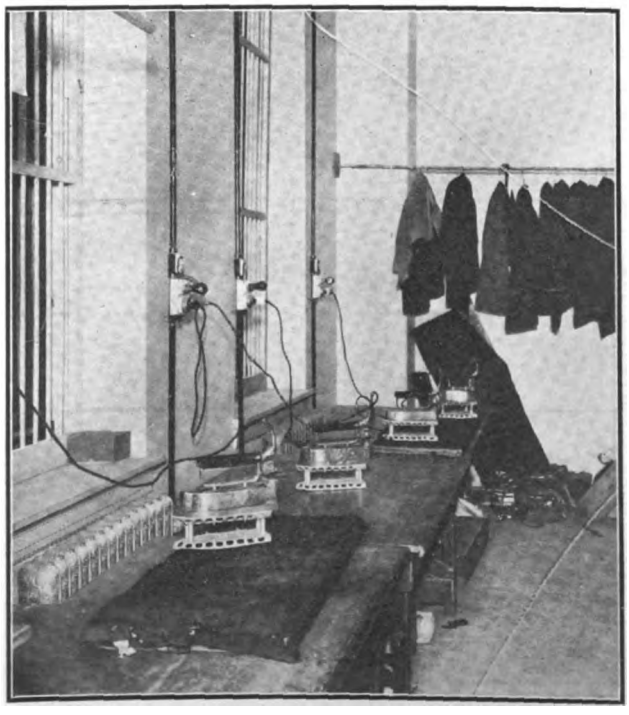
A study was made of eight flat iron installations by C. N. Lewis, manager of the Heating Bureau. These eight installations totaled 105 irons which consumed 67,659 kilowatt-hours for the year, representing an average yearly consumption of 644 kilowatt-hours per iron, or an income at an eight-cent rate of $51.52 an iron per year.

The first case was a cloak and suit manufacturer with an equipment of 20 Simplex irons of the 770-watt type. By actual meter readings this installation for 1915 brought in a return (at a five-cent rate) of $1,113.15 to the company. Case No. 2 was a fashionable men's tailoring establishment on Fifth Avenue. Here 13 General Electric flat irons produced $402.75. A "waist house" using 18 six-pound Reimers irons was tested, this being a type consuming only half as much current as the irons used by the tailor; the company's annual income here was $486.36. Another "shirtwaist house" using 24 of this lighter iron consumed $750.72 worth of current.

As New York is the center of the garment trade for the United States, it can easily be seen that this is an extensive and lucrative field.



Iron Installation in Waist Factory.



Iron Installation in Garment Factory.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING OF A RAILROAD PASSENGER SERVICE TERMINAL.

Passenger Service Station, Coach Yard and Locomotive Roundhouse of the Baltimore & Ohio Chicago Terminal Railroad.

Even though but a relatively small percentage of the total railroad mileage of this country has been electrified, it is not generally known to what a large extent the steam railroads are using electricity, particularly in the service of their passenger departments. Opportunities for the electrical industry to interest itself in this development are steadily increasing. The installation of the necessary electrical equipment for a steam railroad terminal, for instance, requires special study and skill on the part of the electrical contractor, who must really be also an electrical engineer of no mean ability. Many special problems and requirements must be met and the electrical firm that can successfully execute such a contract proves itself capable of handling the most difficult jobs.

An installation of this type recently completed is in the new passenger service station, coach yard and roundhouse of the Baltimore & Ohio Chicago Terminal Railroad, which is located along Fourteenth Street, between Robey and Wood Streets, Chicago. This service terminal is used by the five railroads which enter the Grand Central Station, and it was built because the old passenger yard had to be abandoned because of necessary trackage and freight-house rearrangements necessitated by building the new Union Station. The entire installation was put into service shortly before the close of last year.

Power House.

As considerable steam is needed for heating the service buildings, shops, roundhouse and the cars in the coach yard, a power house was provided for developing the necessary steam and also generating electric current for lighting, power and battery charging. In this power house there are three main generators, two exciters, two steam-driven air compressors, pumps and various auxiliaries. The three generators are each rated at 150 kilowatts, three phase, 440 volts, 60 cycles. They were furnished by the Western Electric Company and are individually driven by Ridgway Corliss engines. Of exciters there are two, both of which were originally Curtis turbine-

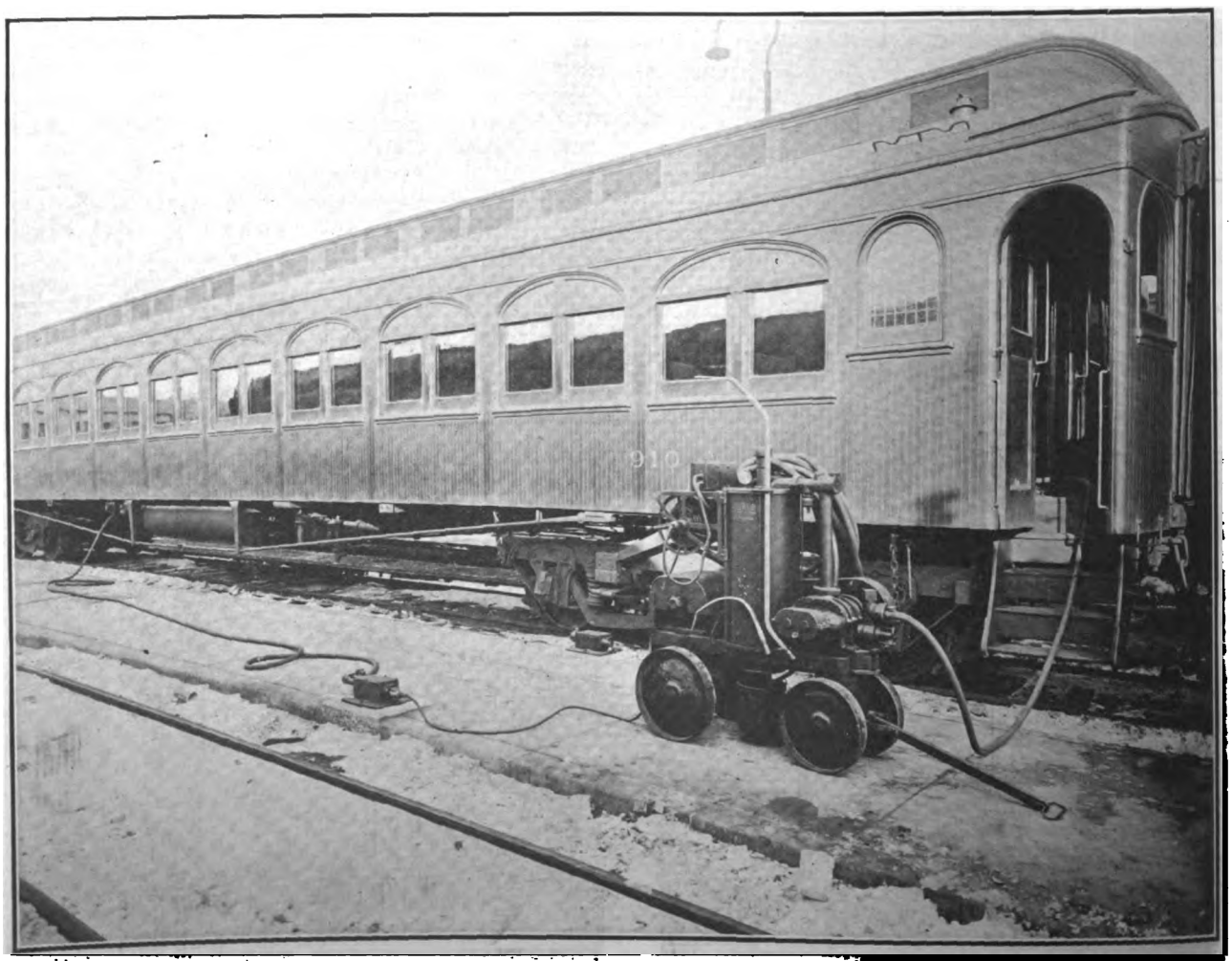

Fig. 1.—View in Coach Yard, Showing Connection of Charging and Vacuum-Cleaner Cables to Yard Receptacles.

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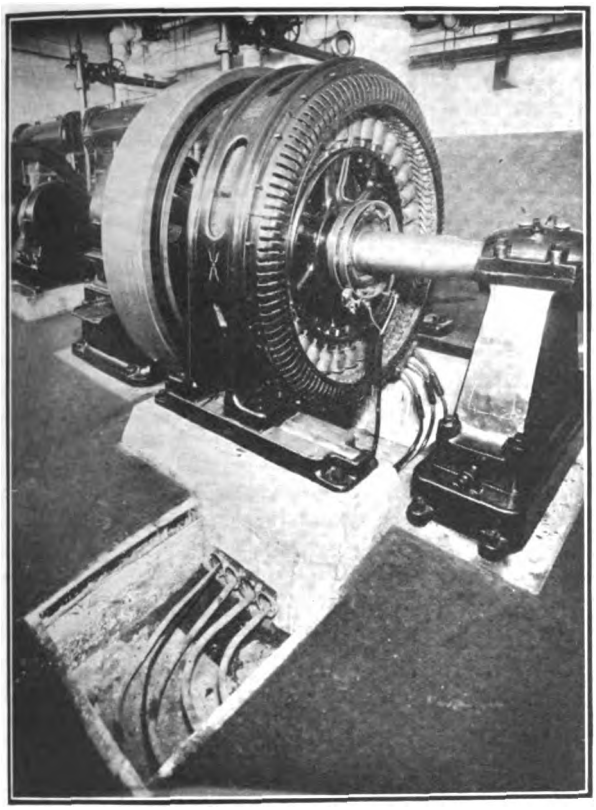

Fig. 2.—One of the Alternators in Power House, Showing Manner of Running Leads to Switchboard.

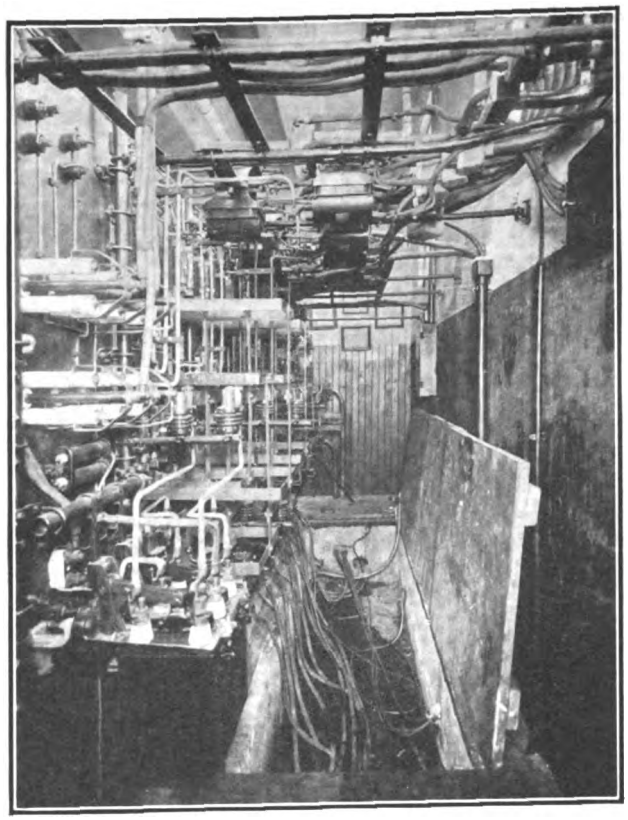

Fig. 4.—Rear View of Main Switchboard with Floor Sections Raised to Show Cable Pit.

driven, 20-kilowatt, 110-volt, direct-current units operating direct-connected at 4,500 revolutions per minute. One of these units has since been replaced by a motor-generator set which was being connected up when the photographs for the accompanying illustrations were being taken.

One of the main alternators is shown in Fig. 2. This also shows the manner in which the leads from the generator are carried to the switchboard. These run through the generator pit in iron conduit and then pass through ducts in the generator foundation pedestal to a convenient handhole in the floor shown in the foreground with its iron cover removed; from here they pass in ducts under the floor, under and back of the switchboard. Lead-covered cable is used for the duct portions of the main and field conductors. The cable lugs joining them to the generator terminals are protected by fiber sleeves entirely covering the lugs.

At the back of the switchboard there is a concrete-lined pit covered by three plank trap doors. In Fig. 4 these are shown raised against the wall. Into this pit run the lead-covered cables from the generators and exciters and here they are distributed to their proper connections at the rear lower part of the switchboard. The motor-driven exciter was being connected up at the time the photograph was taken. In the upper part of this view are eight horizontal pipes which serve both to brace the top of the board from the wall and at the same time to support iron cross bars on which are mounted current transformers and the outgoing lighting and power feeder cables. These cables are nearly all covered with loom to the point of their entrance through Unilet terminal fittings to the outgoing conduits. As can be seen in the upper right corner, most of these conduits bend upward, while a few run straight down to underground feeders. The two cabinets on the right wall are for power-

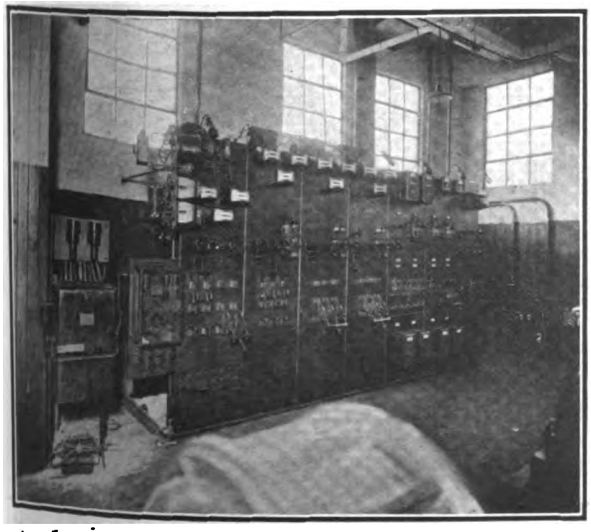

Fig. 3.—Front View of Main Switchboard in Power House.

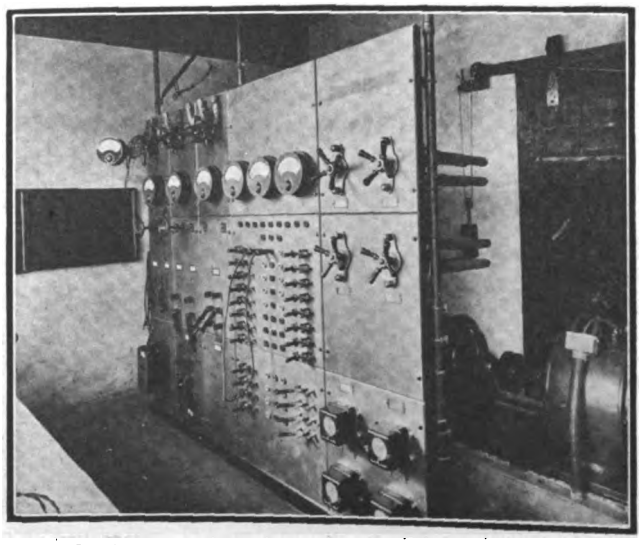

Fig. 5.—Front View of Charging Board in Battery Room.

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house lighting and small-motor circuits in and close the engine room.

Space does not permit going into the details of the switchboard wiring. Two sets of 440-volt, three-phase busbars are provided, to either of which any generator or main feeder can be connected; thus it is possible to segregate the lighting and power loads or obtain other desired load distribution. There are also two sets of exciter buses; either exciter may be connected to either of these buses and any of the three alternators may be connected to either exciter bus.

Fig. 3 is a front view of the switchboard. The first panel controls the exciters; the next three panels are for the main generators; then there are two panels for the eight principal lighting and power feeders, each of which has a watt-hour meter for measuring the output to the various departments; the last panel at the right is for the series lighting system of the coach and locomotive yards. The constant-current regulating transformer for the latter can be seen to the right of the board. Secured to the left end of the board are the usual swinging indicating instruments and below these is attached a panel for the Tirrill field-current regulator. Immediately to the left of this is the autostarter for the motor of the motor-generator exciter, the top of which can be seen in hazy outline in the middle foreground of the illustration. In the corner back of the series lighting regulator, but not shown in the illustration, is a single-phase, step-down transformer for the 110-220-volt, three-wire, multiple lighting system used throughout the buildings.

Battery Room.

In the same brick and concrete building which includes the power house at the west end are various offices, shops and supply rooms for taking care of the cleaning, the provisioning and ordinary maintenance of the passenger coaches. The building which houses these various service departments is about one-eighth mile long and two stories high. From the electrical standpoint, one of its most interesting sections is what is known as the battery room. It takes care of the charging and any special maintenance of the car-lighting storage batteries with which practically all of the passenger cars using the yard are provided. Most of the cars have axle-driven lighting equipments including either a 32 or 64-volt battery, which should normally be fully charged when entering the yard. Due to a loose belt or other cause, a battery with a low state of charge is occasionally found. Some of the cars have other lighting systems, such as the straight storage system, whose batteries need regular charging. For this purpose, a somewhat elaborate charging system is provided which is energized from the battery room referred to through underground circuits reaching close to the cars so as to avoid the removing of the batteries therefrom. Into the battery room are actually brought only such batteries as need more or less complete overhauling. Repairs to other parts of the car-lighting equipment are also made here.

For furnishing the direct current for battery charging, there is in the room adjoining the battery room, a motor-generator set comprising a 50-horsepower, three-phase, 440-volt induction motor, direct-connected to two 15-kilowatt, 55-volt, direct-current generators. Fig. 5 shows the front view of the battery-charging switchboard and a partial view of this motor-generator. Fig. 6 gives a better idea of this set and also shows the back of the board. The method of running the machine leads into conduit through Unilets is clearly shown. The motor switch cabinet with door opened and the autostarter can be seen at the rear in Fig. 6. In this switch cabinet there are also current transformers for the watt-hour meter that measures the motor load.

This meter is mounted at the bottom of the first switchboard panel (Fig. 5); the remainder of this panel controls one of the direct-current generators. The second panel controls the other generator and also has a switch for connecting the two machines in series in case more than 50 volts is needed on any charging circuit. Normally the two generators have a common negative bus. A special circuit from the exciters in the power house terminates at the third panel; this is arranged to furnish a source of direct current to the charging board in case the motor-generator set might be out of commission; a watt-hour meter will be installed on this circuit to measure any energy so used. The fourth panel contains three direct-current ammeters and a system of switches and plugs by means of which any of the charging circuits can be connected to either positive bus and the current in it can be measured and the total charge determined by one of the four Sangamo ampere-hour meters shown at the lower right corner of the board. For regulating the current on the several charging circuits, four Allen-Bradley compression rheostats, each consisting of four rods, are mounted on the upper part of the last panel. Inclosed knife-blade-type fuses for the outgoing circuits are mounted in the cabinet at the rear base of the board. A small panel to permit charging batteries in this room will probably be added in the near future. The circuit layout of this board is quite special and its details cannot be gone into in the limits of a brief general article.

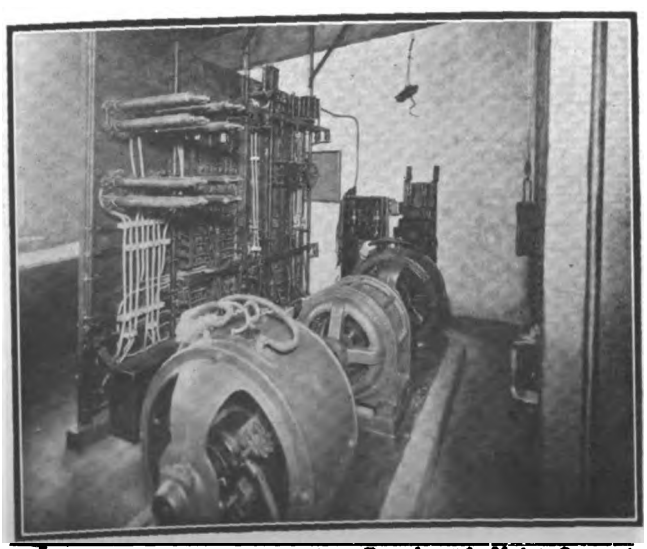

Fig. 6.—Rear View of Charging Board and Motor-Generator Charging Set.

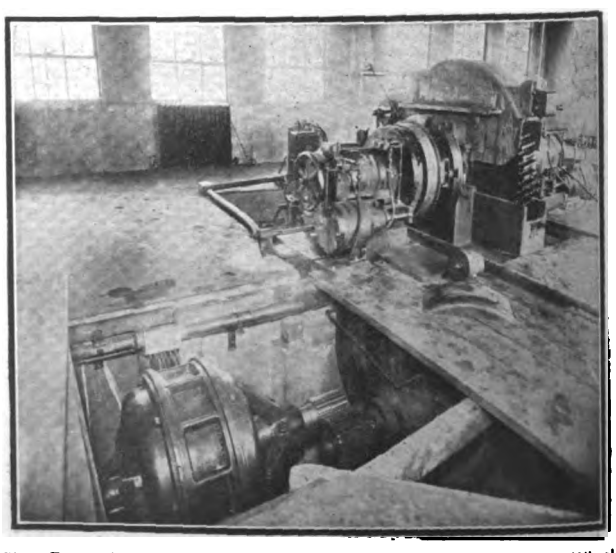

Fig. 7.—Fifty-Horsepower Motor in Pit for Driving Car-Wheel Lathe.

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Coach-Yard Circuits.

The coach yard contains 33 tracks grouped in pairs with a concrete walk between pairs. The charging circuits run underground from the battery room in multiple vitrified-clay ducts to midway between tracks 16 and 17 and then south between them along the length of the yard. From this main duct line there are branched off five laterals running in fiber duct east and west across the tracks. A manhole is provided at the junction of each lateral with the main duct. From the laterals there are tapped off short branches to yard receptacles adjoining the various tracks. These receptacles, of which 99 have been installed, are spaced not over 150 feet, or less than two car lengths, apart along the track, so that it is easy to reach any car throughout the yard by flexible extension cables that need not be over 50 feet long.

There are ten independent charging circuits with a common negative return. The positive leads are No. 2 wires running from the cutout cabinet at the back of the battery-room switchboard through the duct lines and manholes and branching off to the ten laterals referred to. The negative lead consists of two 500,000-circular-mil cables from the common negative bus to the first manhole, then it tapers down through the other three manholes of the main duct line. The ten negative laterals tap off from these main cables in G. & W. underground boxes in the manholes where each lateral is fused. Testing and switching terminals are also provided for the positive laterals where they pass through these boxes.

For the vacuum-cleaner circuit there is a transformer that steps down one phase of the 440-volt supply to 220 volts. From this the cables run to and through the main duct just described. Both sides of each of the ten laterals are fused with a 60-ampere cartridge fuse in the G. & W. boxes in the manholes. All the underground conductors, both for the charging and cleaner circuits, are lead-covered, rubber-insulated cables.

Fig. 1 makes clear the general location and manner of using the special yard receptacles. They are usually installed in pairs at the edges of the walks between pairs of tracks. At the further end of each combination receptacle housing is a 100-ampere receptacle for the battery-charging circuit; at the nearer end is a 220-volt receptacle for the vacuum-cleaner circuit. Each receptacle has a steel guide shell just within the opening which fits a corresponding part of the plug and thereby removes all mechanical strain from the electrical contacts which are concentric and set in a recess a little back of the opening. These openings are protected by spring covers and the entire device is completely weatherproof. The receptacles are easily wired. They were furnished, as also their corresponding plugs, by the Albert & J. M. Anderson Manufacturing Company.

The cable at the left in Fig. 1 shows how the connection to the car battery receptacle is made, although no actual connection was made when the photograph was taken. The cable at the right connects with the portable vacuum-cleaner set, on which is mounted a cable reel with enough cable on it to permit the outfit to be placed, if necessary, about one car length from the yard receptacle. At the request of the city electrical inspector, the plugs at the receptacle end of these cables will be provided with 10 or 15-ampere double-pole cartridge fuses, to protect the cable reel on the machine. A short length of armored cable runs from the reel to the motor switch, which is in a cabinet above the reel. The plug connecting with the reel end of this latter cable is arranged so that it must be removed to permit the reel to be turned; when it is plugged into the side receptacle on the reel it automatically locks the latter against turning. The motor on the machine is a 1.5-horsepower, 220-volt Wagner single-phase induction motor. Sufficient hose is provided to reach any part of the car. Various tools are also included in the outfit, which is known as the Arco Wand vacuum cleaner and is manufactured by the American Radiator Company. Five of these sets are now in successful use in this yard; more will probably be added.

Motor Installation.

In the various shops connected with the service building and also in the roundhouse, there are quite a number of motors, all of which are 440-volt, three-phase machines. Their installation is made in the customary way, but some of them are worthy of special mention. In Fig. 7 is shown a car-wheel lathe which is driven by a 50-horsepower motor installed in the pit. The controller for this machine is located near the opposite wall and is connected to the motor by means of 2.5-inch conduit which is clearly noticeable in the picture. The wiring at the controller was temporary, as was the motor, when the picture was taken; a three-phase slip-ring motor arranged for variable speed will be substituted. Directly above the motor can be seen a special Unilet fitting from which the numerous primary and secondary wires of the motor lead to the machine. The supply wires pass through the conduit at the left and run to the controller along with the other wires. This motor drives a machine for truing up car wheels with slightly flattened portions; this saves hauling the car to the rather remote general repair shops of the respective railroads. There is also an auxiliary five-horse-

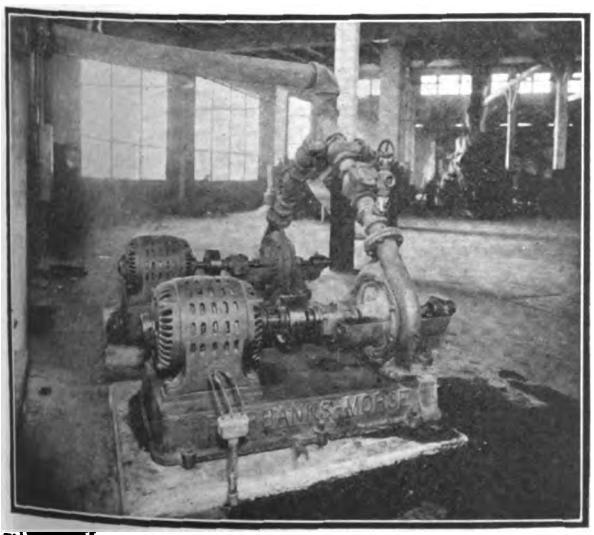

Fig. 8.—Duplicate Set of Motor-Driven Centrifugal Pumps in Roundhouse.

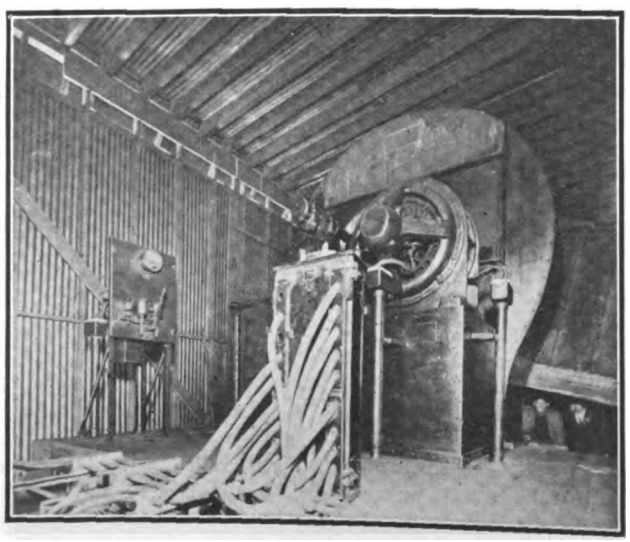

Fig. 9.—100-Horsepower Motor Driving Smoke-Exhaust Fan on Top of Roundhouse.

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power motor in this equipment. In the service building there are also two electric freight elevators supplied by the Otis Elevator Company. In the carpenter shop a motor for operating some woodworking tools will probably soon be installed.

The locomotive roundhouse, which occupies the northwestern portion of the property, contains a number of interesting motor installations. One of these is shown in Fig. 8. This is a duplicate motor-driven centrifugal-pump set. In each unit there is a 10-horsepower induction motor. These pumps are installed for the purpose of supplying water to the large tanks that feed the locomotives, if the city water pressure is insufficient to bring the water to this considerable height. The motors can be controlled manually from the cabinet on the wall or automatically by means of a float switch associated with the tank.

On top of the roundhouse is a long smoke flue which is connected to the short uptakes for each locomotive stack and serves to prevent the smoke from leaking into the roundhouse and conducts it to a large brick stack about 200 feet high. In order to provide a positive draft for this large smoke flue, there is a duplicate installation of suction blowers, each driven by a 100-horsepower variable-speed induction motor. A view of one of these sets is shown in Fig. 9. The diameter of the blades of this blower is about 10 feet. The motor is mounted on a substantial pedestal, secured to which are the heavy three-inch conduits carrying the primary and secondary leads. An oil starting switch and an ammeter are mounted in a panel at the left. In the middle of the picture can be seen the rear of the controller which can be used in accelerating the motor and in regulating its speed through changing the secondary resistance. The heavy leads from this controller are run to a mass of iron resistance grids, only a small portion of which can be seen in the lower left corner. These cables are supported by means of porcelain cleats and are protected where they come in contact with each other by flexible tubing. This entire motor and blower is mounted in a corrugated-iron housing on top of the roundhouse and is thoroughly ventilated and at the same time fairly well protected against the weather.

A large elevated coaling station is also an auxiliary to the roundhouse for which there is a coal hoist operated by a 25-horsepower induction motor. The turntable just outside the roundhouse is electrically operated through a 20-horsepower Westinghouse induction motor of the slip-ring type. The control cab for this motor is at one end of the turntable so that the operator can observe the exact alinement of the tracks. This motor is supplied with current from an overhead three-phase line through a special feed box mounted on a light bridge over the middle of the turntable. In this box are three contact rings with three stationary brushes bearing against them. The feed wires connect with these brushes and the rings connect with the cable that passes through the axis of the box and then leads in conduit to the motor and controller. The turntable, which is 100 feet in diameter, and its operating machinery were furnished by George P. Nichols & Brother.

Yard and Miscellaneous Lighting.

For the lighting of the coach and locomotive yards there is a special series 6.6-ampere constant-current circuit. On this are 38 400-candlepower Mazda type C lamps. In the coach yard, 22 of these are mounted on iron poles with a gooseneck top and radial reflector, as can be seen directly above the car in Fig. 1. They are supplied from an underground lead-covered-cable circuit, entirely distinct from the charging and vacuum-cleaner duct lines. In the locomotive yard wood poles are used and the distribution is overhead. The lamps are from 30 to 35 feet above the track surface of the yard, which is itself elevated some 16 feet above the street surface.

In the roundhouse, which contains 34 locomotive stalls, there is special lighting for each stall consisting of three lamps with reflectors and vaporproof lamp housings. Conveniently located on each side of the engine are two receptacles for connecting extension cords and inspection lamps. These are equipped with Crouse-Hinds Condulet receptacles. For the general lighting in the various shops, offices, etc., standard 110-volt Mazda lamps equipped with Benjamin porcelain-enameled steel reflectors are used.

With the exception of the main switchboard and switchboard in the battery room, which were furnished and installed by the Cuthbert Electrical Manufacturing Company, all of the electrical installation was put in by the Freeman-Sweet Company, of Chicago. O. B. Shaner is the terminal engineer of the railroad company and R. W. Keyes is the electrician in charge.

Among the Contractors.

The Electric Supply Shops, Great Falls, Mont., has been organized by F. H. Seal, Christ Ousum and Joseph Olson with a capital of $40,000. The concern will do electrical contracting and deal in supplies.

A. A. Bonnard has purchased the interest of D. C. Patterson in the Santa Rosa (Cal.) Electric Company, and with J. B. Kent is now in charge of the business.

The Lord Electric Company, Boston, Mass., has been awarded the contract for the electrical work in connection with the construction of the new State Library, at Montpelier, Vt., the price being $3,990.

The Board of Local Improvements, Streator, Ill., has awarded the contract for constructing the ornamental lighting system for Main and Vermillion Streets to J. W. Gates, Inc., of Streator, on its bid of $10,143.97.

L. M. Turner and C. D. Giddings have formed a partnership and will do electrical contracting and handle supplies at Americus, Ga.

The Standard Electric Company, of Minneapolis, Minn., Fred G. Dustin and Charles W. Arrick, proprietors, moved on March 1 to 239-240 Plymouth Building, where accommodations were obtained to meet the requirements of the company's rapidly growing business.

The Harry I. Wood Company, Louisville, Ky., is working on the following contracts in Louisville: Wiring for light and power in the Home Telephone Company's new exchange; installation of one 35-horsepower and two 20-horsepower motors and feeders for the Ewald Iron Company; complete conduit system for the modern Bonnie six-apartment building; installation of feeders for two 225-kilowatt enameling ovens for the Ford Motor Company. The main feeder will consist of two 1,000,000-circular-mil cables for each leg of the three-phase system, the branch feeders being two 500,000-circular-mil cables.

Keeping Pliers in Order.

When pliers get to working stiffly through abuse they may be made to work easily again by mixing a little oil and fine emery powder and applying this paste to the joints. Open and close the jaws a number of times to work the paste well into joints, this cutting any dirt, grit and rust that has clogged them. It is surprising how quickly the bind is ground out in this way. Cleanse by flushing with gasoline.

J. B. Story.

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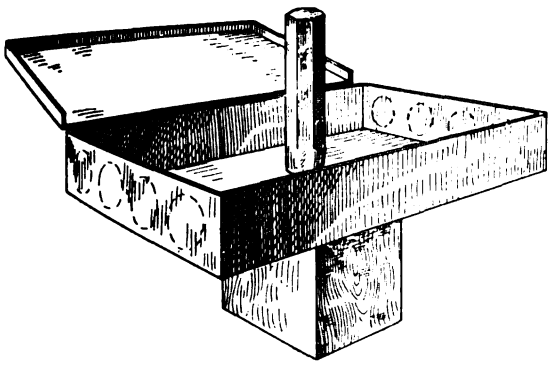
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Punching Holes in Cutout Cabinets.

It is frequently necessary to provide extra holes in cutout or switch cabinets. The usual plan of drilling such holes may be done away with by the method described below, thus saving much time and hard labor. I locate and mark the hole on the box by scratching a few short

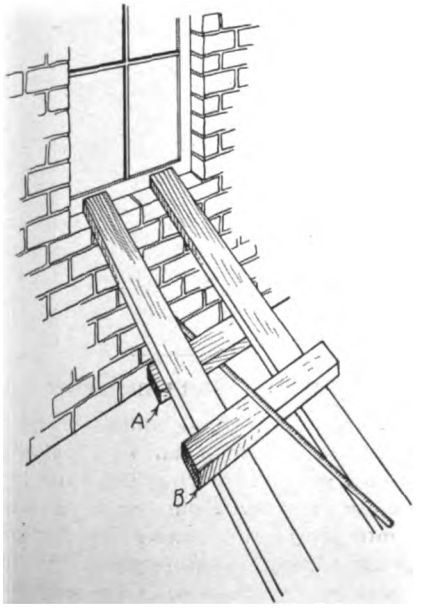


Punching Holes in Cabinets.

lines about it by means of a sharp tool. The box is then placed on a perfectly flat end of a hardwood block. Use a round steel punch with the end ground off squarely. A moderate blow with a hammer will make a clean hole. Be sure to use end grain of block. A. F. Stearns.

Simple Expedient for Conduit Bending.

On new work where conduit above one inch in size is to be bent the following scheme has been found to be very quick and handy in the absence of better facilities. It requires only two planks laid with one end resting on a window sill and the other on the floor. The short pieces are placed across these to hold the conduit in place. The sketch will explain this more clearly. By moving the short pieces *A* and *B* higher up, a more secure position of the planks is obtained. The upper edge of *B*, over which the bend is made, can be rounded to the desired extent, or a small bend made and the conduit pulled out a little at a time for continuing the bend. J. H. Lamoureux.



Conduit Bending Without Bench.

Blanking Knockout Holes in Outlet Boxes.

In the issue of January 29 I notice a wiring kink advocating the use of tin caps in "blanking" holes in outlet boxes. A better way is to cut a piece of threaded pipe about five-eighths-inch in length and secure a three-eighths-inch knockout to one end by means of a monitor bushing. Insert this in the hole from the inside of the box and screw a locknut up tight on the outside. This makes a workmanlike job, and cannot be refused by any inspector, whereas tin, not being of the same strength and thickness as walls of the box, is liable to be condemned. John Shortt.

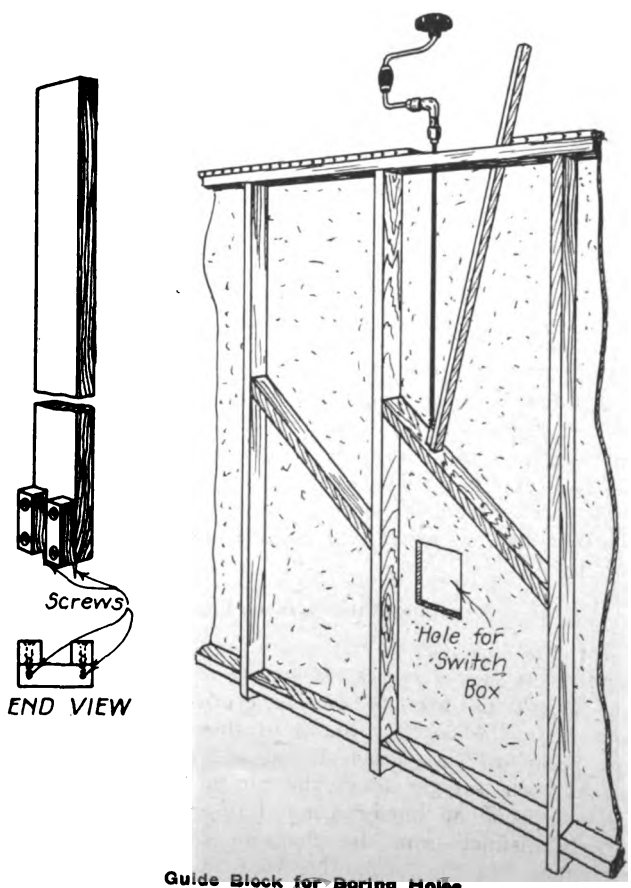
Guide for Boring Holes on a Slant.

In wiring old houses a great many times the wireman finds partitions with braces in them that set on such an angle that it is almost impossible to get a hole drilled in them at the right place. The following is useful for this.

I have a piece of wood about 7.5 feet long, 2 inches wide, by 0.75 inch thick, on one end of which are two small blocks, each 0.75 inch thick, 0.625 inch wide, by 3 inches long; these are put on with 1.25-inch No. 8 wood screws, although nails will do. Take two 3-inch No. 6 or 8 wood screws and screw them into the end of the board about one inch, then file their heads down to a sharp point.

Set it down in the partition as in the diagram at any place you wish to drill the hole and then with a long bit you will be able to drill many holes close together.

Take a No. 11 bit and have a blacksmith weld a steel rod 0.375 inch in diameter by 6 feet long on the one end and then square the other end to fit the brace; this bit I have found to be most useful. J. H. Glenn.



Guide Block for Boring Holes.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Standard Window Display Being Distributed for "Wire Your Home" Month.

Nothing will more effectively call the attention of the public to "Wire Your Home" month than the thousands of uniform displays in the windows of central stations, contractors and dealers throughout the country. Co-operating with the Society for Electrical Development, electrical manufacturers and jobbers have distributed nearly 10,000 displays without cost to the recipients.

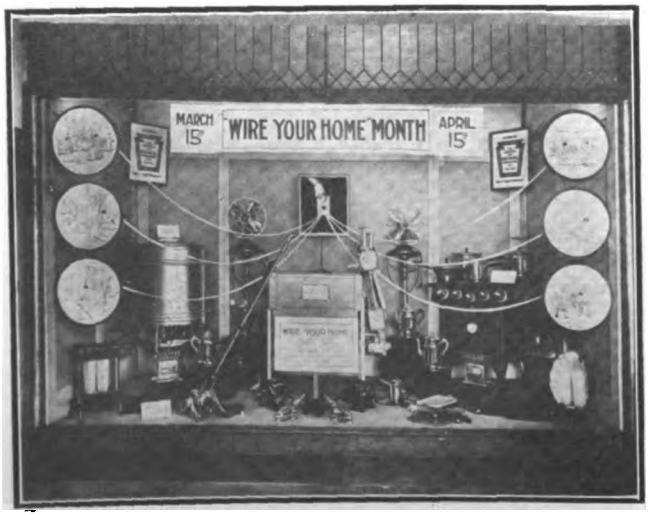
The display is easy to install and is not only descriptive of the advantages of electric lighting in the home, but shows the many other uses to which electrical energy can be applied.

In order to facilitate the use of this most attractive display we publish a photograph of the standardized display now being sent out by the Society. The material consists of six 15-inch circles, lithographed in eight colors; one banner, 11 by 47, lettered "'Wire Your Home' Month;" one card, with hand and switch lithographed in six colors, and 12 strips of paper tape and stickers for fastening.

The six circles are to be fastened to the window glass and from these white strips of tape run to the switch which is placed against the window background. Each circle represents a room in a home wired for electric service, and shows devices that may be used in that room.

In the photograph some of the appliances shown on the circles are displayed, a washing machine being used as a centerpiece. On one side of this is a dishwasher and on the other an electric range. Fans are elevated on pedestals; small devices being placed on boxes draped with velour. At either side near the glass is an electric radiator, and in the foreground a card reads, "Wire Your Home and enjoy not only electric lighting but also electric cooking, ventilating, cleaning, washing, sewing, ironing, heating, dish washing, etc."

If you do not receive a set of this material, write to the Society for Electrical Development or your lamp company, and one will be furnished without cost. It will be a most effective means of taking advantage of "Wire Your Home" month.



Window Display Suggested for "Wire-Your-Home" Month.

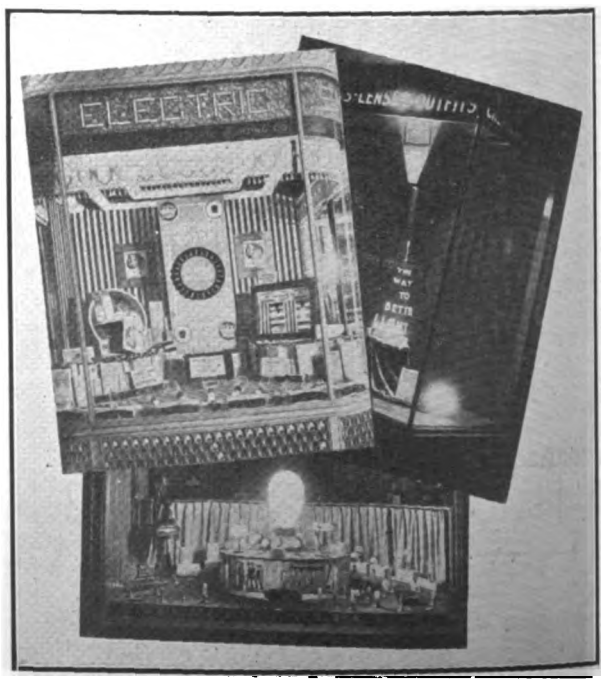
Vacuum-Cleaner Campaign Inaugurated in Kansas City.

The Electric Shop of the Kansas City Light & Power Company has started a vacuum-cleaner campaign for March, which will be pushed vigorously by newspaper and other advertising, distribution of thousands of folders in homes, and on bills to customers. The company, which has been selling a comparatively new model of the Thor cleaner for $19.75, has made a special price of $15 for March, payable in six installments. Five hundred cleaners, it is expected, will be sold. The campaign will parallel the customary spring clean-up campaign of the City Health Department.

Winners of Prizes in National Window Display Contest.

The accompanying illustration shows photographs taken of window-displays winning second, third and fourth prizes in the window-display contest conducted and recently closed by the National Lamp Works of the General Electric Company. An illustration of the window that won first prize was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for February 12, 1916.

The window shown in the upper left-hand corner was prepared by E. R. Davenport of the Narragansett Electric Lighting Company, Providence, R. I., and won the second prize. The window shown at the bottom was displayed by the Enterprise Electric Construction Company, Cleveland, O., and prepared by P. A. Kohl, winner of the third prize. The window shown in the upper right-hand corner was prepared by G. H. Jeffries of the Northern Photo Supply Company, Minneapolis, Minn., winner of the third prize.



Three Prize-Winning Window Displays of Electrical Material.

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Business Hints for the Electrical Dealer

Correct Margin of Profit Destroyed by Price-Cutting—Necessity of Considering Overhead Expense in the Conduct of Business—Results to the Small Contractor Handling Large Contracts Without Adequate Finances

By G. D. Crain, Jr.

Prices and Price-Cutting.

Occasionally one hears a complaint that the electrical dealer does not have the margin of profit to work under that he is entitled to, considering his overhead expenses and the special work that is usually needed to sell the goods.

There is something in this argument, in the case of a good many items, but on the other hand, did you ever stop to consider how many dealers would abuse a longer discount than they have at present?

One of the things which manufacturers are endeavoring to do is to protect the retail selling price. An article which is constantly the medium of cut prices gradually loses prestige, because the public comes to the conclusion that the quality is likely to vary as much as the price. It is bad business to have retailers making all sorts of prices on the same item, for the additional reason that the price tends to reach the lowest level, making the sale of the goods unprofitable for everybody and taking away the legitimate incentive which every dealer should have.

The courts have made it difficult to enforce resale price agreements, and the Stevens Bill, now before Congress, seeks to legalize such agreements. In the meantime, however, the manufacturer who sells his goods to the jobber or retailer loses control over the price at which they shall be marketed, except in the case of patented articles, and there are a lot of strings tied to that. The fact that the lamp business is handled on a reconsignment basis is one proof of the earnest endeavor of the manufacturers to insure the sale of their goods at the correct retail price—not merely one which will give them a profit, but one which will insure a legitimate profit for the merchant as well.

It is a peculiar fact, however, that a long enough margin to take care of overhead and still yield a good net profit would encourage price-cutting more than any other one thing. Some dealers, realizing the facts of the business in regard to costs, would gladly sell at the full price; others, anxious to get the business and not shrewd enough to analyze the situation, would conclude that they could cut the price and still make money, and the result would soon be a drop below the advertised price to a level fixed as the result of competitive conditions in each locality.

Therefore, the solution of the problem of getting a long enough discount rests as much with the retailer as it does with the manufacturer. When the dealers can show that they are real business men, and know how to sell goods without sacrificing their profits they will be in a position to go to the manufacturers and demand a long enough margin to absorb running expenses and leave a satisfactory net gain. But it is doubtful if such a showing could be made at present.

Everybody Knows It, But—

Not long ago the writer was talking with a veteran electrical goods merchant, who jobs as well as retails and who is familiar with every angle of the selling game as it pertains to the distribution of electrical goods.

"Keep hammering on overhead," he suggested, in discussing material for this department. "It doesn't make any difference whether you've written about it before or not—most of the dealers are still in the dark on this subject."

The point emphasized is a good one—not merely that an explanation of overhead expense is never out of order, but that stating a logical proposition does not always secure the universal adoption of the conclusion. In other words, no matter how often the trade papers point out the necessity of taking overhead expense into account in figuring the right price for an article of merchandise or an electrical job, there will always be a good many who either refuse to follow the advice or who cannot understand why they should not be able to get along without any such factor to contend with.

As far as overhead is concerned, however, nobody is doing such a small business that he can escape it entirely. Overhead is really the factor which must absorb all of the expenses of the business not directly chargeable to the individual item of goods or the particular job of labor. And even the man who has just graduated from the ranks of the journeyman will have some expense of this sort, if it is no more than telephone rentals, car fare and the purchase of tools. And the little dealer on the side street with a small store and a minimum rent must still acknowledge his costs if he expects to come out on top in the big struggle for business success.

The man who forgets overhead is like a polar explorer who throws away his compass. He has lost the indicator which will tell him whether he is traveling in the right direction or not. And, carrying the comparison a bit further, he may think he is making fine progress, and putting forth prodigious efforts, only to find in the end that he has been going around in a circle and arrived nowhere, if indeed he has not retrograded.

A Colossal Error.

Ambition is a good thing to have. In fact, it is absolutely necessary to the business man who is going to succeed. Without ambition you might as well quit running your own concern, with all its worries and risks, and take a safe and easy job with somebody else. It is legitimate, healthy, dynamic ambition that drives men ahead and results in carving out big niches in the hall of industry for their enterprises.

But there is such a thing as being too ambitious, as plenty of men besides Julius Caesar have discovered. An excess of ambition becomes a form of personal vanity, and the empty satisfaction of having handled a "big job" is often the only recompense for the man whose ambition led him to bite off more than he could comfortably chew.

In fact, on the dockets of the bankruptcy court in a certain city is the case of an electrical contracting concern which struck financial shoals just because the head of it was too ambitious for his own good. He wanted to do big things before he had demonstrated that he could cope with them by doing little things.

The fact that a great many small contractors forget is that they have their own field, which is practically safe from competition. There is any amount of small jobbing work to be had, to be handled at a good profit and to be used as a means of keeping the usually small capital of the concern working at maximum efficiency all the time.

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UNIVERSITY OF CALIFORNIA

Many a young business man does not realize it, but it takes capital to handle accounts. When you put a charge against Mrs. Smith for new batteries for her door bell and the installation of a buzzer in her dining room you are investing a part of your capital in that account. Until she pays the bill—which may be 30 or 60 days—you are not only waiting for your profit, but you are deprived of the use of the capital represented by your investment in the material and the labor and the overhead expense put into that particular job.

Now, having that clearly in mind, it is evident that the contractor with a limited capital should get as many small accounts as he can. The result will be handling jobs which can be completed promptly, so that the bills will fall due without delay. This will mean the collection of accounts receivable very rapidly, comparatively speaking, and the capital which is used to carry book accounts can be kept down to the smallest possible percentage of the total, leaving the remainder for the purchase of supplies and labor and the payment of overhead expenses of one kind or another.

This is a point which is not always grasped. The man who fails often insists that it was because of "poor collections," and the contractor who is not managing this end of his business right will tell you that he is hard up because his customers won't pay their bills as soon as they should. Statements of this kind indicate the fundamental proposition that in every business a certain amount of the capital is bound to be absorbed in carrying accounts has not been grasped. If provision has not been made to take care of this feature the man who is running the business is going to find himself always without the funds needed for the conduct of his affairs.

The big concern, with a large organization to be kept busy, is usually not in a position to go after small jobs. "Chicken-feed" of this kind would not be profitable. In other words, it is forced to seek the important jobs and leave the field of the small work to the contractor whose business is modest enough to enable it to be handled to good advantage. The larger house, with more capital invested, is in a position to take hold of a big job, which will take months to complete, and to wait for its money not only that length of time, but until the work is accepted and the routine ordinarily inseparable from the liquidation of a building account has been gone through.

Now, then, with these fundamental features in mind, consider the egregious folly of the contractor with only a few thousand dollars in his business going out after work which would involve the investment of that much in a single account. Such a course would practically mean business suicide, and that is exactly what happened in the case referred to above. The ambitious young contractor wanted to make a name for himself. He bid on a big piece of work—necessarily at bottom figures, as there was, of course, plenty of competition for the job—and unfortunately received the contract. The result was that during the next four or five months he saw every cent he could get hold of going into the "bottomless pit" of this work; and then for months more he waited until he could get his money.

He had other smaller jobs to finance, a payroll to meet, material bills to take care of, rent to pay and various other expenses to dispose of. The result of it all was that he got so deep in the hole that bankruptcy was the only way out. Maybe next time he will profit by his experience, but not necessarily. In a lot of cases a man who has failed under such conditions insists that it was due to bad luck or something else, instead of to ignorance of the basic principles of business management. Level-headed management of any business enterprise demands a knowledge of the capabilities and limitations of the business.

JOBBERS ARE CARRYING BIG STOCKS.

An Interview with Arthur J. Selzer, Sales Manager of the Central Electric Company, Chicago, Ill.

The statement, which has received considerable circulation, that stocks of electrical supplies were being depleted owing to a great demand for immediate shipment, has led to an inquiry to one of the leading Chicago jobbers as to the conditions of stocks. Arthur J. Selzer, recently elected chairman of the Central Division of the Electrical Supply Jobbers' Association, and sales manager of the Central Electric Company, Chicago, in answer to this inquiry said:

"Years ago the electrical manufacturer realized the importance of the electrical jobber as an economical method for distributing his products. Later the good electrical purchaser became thoroughly cognizant of this condition, but today the whole electrical world in unison has acknowledged this fact.

"For the past six or eight months the prominent electrical supply jobber has been stocking his warehouse from basement to roof with electrical merchandise to take care of exactly the problem which the buyer is now facing. The manufacturer's inability to get raw material and the over-crowded freight conditions for hauling his finished wares makes factory shipment of from ten to twelve weeks the work of a wizard.

"Compare this condition with that of the electrical supply jobber who can ship immediately from his own warehouse electrical supplies in any quantity from parcel post shipments to carloads!

"Although construction material is now commanding prosperity prices, the ease and low rate at which money can be secured has brought about an equalization that will create great activity in construction work this coming spring. The electrical supply jobber has prepared for this condition and merchandise will be dispatched with the same speed as in normal times.

"When this year has passed into history, the jobbers' worth will be so thoroughly established in the electrical buyers' good graces that 'economical distribution' and the 'electrical supply jobber' will be synonymous."

Demand for Electrical Supplies Indicates Prosperity to Philadelphia Men.

Touching on the prosperous condition of the electrical supply business in general, with particular reference to the motor market, representatives of well known Philadelphia electrical concerns, have given out statements during the past week, as follows:

F. E. Dolbier, engineer for Walker & Keppler, electrical supplies, declared that the demand for electrical appliances had actually run riot in the past year.

"Manufacturing plants working on war materials are swamping the electrical industry with orders for motors, so that they can crowd on every ounce of power possible to turn out their work speedily. With big profits ahead, the expense incident to changing from one form to another is not given a second thought. Production is the thing, and the initial expense of a new installation is considered as nothing in view of the ultimate result attained. Even second-hand motors are commanding a premium." The demand affects not only motors but every class of supplies, he declared.

Frank H. Stewart, of the Frank H. Stewart Electrical Company, was among others to concur in the opinion that never before had the electrical supply business even approached its present prosperity. Mr. Stewart, who speaks from an experience of 24 years, declared that supply men could not possibly get out from under the great avalanche of orders, even if they wanted to.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Grounding of Secondaries.

To the Editor:

The recent articles appearing in this paper appertaining to the grounding of secondary systems are, I think, of deep import to the inspection departments at large. We have seen distinctly contrasted the liability of fatalities due to contact with high potential in ungrounded systems and the increased fire risk incurred in grounded systems.

Apparently, which course should be pursued opens a wide field which experimentation and practical experience will no doubt ultimately solve.

In this connection it might be advisable to note that experience in this section has shown that the majority of cases of fatality on ungrounded secondary systems have been attended by unusual circumstances in relation to the condition of the equipment.

In one case tests made after the accident showed no breakdown or defect in insulation of any part of the system. This leads me to believe that, as shown by Mr. Croft in his article, primary circuits, although clear of ground, may be dangerous to touch by a person in contact with ground, due to inductive and capacity effects extending perhaps over a considerable area. This condition, I personally believe, is possible between primary and secondary circuits where both primary and secondary systems extend in close proximity over a considerable area.

The point I wish to emphasize is that it is not always necessary for metallic contact between primary and secondary, such as a transformer breakdown, to have a dangerous potential between one or both of the secondary wires and ground.

We are assured of one thing, at least, that when the secondary system is grounded, there is absolutely no chance of direct-connected, induced or high-potential static to exist to ground.

In view of the foregoing facts I am in favor of the grounded secondary system, and in this connection I agree with Mr. Hill in his contention that to all intents and purposes the fuse on the grounded side of a system is useless, and that it would be of considerably more value if it were placed in series with the other fuse on the live side.

This would make necessary the bridging of both fuses to kill the required protection of the system.

A. V. G. Doremus.

Inspector, Bureau Electrical Inspection, City of New York.

New York, N. Y.

To the Editor:

Mr. Hill's comments, printed in your issue of January 15, relative to the writers article "Transformer Wiring Practice" which appeared in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for January 1, indicate that he has devoted considerable thought to the subject of secondary grounding. Mr. Hill writes: *I should like to have an expression from him (Mr. Croft) as to whether he does not believe that the fire and life risk are abnormally increased due to the grounding of secondaries on 100 per cent of transformers for the purpose of anticipating accidents to less than one-half of one per cent of actual failures or collapses.*

Frankly, the writer hesitates to express an opinion relative to this particular situation inasmuch as he has not made a study of it. Obviously, such an opinion should be based on the data and the statistics of the case with which the writer is not, unfortunately, familiar. However, it must be confessed that the facts to which Mr. Hill draws attention are important and certainly worthy of very mature consideration.

The thought occurs to the writer that when the "so-called" concentric wiring systems are used, the branch circuits of which, as Mr. Hill suggests, will be protected by only one fuse, the repair man will hesitate to "copper" this fuse. Insofar as we are aware no difficulties have been encountered from this source in the European countries where concentric wiring systems are extensively applied.

Furthermore, as Mr. Hill suggests, it should be determined as to who should be responsible for making periodical inspections of secondary groundings.

St. Louis, Mo. Terrell Croft.

Facilitating Customer's Development.

To the Editor:

With reference to the practice of a Western central station in furnishing transformers to consumers, as published in your issue of January 15, of course, the point made is a very good one where the consumer furnishes the transformers and where the central station is not very much concerned in line and transformer losses, which would be the case on a hydroelectric system where it is not necessary to store water for use during a dry season. I question, however, the advisability of encouraging such a practice in general, and believe it would be more satisfactory for the transformers to be somewhere nearer the size desired. As the load increases additional transformers can be installed and banked with the ones originally put in.

Where the transformers are furnished by the power company it is not a difficult matter to make changes so as to keep the transformers installed somewhere near the capacity required to furnish the load. I believe there are other ways in which the power company can help to build up an industry than by encouraging a practice that is an economic loss. We are rapidly reaching the stage where we must seek for efficiency in every branch of our business, although, of course, we must not let our endeavors to increase efficiency interfere with good business practice.

We have made it a particular point, and are giving it more attention now than heretofore, to have transformers, not only for our consumers, but in our substations, as nearly loaded to capacity as possible, in order to improve conditions on our system and cut down unnecessary losses. With the exception of our reclamation business and certain of our mining business, it is our practice to furnish transformers for consumers, and as the matter is entirely under our control it is not hard to keep the capacity down to the requirements, although, of course, where we know the load is to be increased within a reasonable time we will put in more capacity than is required to start with.

S. V. Walton.

Manager, Commercial Department, Pacific Gas & Electric Company.

San Francisco, Cal.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 333.—Electric Car Heating.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

No. 337.—Master Switch for House Lighting.—There are thirty lamps in a house arranged on three circuits. It is desired to be able to light all of the lamps throughout the house by means of a master switch placed along the bed of the owner in one of the bedrooms. I have heard that it is possible to do this. What special wiring is necessary?—O. P., Lewiston, Idaho.

No. 338.—Grounding of Motors.—What is the best way to ground a group of motors? Can motors of different voltages be connected to the same ground plates, say in the case of 110, 220 or 440-volt alternating-current machines?—R. B., Jackson, Mich.

Answers.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

The question at issue will have to be answered conditionally, because it is obvious that the gain or loss depends upon the article in question, the condition and manner of sale, the facilities of the jobber and the "commercial state" of the manufacturer.

The practice, adopted by jobbers in many lines, of offering goods under distinctive trade names or brands of their own involves a number of important points. Many of these have been discussed at considerable length at meetings of hardware jobbers and manufacturers, so that the inquirer should find light on this subject in the trade journals covering the hardware field. Among the points involved are these:

(1) The use of jobbers' brands instead of the manufacturers' trade names transfers the expense of the advertising from the manufacturer to the jobber. The latter can no longer profit by any national advertising on the part of the manufacturer, but must pay for advertising his own brand. However, this is easily offset by the advertising resulting from the use of the same brand or trade-mark on other classes of goods distributed by the same jobber. In other words, instead of re-inforcing and profiting by the general advertising of a dozen manufacturers offering various products under as many different trade names, the jobber can offer all under a single trade name controlled by himself, thus making the sales of each article act as publicity for all the others.

(2) Since the jobbers' distinctive labels are usually affixed to the goods themselves, the practice of supplying the same article to a number of jobbers under different trade names complicates the manufacturer's stock and shipping methods. Where the goods are shipped from the factory in large quantities, this is not objectionable, but becomes so where the various jobbers order in comparatively small quantities and expect the articles comprising each shipment to be distinctively labeled. In the latter case, the special labeling interferes with prompt shipments from the factory unless the latter carries a stock of duplicate lots bearing the different labels. It may also interfere with economical packing and shipping, as in the canned-vegetable lines where the necessity of access to the boxes for affixing "jobbers'" labels to the cans has barred the economizing on freight rates by the use of wire-bound boxes.

(3) Jobbers' brands tend to restrict competition and price-cutting. Where a manufacturer's brand is specified, any dealer can bid on the same; but where the specifications call for a distinctive jobber's brand, it may require considerable effort for a competitor to secure the order, even though the goods offered are identical except as to the labeling. So, also, where identical articles are offered by stores and mail-order houses, the former need not be influenced by the cut prices of the latter if the markings are sufficiently different to warrant some sales talk as to superiority. Hence the practical boycotting by dealers in some lines of those manufacturers who allow their products to be sold by mail-order concerns under the same names under which they are offered to the trade.

(4) Unless the manufacturer adequately controls the product by patents or superior manufacturing methods, his supplying the goods to be sold under a jobber's brand will leave the jobber free to contract for the same elsewhere. This point has often been overlooked by manufacturers, who jumped at the chance of securing large orders from jobbers of established reputation (thereby profiting by the advertising value of the latter) and who afterwards found themselves only to be competitive bidders for the privilege of manufacturing duplicate lots of the same goods.

(5) Even where the article is patented (thus giving the manufacturer the control during the life of the patent, unless the jobber finds a way of evading the patent and offering the substitute under the same trade name) the jobber offering this article under his own brand may have a decided advantage at the expiration of the patent. For example, where a distinctive trade name controlled by the manufacturer is continuously associated with an article made under a certain patent, also controlled by the same party, this trade name becomes public property upon the expiration of the patent. However, if the jobber is one of a number who have distributed the patented article and if the trade-mark used by the jobber was adopted and registered by him, this trade-mark continues in force and may be renewed indefinitely as long as it continues to be used.

Of course, both the manufacturer and the jobber can usually modify the effect of the above-named influences by a careful wording of the contracts between them. However, such a wording must take due cognizance of the statutes and decisions covering patents, trade-marks and unfair competition, hence the importance of having documents of this class prepared by specialists.—Albert Scheible, Chicago, Ill.

No. 327.—Reducing Glare from Table Lamps.—I have observed that practically all table lamps cause eye strain to children reading or playing on the table by shining glaringly directly into their eyes, if the children are not sufficiently tall to have their eyes screened by the shade or dome. Can anything be done to reduce this glare, aside from using full-frosted lamps?—P. M. C., Lockport, N. Y.

A simple expedient that I have found useful in relieving the glare from reading or other portable table lamps is to stretch a very thin sheet of silk or other almost sheer fabric across the bottom of the shade. If the latter is circular and has smooth bottom edge, a fairly neat and tight joint may be made after some trial. The best way is to have a circular brass wire rim to the sheet and secure it just inside the shade by inconspicuous clasps. The sheet can have one radial slit and a central hole to pass around the stem; after it is in place the slit is closed by means of clasps similar to glove fasteners; then it is secured to the inside of the shade. I first tried this scheme out with tissue paper which I glued to the inside of the shade. The sheet chosen must be thin enough so as not to cut down the light too much, but dense enough to act as a diffuser and effec-

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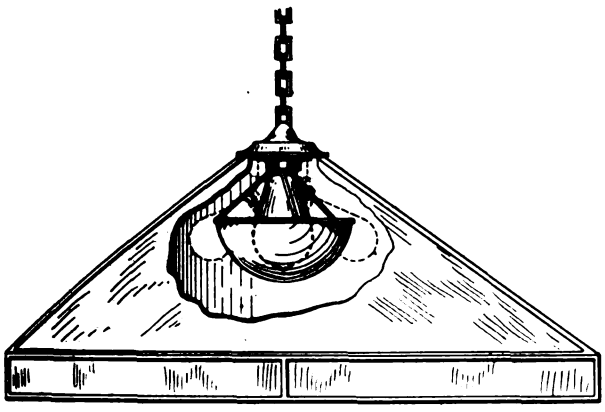
tively diminish the glare. I believe that portable lamp manufacturers could easily get up a design of table lamp in which a circular light-opal glass plate was provided just above the lower inner edge of the art shade. It might be made in two half-circular parts with a central hole and supported by a light annular brass rim which is held by light arms from the stem and also supports the shade.—F. H., River Forest, Ill.

Even a full-frosted lamp if used under domes as commonly placed over dining-room tables is so directly in the line of



No. 327.—Reducing Glare from Dome-Type Table Lamps.

vision as to cause eye strain for all seated around the table. A better and inexpensive solution of the problem is shown in the accompanying diagram of a dining-room light which originally had a cluster of lamps. A single lamp of higher candlepower was substituted for the cluster and a glass hemispherical shade (taken from a portable lamp, and of the kind having spring clips which grasp the lamp bulb) was snapped upon this single lamp. The result is exceedingly restful, while the shade can easily be removed for cleaning or for affording a more intense light while the table is being set.—Albert Scheible, Chicago, Ill.

No. 332.—Electric Belts.—Does any recognized authority on electrotherapeutics find any curative value from the use of the so-called electric belts? Has their sale or exploitation ever been prohibited?—J. S. C., Dayton, O.

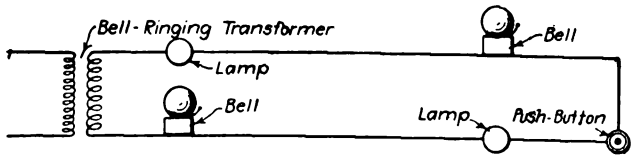
I am inclined to believe that no curative value is obtained from the use of such devices. I have been manufacturing electrotherapeutic apparatus for many years and am conversant with most every state of the art. The United States Government, not more than four years ago, proceeded against a manufacturer of electric belts in New York whose product had been on the market for more than twenty years. Also against a Chicago manufacturer of electric soles whose product was extensively advertised. The contention of the Government in both cases was that the devices in question as advertised by the makers do not do what the makers claim for them, and consequently their sale was prohibited through the mails.—G. W. E., Pittsfield, Mass.

Electrotherapeutics in general embrace the use of electricity in the alleviation and cure of diseases; that is, a *real* use or *legitimate* use. In no authority on electrotherapeutics (or magnetotherapy) to the writer's hand is there any sanction of the so-called "electric belt," "magnetic girdle," *et al.* But, just the opposite, such devices and contrivances are consigned to the medical quack and charlatan. In the medieval period many magical properties were attributed to lodestone, amber, etc., and since superstition and mystery-worship still thrives today in a greater degree than our modern enlightenment would seem to allow, many ignorant people are taken in even now by methods worthy of the most expert magical savants of the dark ages. Some of these methods *superficially* appear to have scientific principles back of them, due to misconceptions. For example, a wave of change of electrical state similar to the currents of action (as the term is used in medical application) traverses a nerve which has been stimulated; this wave travels at the same rate as the nervous impulse (about 31 yards a second in a frog's nerve)—a rate so much slower than that of an ordinary electric current, that by itself it suffices to show that the nervous impulse is something essentially different from an electric current. The association of such electrical changes with vital phenomena, when first observed, led some too hasty people to the conclusion that they were identical, a view to which are due the foolish statements, such as "Electricity is Life," which figures so prominently in the advertisements of various quacks. (Understand, however, that this last statement does not seek to undermine the electron theory or modern views on the *constitution* of matter, mind, etc., which seem to indicate that life really *is* electricity. That is a different matter.)

As regards the sale or exploitation of electric belts and similar lures, attention is called to the work of the American Medical Association in its propaganda for reform which is continually being carried on. In this work anything (patent medicine, appliance, course of treatment, etc.) seeming to bear the hall-marks of fraud is carefully investigated in the Association's laboratories and, in some cases, the Bureau of Standards or other government laboratories, experts, etc., being brought into use. If the charge of fraud be established, then the Federal Government steps in and prosecutes according to the "fraudulent-use-of-the-mails act." In case the mails have not been used in connection with the fraud, it is to be supposed that state law may be resorted to in the ordinary way. Hardly a month goes by that some fake is not unearthed through the medium of this reform propaganda. One of the first of the so-called electrical magic cures to be dealt with was that of the "Electropoise," so much in vogue (?) 20 or 30 years ago. Quite recently the Oxybon Company, of Chicago, got into the toils. An outline of this case appears in the *Journal of the American Medical Association* of February 12, 1916. The article makes interesting reading and gives an insight into the tricks of the trade, which may be recognized in connection with a number of other wonderful (?) cures now being exploited.—P. B. W., Verbena, Ala.

No. 336.—Visual and Audible Signal.—I should like to know whether it is possible (and if so, how) to wire a simple but positive signal system which will indicate at the same instant at the sending and receiving points by means of lighting red lamps and ringing large gongs for perhaps half a minute. That is, the man at the sending end must know positively by the lighting of his lamp and ringing of his gong that the combined signal was properly actuated at the receiving end without a special answer-back signal.—G. S. C., Joplin, Mo.

The diagram gives a very simple and troubleproof method of wiring the visual and audible signal. The diagram is easily read and needs no explanation. The bells and lamps must be selected to operate on the same amperage, and the



No. 336.—Series Arrangement for Visual and Audible Signals.

sum of their voltage ratings should when added to the line I^2R drop be nearly equal to the E. M. F. of the source of power. If direct current is used, one of the bells must be a single-stroke type and the other a vibrating bell. If large signal lamps are desirable and the bells cannot carry the current, a relay may be used in the series circuit and the lamps put in a local circuit. It is to be noted that the source of supply must be at the receiving station or otherwise that station would not receive the signal, but the sending station would, if the line were crossed.—H. E. W., Chicago, Ill.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Control Equipment for Charging of Starting, Lighting and Ignition Batteries.

The line of charging apparatus for use with batteries on starting, lighting and ignition systems has recently been augmented by the addition of a new small type of rheostat, such as is shown in Fig. 1, and by a larger one, made particularly for charging a number of gasoline-automobile batteries in series.

The former is intended for mounting on a wall or switchboard and consists of several resistance units inclosed in a sheet-iron case. On the slate panel there are several contact buttons with a convenient operating lever and two binding posts at the top for connecting to the batteries. For this small type, designated by the manufacturer (the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.) as "G," two sizes are made for connection to 115-volt direct-current circuits. The boxed weights are given

Fig. 1.—Rheostat for Charging of Lighting and Ignition Batteries.

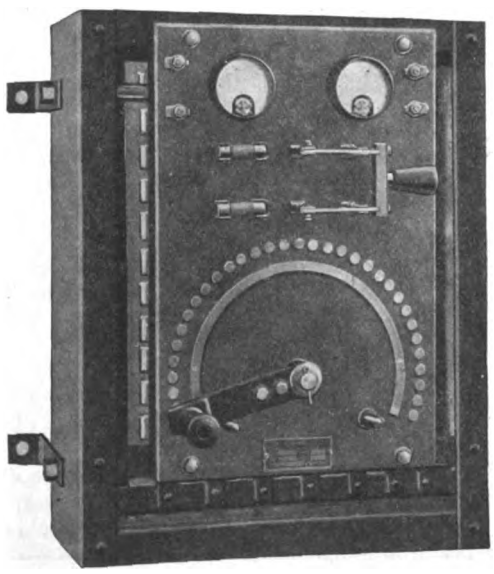

Fig. 2.—Charging Board for Large Gas-Car Garages.

as 16 and 24 pounds, respectively, and the maximum and minimum charging rates are 5 and 2.5, and 10 and 5 amperes, based on charging the usual three cells of a six-volt system in series.

The type shown in Fig. 2 is particularly well suited for the larger garage where it is desirable and economical to charge a number of motor-car batteries in series. They may be used to charge any number of cells up to 44 lead or 60 Edison cells on a 115-volt circuit, or up to 88 lead or 120 Edison cells on a 230-volt circuit.

The apparatus consists of a sheet-metal frame arranged for wall mounting, containing the resistance and carrying a slate panel on which is mounted a movable arm with suitable contacts. Thirty steps of adjustment are provided. When required, a double-pole main-line knife switch, an ammeter, and a voltmeter can be furnished mounted on a panel as shown in the illustration. The ammeter is permanently connected in series with the rheostat, and indicates the charging current at all times. The voltmeter has a 15-volt scale and is intended to be used with flexible leads so that the voltage of the separate batteries can be easily obtained.

The Master Cronograf.

In the issue of May 8, 1915, a description was given of a time-study watch, which was being marketed by Mortimer J. Silberberg, 755 Peoples Gas Building, Chicago, Ill. A more recent model of this time-piece, known as the "master cronograf," is illustrated herewith.

The ordinary hour-hand and minute-hand of the watch are retained in this model, and the dial is marked off in seconds and fifths, as with other stop watches. To eliminate time-robbing calculations, a series of numbers are placed around the outer circumference of the dial for giving the output per hour. For any period of elapsed time the corresponding output per hour is indicated. Thus if 29

Master Cronograf.

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seconds are required to perform an operation, as shown by the stopping of the large hand, the reading 124 directly under it is the corresponding output per hour. If the hand stopped at 19 seconds the output would be 190 per hour.

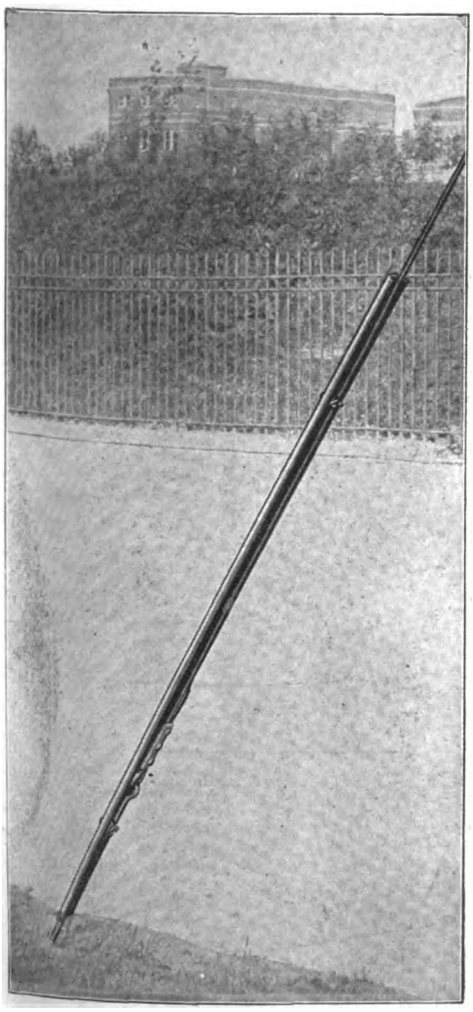
In cases where the duration of an operation is more than one minute, the figures on the extreme inside of the dial are used. Thus if the large hand made one entire revolution and went 10 seconds beyond, 51 operations per hour can be performed. In the case of very short operations it is well to time ten operations, and multiply the reading by 10.

This instrument is a high-grade, 17-jewel watch in gun-metal case, and is accurately adjusted and guaranteed. It is invaluable for making motion studies and eliminating lost time and motion.

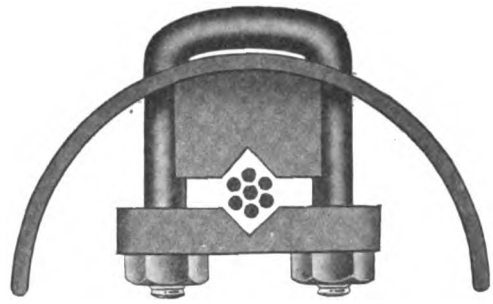
Bierce Guy-Wire Protector.

Wires used for guying overhead pole lines and similar structures need to be protected so that pedestrians, automobiles and vehicles do not run into them. It has been the common practice to use old pipe, wooden boxes or posts driven into the ground for this purpose. The objection to pipe is that it leads rain water to the anchor rod and this quickly rusts and weakens or destroys it. Wooden boxes are easily broken and soon decay.

To overcome these disadvantages a special but simple form of guy-wire protector has been placed on the market by the Specialty Device Company, 112 West Third Street, Cincinnati, O. This Bierce device is made of heavy sheet steel formed to a half circle. It is 7 feet long and weighs 12 pounds. A clamping device shown in the sectional view is placed 18 inches from each end. By means of these



Bierce Guy-Wire Protector in Place.



Sectional View of Guy-Wire Protector.

clamps the protectors are quickly applied on any part of the guy wire desired. One of the clamps has its U bolt one inch longer than the other to enable it to be clamped over the anchor rod, if desired, while the other clamp is secured to the guy wire in the ordinary way. The protectors are neat in appearance and readily visible from all directions. Their length is sufficient so that the top of the protector will be above the level of a man's head even when the bottom of the protector is near the ground level.

Bakelite-Dilecto—A New Insulating Material.

Since the development of the insulating material known as Bakelite, various modifications in this compound made under the general Bakelite patents have been developed to meet special requirements. One of these is known as Bakelite-Dilecto. Although this material has been in course of gradual development and perfection for three or four years and is at the present time used by practically every large electrical manufacturing company in this country, the properties of the compound have not been generally known. Before touching on these it may be said that in every case where this material has been purchased ordinarily in small lots, the excellent results obtained with it have led to a steady increase in its consumption. Manufacturers have found that it is adaptable to a wide range of applications.

This material is made in two grades, of which the XX grade is said to be the best laminated insulating material known. This grade is furnished in sheets, rods and tubes, or it can also be furnished in finished shapes to suit specifications. It is of exceptionally high dielectric strength and is absolutely waterproof, unaffected by ozone, highly resistant to heat and acids, and is strong and tough.

On account of its ability to take a fine finish it is also used in many purely mechanical applications. It is made in any of its natural colors, which are brown, red and black; the latter is used in many cases where hard rubber has heretofore been employed, as it possesses all of the good properties of hard rubber and many that are vastly superior to those of hard rubber; among the latter are that it is not affected by ozone and does not deteriorate or change in color with age. This material is used very largely for high-voltage insulation and may be easily machined, turned, planed, milled and tapped.

This compound is a laminated material, that is, it is built up of successive layers of material saturated with Bakelite and compressed together with extremely high pressure. This method of manufacture is the secret of the very great strength possessed by this material.

Bakelite-Dilecto is also manufactured in a grade known as X, which is somewhat cheaper than the grade XX. In the main it is identical with the latter, but is not absolutely waterproof; however, it will not absorb moisture from the atmosphere to nearly as great an extent as fibrous insulating materials and therefore does not warp or change its shape. This grade X is made in sheets and tubes only. The fact that both grades of this material

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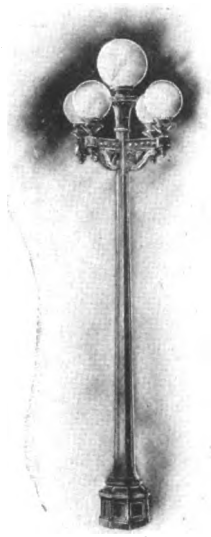
may be made into tubes, either round, square or of any other section, makes it adapted for coil cases and similar work.

Bakelite-Dilecto is manufactured by the Continental Fibre Company, Newark, Del. This company is in position to render special service to manufacturers in the way of recommending certain grades of this compound to give satisfaction for particular purposes.

Olympian Ornamental Iron Cluster Post.

The undiminished popularity of street lighting with ornamental posts is calling for new designs to meet special requirements. The company that has been one of the leaders in the manufacture of posts for ornamental clusters is the Flour City Ornamental Iron Works, Minneapolis, Minn. The Corinthian cluster post manufactured by this company has for some years been looked upon as one of the most classic designs for this type of lighting and is installed in many parts of the country. The company has now added a new pattern known as the Olympian type. It is lighter in construction and is made for either three or five lamps. This new post has been



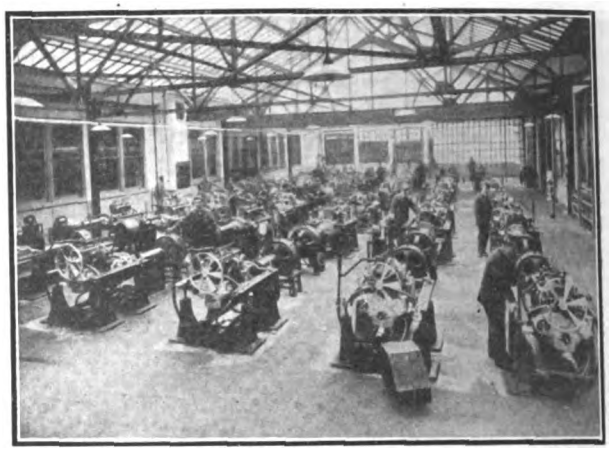
New Olympian Ornamental Cluster Post.

designed with extra care for economy in material and manufacture as well as elegance in appearance. It is made by experienced molders from the best grade of pig iron. In general construction it bears out the high grade set by the company's Corinthian standard.

Electrically Operated Test Room of the Packard Motor Car Company.

The Packard Motor Car Company, Detroit, Mich., strives continually to attain to that measure of quality of which it is justly proud. The Packard standard is upheld by skill in designing, selection of materials, and care in manufacturing. But to further insure a perfectly running car every engine is carefully tested before being installed in its car. In the illustration are shown 40 of these engines in the large Packard test room.

Forty Westinghouse 15-horsepower direct-current motors are shown driving these engines so as to grind in all the bearings and wearing parts. When the engines operate smoothly and with the minimum amount of friction demanded by the Packard standard, this is shown on the ammeter used in connection with each electric motor. As the engine runs easier the current decreases until the point is reached where the highly desired smoothness of



View in Packard Test Room.

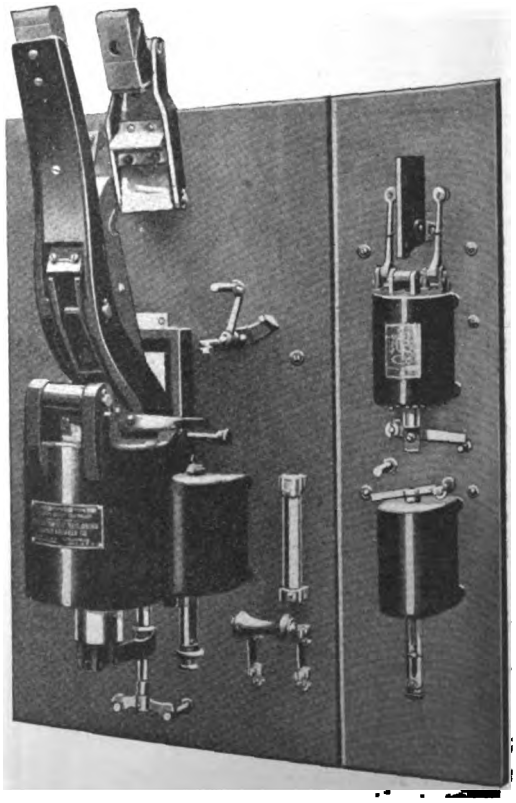
action of the Packard is obtained. Every Packard engine goes through this test room for its rigid test for reliability, smoothness of action, etc.

Feeder-Circuit Relay for Automatic Reclosing Circuit-Breaker.

The Automatic Reclosing Circuit Breaker Company, Columbus, O., has recently developed a new style of relay, known as type F-2, to operate in conjunction with its line of automatic reclosing circuit-breakers, which were described in the Electrical Review and Western Electrician of May 15, 1915.

The standard form of automatic reclosing circuit-breaker is designed to control the entire current input to the circuit and will not operate satisfactorily in a feeder circuit where such feeder is supplying current to a load circuit that is also supplied by current from other points.

This new feeder-circuit relay is designed especially to operate with circuit-breakers connected in a circuit supplying current to a distribution network. The accompanying cut shows the feeder-circuit relay operating in conjunc-



Automatic Reclosing Circuit-Breaker with Feeder Relay.

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tion with a 1,200-ampere type D automatic reclosing circuit-breaker. The special feature of this relay is that it has a potential adjustment whereby the breaker may be set to reclose at any voltage from 50 per cent normal to full voltage on the load side of breaker.

Should the breaker open due to an excessive load, it will reclose at the expiration of a short time interval, provided the voltage on the load side of the breaker is not excessively low; should the voltage be excessively low so that breaker would immediately open were it to reclose, the potential adjustment may be set so that the breaker will not reclose until the voltage has risen to a safe value, but the instant the voltage does reach the allowable value, the breaker will automatically reclose. Should a short-circuit occur, the breaker will of course remain open until the short-circuit has been removed.

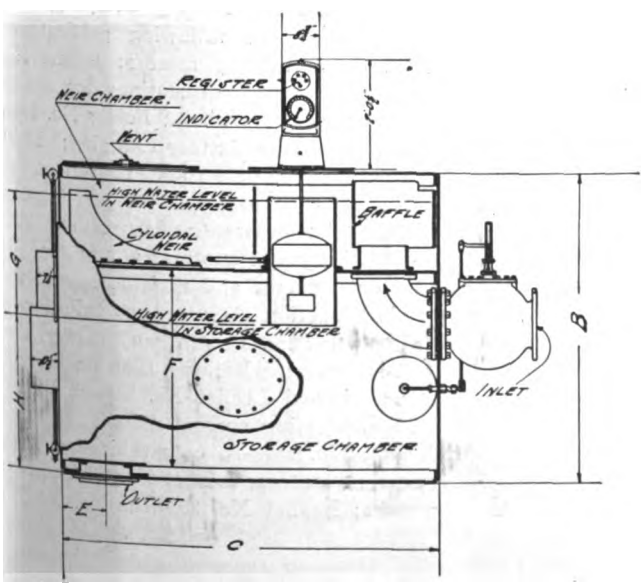
Another feature of this relay is that it enables the breaker to be used on a network where a number of feeders are supplying current to a common load or it may be used on an independent circuit, where breakers control the entire current input to the load. When used in either connection, the breaker will operate entirely automatically and will reclose only when line conditions are right and no short-circuit exists.

A dead-load adjustment is provided for the breaker whereby it will reclose on any predetermined amount of load, such as lamps, self-starting motors, etc., but will not reclose on an actual short-circuit of low resistance. This combination of feeder-circuit relay and circuit-breaker is especially suitable for the protection of rotary converters or generator sets in small substations supplying current to mines, street railways, mills, etc., where the switchboard attendant has other duties to perform besides looking after the circuit-breaker.

The potential adjustment on the relay furnishes a certain means of having the breaker close only when proper voltage relations exist between the generator protected and the load circuit. This eliminates the necessity of having a voltmeter or other means of indicating proper voltage for the operator to close the breaker, it also eliminates the human factor in operating the breaker, thus making the operation more certain to occur at the proper time.

Kennicott Cycloid-Weir Water Meter.

The use of the weir has long been recognized as possessing special advantages in measuring the flow of water or other similar liquid. An improved type of weir meter that is now attracting much attention is the Kennicott cycloid-weir meter.



Internal Arrangement of Kennicott Cycloid-Weir Meter.

The cycloid weir is the heart of the new Kennicott cycloid-weir meter. The scale drawing herewith shows this cycloid weir correctly located in the weir chamber, through a slot in the cycloidal face of the weir.

A study of this cycloid weir reveals the following: The lower the head falls, the greater the proportion of the opening through which the water flows from the weir chamber. As the water rises, the proportion of the opening decreases. This condition offsets the varying flow of water, which would ordinarily result from lowered or increased pressure. The exact proportion is thus automatically maintained, regardless of the head of the water.

By this construction the opportunity for error has been reduced and greater accuracy assured by this utilization of a new principle for the flow meter. This unit therefore provides a weir, through which the rate of flow is at all times proportional to the head of water above the crest of the weir.

The manufacturers of this weir-type meter point out two principal reasons why the cycloid weir is accurate:

First—At low flows, for example, when there is from 1 to 2-inch head over the crest of the weir, the water invariably flows clean from the surface of the weir. It does not trickle or drizzle down the face of the weir. Thus the cycloid weir has overcome one of the primary objections to this type of meter.

Second—Since the flow of water is in exact proportion to the head, the float which operates the registering mechanism accurately registers an average height above the crest of the weir. The mechanism is driven in proportion to this average height. As the flow is proportional, this condition automatically compensates for any slight variation in the water level above or below the average height. The weir is therefor compensating and not cumulative, as is the case where the flow of water is not in exact proportion to the head.

The Kennicott cycloid-weir meter, as designed, has, therefore, seemingly overcome the main objections offered to the ordinary flow meters where the head is not proportional to the rate of flow, since the former type of flow meter must embody mechanism necessary for the computation of a fairly accurate result.

Other advantages claimed for this meter are: It is the most accurate device of this type being offered, as has been demonstrated by a series of experiments. It is wonderfully simple and has nothing to get out of order. It is accurate at all rates of flow within the capacity of the meter. Changes in temperature do not affect its operation. There are no parts to warp and there is no friction. It will measure boiler-feed water from an open heater, condensation water, or any free flowing liquid, hot or cold.

This meter is manufactured by the Kennicott Company, Chicago Heights, Ill.

Leakage of Current from Electric Railways.

A study of the problems connected with the leakage of current from electric railways has recently been completed by the Bureau of Standards, Department of Commerce, and the results just published in Technologic Paper No. 63.

The theory of the leakage of current from electric railway tracks is developed mathematically, and curves are then plotted to aid in the interpretation of the results. The conclusions to be drawn from the formulas and curves are discussed with special reference to practical problems in electrolysis. It is shown how the escape of electricity from the rails is affected by increasing the track conductivity, as by careful bonding of all joints; by the use of a high resistance roadbed; and by shortening the distance over which a power house or substation furnishes power.

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INDUSTRY ACTIVITIES

The Globe Stove & Range Company, Kokomo, Ind., announce the successful test and approval of Globe electric ranges by the Good Housekeeping Institute.

Westinghouse Church Kerr & Company, engineers and constructors, 37 Wall Street, New York City, have issued a folder giving an illustration of saving in concrete construction.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued an eight-page booklet which gives a reprint of an illustrated article on "Portrait Lighting with Mercury-Vapor Lamps."

The Trumbull Electric Manufacturing Company, Plainville, Conn., has issued the February number of "Trumbull Cheer," which has preparedness as its keynote. Illustrations and prices are given of the Trumbull "standard" attachment plug and new design No. 701 combination switch.

Sprague Electric Works of the General Electric Company, 527 West Thirty-fourth Street, New York City, has issued bulletin No. 48705, on direct-current motors and controllers for flat-bed and small rotary printing presses. The company also has issued an 18-page booklet on electric fans.

The Union Metal Manufacturing Company, Canton, O., has issued an attractive booklet on its lines of entrance standards, wall brackets, exterior newels and garden fixtures. The Chicago district sales manager for the Union company is the Minerallac Electric Company, 1043 Washington Boulevard.

Crouse-Hinds Company, Syracuse, N. Y., has issued Bulletin No. 1C, a supplement to its panel and cabinet Bulletin No. 1, which gives listings of its line of narrow panels and revised listings of types O and P panels. The company has also issued catalog sheets on multimeter panelboards and adjustable trim fasteners.

Westinghouse Lamp Company, 261 Broadway, New York City, has issued a new handbook for the benefit of electrical salesmen. This handbook is the fifth of a series issued during the past six months, these books being designed to furnish valuable information to electrical salesmen in order to make them more efficient. The company supplies these books without charge upon request.

General Electric Company.—Business at the Pittsfield, Mass., plant during January and February of this year was the largest in the history of the plant. Nearly all the orders were for materials purchased by companies in the United States. Among the large orders was one for transformers for the Montana Power Company, to be used in the electrification of the Chicago, St. Paul & Puget Sound Railroad, duplicating an order for apparatus furnished two years ago.

The National Electric Utilities Company, manufacturer of Neuco heating appliances, has removed its offices and display rooms to the Grand Central Terminal Building, 103 Park Avenue, New York City. The factory in New York City has been discontinued, and a new factory opened in Danbury, Conn. The company manufactures household ranges, together with hotel and restaurant electrical equipment, and electrical heating and drying appliances for mills and factories.

The Gamewell Fire-Alarm Telegraph Company, New York City, was the only bidder for the installation of a fire-alarm system in Holyoke, Mass. The company recently submitted a bid of $29,800 for a 12-circuit system, with fast and slow transformer, perforating register and other appurtenances. A bid of $23,500 was submitted in 1913 by the same company for an 8-circuit system. On the same basis, the new bid is about 13 per cent higher than the first, the increase being attributed to increased cost of labor and materials. The Fire Commissioners will recommend an appropriation for the installation of the system.

Experts Differ Widely on Plant Renewal Costs.—Wide differences have been revealed in the claimed reproduction value of the physical properties of the Philadelphia Electric Company submitted to the Pennsylvania Public Service Commission in the suit instituted by the City of Philadelphia in an effort to obtain reduced light and power rates. After an exhaustive appraisal conducted by Prof. D. C. Jackson, of Boston, the company recently submitted figures in which it put its replacement value at $51,562,000. Henry W. Ballard of Cleveland, expert for the complainants, contends that the plant could be replaced for $28,583,000. Mr. Jackson's appraisal valuations were higher for each item. Mr. Ballard did not place any valuation on brokerage, patents owned, or going-concern value.

German Price Advance for Machinery.—The leading firms in Germany belonging to the price convention for heavy electrical engineering manufacturers, have made a further increase of 10 per cent in the list prices, owing to the present situation of the market for raw materials, thus making a total advance of 40 per cent. The higher charges apply to machines and motors, including electrically driven ventilators, pumps, boring machines, etc., starting appliances, regulating resistances, controllers, oil, lever and automatic switches, and railway materials, while the list prices for machines and motors of over 100 horsepower, as well as for transformers, continue suspended. Further increases are reserved in the case of articles for purely peace services. Among the firms who have signed the circular announcing the alteration are the Allgemeine Elektricitäts Gesellschaft, Siemens-Schuckert, Bergmann and Brown-Boveri Works.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued the following publications: Leaflet No. 3763, on 532-B railway motors; Leaflet No. 3818, on type C push-button-control stations for use in automatic motor-starters and controllers; Folder No. 4201, called the "A B C of Automobile Battery Charging;" Leaflet No. 3823-A, on commutating-pole rotary converters, describing the effectiveness of the newer designs; Catalog No. DS846, on pole-line hardware; Catalog section IP54, on type CW slip-ring induction motors, a new type of pressed-steel motor for constant and variable continuous-duty service; Catalog section DS919, on switchboard meters for measuring pressure, current and energy; the January issue of "Westinghouse Railway Data Exchange." The company has also issued Leaflet No. 3504-A, on the selection of type CI alternating current motors for intermittent service; Leaflet No. 3513-A, on machine-tool controllers for direct-current motors; Leaflet No. 3832, on No. 307-CV railway motors; Leaflet No. 3834, on No. 306-CV railway motors; Leaflet No. 3836, on No. 548-A railway motors; Leaflet No. 3848, on types B and R rheostatic drum controllers, and Leaflet No. 3766-A, on large slip-ring type CW induction motors.

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PERSONAL AND BIOGRAPHICAL

MR. JAMES BENNETT, formerly managing director of the Fire Prevention Company, Montreal, Canada, is now special agent for the Economy Fuse & Manufacturing Company, with headquarters in Chicago, Ill.

MR. G. F. EVANS has resigned from the position of illuminating expert for the Columbus (O.) Railway, Power & Light Company to become supervising engineer for the W. C. Moore Company of Columbus.

MR. S. E. SANDESON is now superintendent of the Intermountain Railway, Light & Power Company at Las Animas, Colo. He formerly was with the Utah Power & Light Company and other western concerns.

MR. U. S. ARNOLD is now the Oklahoma and Texas representative of the Commercial Electric Supply Company of St. Louis, Mo. He has previously been in the sales organization of the Western Electric Company in Dallas, Tex.

MR. C. F. PEARSON recently has been appointed general manager of the National Coil Company, Lansing, Mich. He was chief electrical engineer for the company during a period of 15 years prior to his appointment as general manager.

MR. C. R. BALDWIN tendered his resignation as manager of the Manhattan Electrical Supply Company, St. Louis, Mo., on February 25. Mr. Baldwin has not announced any definite plans for the future, but he will in all probability remain in St. Louis.

MR. ROBERT DUERER, who has been connected with the Houston (Tex.) Lighting & Power Company for 21 years, serving in the capacity of secretary-treasurer of the company during the past ten years, has resigned. MR. P. S. DAUNOY has been elected to the position.

MR. HENRY WILMERING, for five years chief accountant of the Oklahoma Gas & Electric Company, has resigned to serve the state in an expert capacity in connection with the freight and passenger railway case which is now being heard before the Corporation Commission.

MR. C. LOUIS ALLEN, formerly sales and advertising manager of the Pyrene Manufacturing Company, New York City, has been elected president to take the place made vacant by the retirement of MR. DARWIN R. JAMES, who recently was made president of the American Chicle Company.

MR. JAMES CLARK, JR., of the James Clark, Jr., Electric Company, and MR. SAMUEL RIDDLE, superintendent of transportation of the Louisville Traction Company, are two of the incorporators of the Louisville Auditorium Association, which is made up of citizens who have subscribed $300,000 toward a fund for construction of a public auditorium in Louisville, Ky.

MR. HARRY C. BROWN, formerly with the Crouse-Hinds Company, Syracuse, N. Y., has been appointed assistant secretary of the National Electrical Contractors' Association, and will be located in Utica, N. Y. Mr. Brown began his electrical work with the Crouse-Hinds Company a number of years ago, and of late years has been a traveling representative for the company in the United States and Canada. One of Mr. Brown's new duties will be to prepare the National Electrical Contractors' Association universal data and sales book, which gives information on electrical materials and products.

MR. R. S. WALLACE, who was elected president of the Illinois State Electric Association at the annual convention held in Champaign, February 24-25, as reported in last week's issue, is a native of Illinois and a graduate of the engineering college of the University of Illinois. Mr. Wallace has been in the public utility field about 15 years, during which time his work has been associated with various

R. S. Wallace.

branches of mechanical and electrical engineering. He is vice-president and general manager of the Central Illinois Light Company, Peoria, Ill., and has served it or its predecessors in various capacities beginning with that of chief engineer. During the past few years, Mr. Wallace has been largely instrumental in broadening the company's field of operations from the limits of the city of Peoria to include Pekin and about 25 cities and villages within a radius of 50 miles of Peoria. The Central Illinois Light Company furnishes gas, electric and heating service in Peoria and Pekin, and electric service in the remainder of its territory, which covers a large part of Peoria and several adjoining counties.

MR. GEORGE D. SMITH, for the past two years supervisor of agencies for the General Vehicle Company, Inc., has been appointed special assistant to MR. HARRISON G. THOMPSON, vice-president and general sales manager, Edison Storage Battery Company. He will make his headquarters at the factory and main office, Orange, N. J. Mr. Smith is widely known throughout the electrical industry, especially to central-station officials and operators who know him for his conscientious endeavor and successful efforts in placing the electric commercial vehicle on a firmer footing in the United States and Canada.

MR. CHARLES R. UNDERHILL, chief electrical engineer, the Acme Wire Company, New Haven, Conn., lectured on the subject of "Electromagnets" at the Rensselaer Polytechnic Institute, February 15; Union College, February 16; Worcester Polytechnic Institute, February 18; Cornell University, February 21; Franklin Union Industrial School, February 23; Massachusetts Institute of Technology, February 24; Lehigh University, February 25, and Stevens Institute of Technology, March 1. These lectures were delivered before the student bodies and engineering societies at the different educational institutions.

OBITUARY.

MR. GEORGE W. BANKS, for many years associated with the power industry and connected with the Podds Power Company of New York, now dissolved, died February 29, at his home in Mount Kisco, N. Y., aged 57 years.

MR. WILLIAM W. MILLS, one of the engineers who built the New York City subway and a former City Engineer of New York, recently died at his home in Los Eucinas, Cal., aged 71 years. He was graduated from Troy Polytechnic Institute in 1868, and was appointed City Engineer of New York a few years later. In 1881 he located in Pasadena, Cal., and became engineer of Los Angeles County. A few years later he returned to New York and joined the engineering staff of the subway. While engaged in this work Mr. Mills' health failed and he returned to California.

MR. HENRY W. POPE, one of the early telegraph operators and a coworker as an operator with Thomas A. Edison, died in his home in Bellerose, L. I., February 29, aged 67. Mr. Pope was born at Great Barrington, Mass., in 1849. At the age of 13 he worked as a telegraph operator in Boston with Mr. Edison, with whom he retained a close friendship. In 1864 Mr. Pope had charge of the war telegraph wire between Washington and New York and was in close touch with many prominent officials, soldiers and politicians. He claimed the honor of having installed the first telephone in New York City and the first electric light in Brooklyn. He was at his death connected with the American Telephone & Telegraph Company. Mr. Pope was a man of exceedingly kind disposition and had a great many friends. His brother, the distinguished electrical engineer, Franklin Leonard Pope, died several years ago, but he is survived by his brother, Ralph W. Pope, honorary secretary of the American Institute of Electrical Engineers.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

SOUTH SEBEC, ME.—It is reported that the Milo (Me.) Electric Light & Power Company, C. D. Tawne, manager, is planning to extend its transmission lines to this place, and will supply energy for light and power.

MONTPELIER, VT.—The petition of the Montpelier & Barre Light & Power Company for permission to issue $300,000 in bonds to purchase the holdings of the Waterbury Light & Power Company, known as the Moody & Almon plant, has been granted in an order recently issued by the Public Service Commission.

MONTPELIER, VT.—The Eastern Vermont Public Utilities Corporation is the name of a new concern which seeks a certificate of incorporation from the state. The company asks the right to hold land, riparian, water rights and real estate, in the towns of Barnet, Groton, Ryegate, Stannard, Walden, Peacham and Danville, in Caledonia County, and Newberry in Orange County, and to hold and use water powers and to build dams, flumes, pipe lines, transmission lines, power stations, etc., for the generating of electrical energy for power, heat and light, and to issue bonds and notes and to mortgage its property, with a capital stock of $200,000. Among the subscribers are I. M. Frost, of Rutland; W. C. Clifford, of Bethel; Albert A. Daniel, of West Danville; E. F. Clark, of Groton, and F. Monroe Dyer, of 21 Broad Street, New York City.

RUTLAND, VT.—The Rutland Railway, Light & Power Company is extending its pole lines, for light and power service, to include a farming community in Pittsford.

CENTERVILLE, MASS.—Ways and means for securing electrical energy for street lighting are being discussed by interested citizens.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company is to build a three-story electric power station. Stone & Webster, 147 Milk Street, Boston, will build and equip the plant.

OAKFIELD, MASS.—The Oakfield Light & Power Company has been organized with a capital of $10,000 to generate and distribute electrical energy.

SOUTH HADLEY, MASS.—The city has voted $2,000 for extensions to municipal transmission lines, and $7,050 for street lighting during the coming year.

WORCESTER, MASS.—The Worcester Electric Light Company, of which R. W. Rollins is president and general manager, will make an extension to its Webster Street power house building which will permit additions to switchboard facilities and space for additional turbine capacity. A 20,000-kilowatt Westinghouse turbogenerator will be installed later in the year. The dimensions of the power house, when completed, will be 150 by 183 feet.

BUFFALO, N. Y.—Councilman J. F. Malone is advocating a better lighting system for Delaware Park.

ELLENBURGH, N. Y.—Norman P. White, who is president of a company recently formed for the purpose of furnishing this place with energy for light and power, states that a water-power site on the Big Chazy River near here has been secured and will be developed. The company is capitalized for $30,000, and plans are being made to furnish service to nearby towns.

FORESTVILLE, N. Y.—A franchise has been granted the Silver Creek Electric Light Company to furnish electrical energy to local consumers.

SENECA FALLS, N. Y.—Plans and specifications have been received here for the new power plant of the Seneca Power Corporation, which is to be built at the new dam east of here during the coming summer. There is over $2,000,000 involved in the erection of the plant and the development of the power, and it is expected that the structure alone will cost more than $200,000. The plans call for an ornamental structure, 100 by 48 feet, to be erected at the north extremity of the dam. No preparations have as yet been made for the installation of electrical equipment. About 7,000 horsepower will be the initial capacity. Mortimer J. Barns is the engineer in charge.

BRIDGETON, N. J.—The Board of Public Utility Commissioners has granted permission to the Bridgeton Electric Company to issue capital stock for $50,000 for extensions and improvements.

BURLINGTON, N. J.—The City Council is considering a bond issue of $8,500, to provide for the installation of new electric pumping equipment at the municipal waterworks.

CLINTON, N. J.—The Board of Public Utility Commissioners has approved an ordinance granting the Jersey Electric Company to install a system at Clinton.

HOBOKEN, N. J.—The Board of City Commissioners has awarded a contract for street lighting to the Public Service Electric Company, at a cost of $80 per lamp a year. The Board is planning for the installation of a new street-lighting system to form a white way along Washington Street.

JERSEY CITY, N. J.—Property owners along Ocean Avenue are negotiating with the City Commission for the installation of an improved street-lighting system.

NEWARK, N. J.—The Common Council is planning for the installation of a new lighting system in the City Hall. Hooper & Company are the architects.

POMPTON LAKES, N. J.—The Commercial Power Company, Jersey City, is negotiating with the Borough Council for the purchase of the municipal electric power station, recently erected at a cost of about $75,000, and now operating at a profit. The Council has announced its intention of selling the plant if a suitable price is offered and a guarantee as to local electric rates.

TRENTON, N. J.—The State Assembly has passed a bill permitting the City Commissioners to install an underground conduit system in Mahlon Stacy Park.

HARRISBURG, PA.—Application has been made to the Public Service Commission for the approval of a merger of over 50 electric power companies in Western Pennsylvania into the West Penn Electric Company, of Pittsburgh, and for approval of purchases and mergers of electric lines and other properties of the same interests. No action has yet been announced.

HARRISBURG, PA.—The Pennsylvania Railroad Company has announced plans providing for the electrification of all tracks and switches in the Enola freight yards near here. It is expected to complete the work in about six months. The company is also making surveys for a second track from Pavonia to Mount Holly, N. J., with the ultimate plan of electrifying this branch of its system. It is proposed to use the same method of propulsion as on the main line out of the Broad Street station, Philadelphia.

PHILADELPHIA, PA.—Estimates are being prepared by the Electric Bureau for a new lighting system in Germantown Avenue.

YORK, PA.—In listing $665,000 additional first mortgage 30-year 5-per-cent gold bonds on the Philadelphia exchange, the York (Pa.) Railways Company states that $479,690 was issued for extensions, improvements, betterments and double-tracking on the parent company's lines of railway; $135,000 for acquiring and constructing a power plant for supplying energy to the York Railways Company and the Edison Light & Power Company, and $50,310 for the purchase of a majority interest in the York & Windsor Electric Light Company and the Edison Light & Power Company.

CENTERVILLE, MD.—The Commissioners here are making plans for the establishment of an electric lighting and power plant.

ALEXANDRIA, VA.—In order that it may extend the use of the telephone for dispatching trains over the entire line, from Alexandria to Salisbury, N. C., a distance of 330 miles, the Southern Railway has authorized the construction of two telephone circuits between Alexandria and Monroe, Va., 160 miles. The work will be under the direction of W. H. Potter, superintendent of telegraph.

FORK UNION, VA.—According to C. E. Crosland, the Fort Union Military Academy is preparing plans for four new buildings. A 15-kilowatt generator and other electrical equipment will be installed.

FRONT ROYAL, VA.—Improvements to the municipal hydroelectric power plant are being planned. An auxiliary steam plant may be erected.

TROY, N. C.—J. C. Hurley, of the Smithtown Power Company, recently incorporated with a capital of $300,000, states that the company is planning the development of a power site on the Little River, near Mount Gilead.

ADEL, GA.—The city water department, T. R. Sutton, superintendent, is planning to install a motor-driven centrifugal pump.

BLAKELY, GA.—Improvements to the electric lighting plant, of which E. R. Adams is superintendent, are being planned.

ELLAVILLE, GA.—The city contemplates voting $5,000 in bonds for the construction of an electric lighting plant and water works.

PEMBROKE, GA.—The citizens of Bryan County have a plan on foot whereby the town may be furnished with electric lights very economically. A large sawmill is being erected near here, which will have a large surplus of power, the plan being to utilize this power. The only additional expense would be in procuring a generator and wiring for lamps. L. B. Godbee is interested in the plan.

JACKSONVILLE, FLA.—The American Telephone & Telegraph Company will build a toll line down the Florida east coast to Key West, the line to parallel the Florida East Coast Railroad.

PLANT CITY, FLA.—This city is planning to build an electric lighting plant at a cost of $50,000. The Board of Public Works is preparing the plans.

NORTH CENTRAL STATES.

COLUMBUS, O.—A meeting of the stockholders of the Scioto Valley Traction Company will be held to authorize the directors to use the $200,000 first preferred stock of the company, which was created in 1908, for a new interurban station here.

DEFIANCE, O.—The Defiance Gas & Electric Company has increased its capital stock from $300,000 to $850,000. A number of extensions and improvements are being planned.

GREENSPRING, O.—The Greenspring Electric Light & Power Company has been organized with a capital of $10,000, by D. M. Scott, F. M. Audrish and others, to furnish electric service here.

ROSSVILLE, O.—Better electric lighting facilities are planned for this community by A. E. Moore and others.

GROVEPORT, O.—It is reported that the Scioto Valley Traction Company, of Columbus, will purchase the distribution system here and make improvements.

MASSILLON, O.—The Massillon Electric & Gas Company is planning to install an ornamental lighting system and make other improvements in its service.

COLUMBUS, IND.—The Bartholomew County Commissioners have accepted plans and specifications for a new lighting system for the county courthouse, which will cost $7,000.

BRISTOL, IND.—Representatives of both the Indiana & Michigan Electric Company and the Hawks Electric Company, of Goshen, have visited Bristol to make estimates with a view to submitting propositions for lighting the town.

EVANSVILLE, IND.—Plans for the electrification of the Evansville & Indianapolis

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Railroad are being considered, it is reported, by the officials of the company.

GAS CITY, IND.—The city water and light department, T. S. McKee superintendent, is in the market for an engine-driven, direct-connected, 2,400-volt, three-phase, 60-cycle, revolving-field generator, with exciter.

MILROY, IND.—W. W. Barton, W. B. Crane and Frank McCorkle have organized the Milroy Light & Power Company, with a capital of $6,000, and will build a power plant here.

ALEDO, ILL.—The Tri-County Light & Power Company is planning to install an additional generating unit in its power plant here.

BROCTON, ILL.—Mayor J. M. Lewis will present to the Town Board a proposition to buy a municipal electric lighting plant.

EAST ST. LOUIS, ILL.—The Board of Education here has decided to install an electric lighting and power plant, to supply three of the city schools. Bids will be advertised in about two weeks.

MACOMB, ILL.—The city is preparing to install a cluster lighting system. All wiring for electric light and power and telephone and telegraph lines will be placed in underground conduit.

M'LEANSBORO, ILL.—Plans for extensions to the electric lighting system here are being considered.

MT. CARMEL, ILL.—The Oil Belt Railroad Company has secured an option for the development of a power site at the Grand Rapids dam above Mt. Carmel. It is proposed to develop power for industrial as well as traction purposes.

PARIS, ILL.—The Central Illinois Public Service Company has announced that the company's plant here will be practically rebuilt in the near future.

SPRINGFIELD, ILL.—Business men along Sixth Street, from Capital Avenue to Madison Street, have petitioned the Board of Local Improvements for the installation of an ornamental lighting system.

WHITE HALL, ILL.—At the coming city election a proposition to erect an electric lighting plant will be placed before the voters.

GRAND RAPIDS, MICH.—At a meeting of the Board of Public Works, W. H. Anderson and a number of other property owners on Oakes Street, between Division and Ionia Avenues, were granted permission to install single-standard boulevard lamps. The cost will be about $1,600.

KALAMAZOO, MICH.—The question of issuing bonds for the acquisition of a municipal electric lighting plant will be placed before the voters here.

MARQUETTE, MICH.—J. E. Sherman, Commissioner of Light and Power, is preparing estimates for the construction of a new electric power plant, to cost about $200,000.

WHITEHALL, MICH.—The Frugale Power Company of which Frank H. Speese is president, is planning to begin the construction of a power plant on the north branch of White River in the early spring. The new plant will cost about $100,000.

RACINE, WIS.—The merchants of State Street have petitioned for an ornamental street-lighting system.

WALWORTH, WIS.—The Southern Wisconsin Electric Company, Lake Geneva, has purchased the electric lighting plant here. The company will build a 33,000-volt transmission line to this city during the spring.

BARRETT, MINN.—An election will be held March 14 to vote on the question of issuing bonds for the establishment of an electric lighting system.

DASSEL, MINN.—The Public Service Company, of St. Cloud, has been granted a franchise to extend its electric light and power lines into and through this village.

MOUNTAIN LAKE, MINN.—The Consumers Power Company has been granted permission to erect and maintain poles, wires and appurtenances for transmission and sale of electrical energy here.

ST. PAUL, MINN.—The Western Union Telegraph Company will spend about $150,000 on improvements this year. All pole lines between St. Paul and Minneapolis will be replaced by underground conduit. Instruments, switchboards and other appliances at branches and the Pioneer Building offices and operating rooms will be supplanted by new equipment. C. A. Crane is local manager.

MECHANICSVILLE, IOWA.—An electric light plant will be installed here.

ST. ANTHONY, IOWA.—At a recent election a franchise was granted to the Iowa Railway & Light Company of Cedar Rapids, to furnish energy for light and power to St. Anthony. The energy will be supplied from the company's Marshalltown plant.

DATES AHEAD.

Wisconsin Electrical Association. Annual convention, Hotel Pfister, Milwaukee, Wis., March 16 and 17. Secretary, George Allison, First National Bank Building, Milwaukee, Wis.

Railway Signal Association. Annual convention, Chicago, Ill., March 20 and 21. Secretary, C. C. Rosenberg, Times Building, Bethlehem, Pa.

American Society of Mechanical Engineers, Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-anual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., May 9-11. Secretary, R. B. Fowles, Pine Bluff, Ark.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

National Electric Light Association. Annual convention, Chicago, Ill. May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SHELDON, IOWA.—The holdings of the Sheldon Light & Power Company have been purchased by the Northern Iowa Power Company, Humboldt, Iowa. It is reported that the extensions and improvements to be made here will cost about $60,000, and will result in practically a new plant.

SIDNEY, IOWA.—The City Council is considering a proposition to grant the Continental Gas & Electric Corporation, of Cleveland, O., a franchise to install and operate an electric lighting plant here.

CARUTHERSVILLE, MO.—The Electric Light & Power Company has applied to the Public Service Commission for authority to issue $15,000 in stock to provide for proposed enlargements in its power plant.

GENESEO, KANS.—The municipal electric light plant, Chester Norman, manager, will extend its transmission lines this spring.

HUTCHINSON, KANS.—The ordinance embodying the contract with the United Water, Gas & Electric Company for additional lights for the city was passed by the City Commission. The total number of white-way clusters will be increased to 178, and a large number of incandescent lamps will be added.

MORGANSVILLE, KANS.—The City Council has passed an ordinance granting a franchise for the establishment of an electric lighting plant and distribution system here.

CONCORD, NEB.—Concord is planning to install a municipal electric lighting plant. The town of Dixon is also considering similar plans.

SCOTTSBLUFF, NEB.—It is reported that Wilkinson & Vandees, of Denver, who have purchased the holdings of the Cross & Roberts Electric Light Company, will build an interurban line between this city and Gering. They also plan to spend $50,000 for improvements to the electric lighting plant here.

PEEVER, S. D.—The business men of Peever have held several meetings recently for the purpose of discussing the matter of having the town provided with an electric light system. H. C. Kurrasch is interested in the plan.

ENDERLIN, N. D.—The Enderlin Electric Light & Power Company, F. A. Barnard, manager, plans to install additional generating equipment and will extend its transmission lines.

FORTVILLE, N. D.—Plans are in progress for the establishment of an electric lighting plant here during the year.

HUNTER, N. D.—The Hunter Light & Power Company, J. B. Heckridge, president, is planning to install additional generating and switchboard equipment.

SOUTH CENTRAL STATES.

PROVIDENCE, KY.—The Board of Public Works has been given an appropriation of $21,400 for building a municipal lighting plant, and is now engaged in selecting a site.

WALTON, KY.—J. E. Kelley, of Pee Dee, N. C., has taken charge of the plant of the Walton Electric Light Company, which he has purchased of H. W. Mayfield. He will enlarge and improve the plant and proposes to give day service.

GURDON, ARK.—Richard Schwartz, Hot Springs, Ark., has been granted a franchise to install an electric lighting and power system. Two generating units, driven by fuel-oil engines, will be purchased.

VILLE PLATTE, LA.—A $10,000 electric light and power plant is proposed. Edwin Thompson has charge of the plans.

CHANDLER, OKLA.—Additional generating equipment, to increase the capacity of its plant by 200 horsepower, is being proposed by the Chandler Electric Company.

HENRYETTA, OKLA.—The electric power plant here has been purchased by the American Public Service Corporation, which also owns the plant at Okmulgee. The plans, as outlined, indicate that one central plant will be established here to furnish power for mining operations and to the towns of Morris, Dewar, Coalton and Okmulgee.

M'ALESTER, OKLA.—A court order has been issued authorizing the sale of the properties of the Choctaw Railway & Lighting Company, which operates an interurban line between McAlester and Hartshorne. Another order has been granted giving the receiver of the company authority to issue receiver's certificates in the amount of $130,000 for improvements and extensions. Among other plans, it is proposed to extend the lines of the company to furnish power to mine operators, and to purchase the power plant at Wilburton.

ARCHER CITY, TEX.—The City Council is considering ways and means for the establishment of a municipal electric lighting and power plant.

BALLINGER, TEX.—The Ballinger Electric Light & Power Company has been incorporated with a capital of $50,000 by R. H. Irvine, M. F. Treadwell and others.

COLUMBUS, TEX.—Sam Hamburger and Leo Steiner, who recently purchased the local electric light and power plant, will install new machinery and make other improvements.

DALLAS, TEX.—The International Electric Company has increased its capital stock from $160,000 to $210,000. Improvements will be made.

DALLAS, TEX.—The City Commission has called an election, to be held April 4, to vote on issuing $500,000 for the construction of a municipal electric light plant.

DALLAS, TEX.—The Texas Power & Light Company, through its board of directors, has authorized the sale of $200,000 bonds, the proceeds to be used for extensions and improvements to its electric power and transmission system. J. F. Strickland is president.

GILMER, TEX.—The Texas Public Service Company is planning to install a 75-kilowatt, engine-driven alternator.

HOUSTON, TEX.—The Houston Lighting & Power Company, S. R. Bertron, vice-president and general manager, is planning to install a 7,500-kilowatt turbo-generator in its main power house. Other plans for the extension of service to care for the growing needs of the city are being made, which will necessitate the installation of additional equipment. The company's general offices have been moved from New Orleans to Houston.

ORANGE, TEX.—The Lutcher & Moore Lumber Company has closed a contract with the Pawling & Harnischfeger Company, of Milwaukee, Wis., for the installation of a monorail system at its new mill, to be built here. The system will be 24,000 feet long and will include three hoists or carriers, twenty-seven switches and other equipment. It will be electrically operated.

SAN ANTONIO, TEX.—It is announced by D. E. Colp, president of the Meridian Highway Association, that arrangements have been made for installing an electric lighting system along the Meridian road in Texas for a distance of more than 300

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miles. The energy for lighting will be furnished by the Texas Light & Power Company, of Dallas.

WESTERN STATES.

ANACONDA, MONT.—The Mountain States Telephone & Telegraph Company has voted to spend $3,950,000 for extensions and betterments to its system.

PUEBLO, COLO.—F. W. Cooper, local architect, is preparing plans for a new power house for the Colorado State Insane Asylum.

PUEBLO, COLO.—The Arkansas Valley Railway, Light & Power Company will construct a seven-mile extension from its lines at Rocky Ford to the town of Cheraw, where an alfalfa mill requiring 150-horsepower motors will be served, in addition to a number of farms en route and a certain amount of residential lighting in the village. The company will make another seven-mile extension from Manzanola to Crowley, where a 100-horsepower motor and 25 lighting customers will be connected.

DOS CABEZOS, ARIZ.—The large power plant of the Mascot Copper Company near here was destroyed by fire recently, and while the engines are not a total loss, it is said that it will take six months to reconstruct the plant.

PHOENIX, ARIZ.—The City Commission has instructed the City Engineer to make a survey and investigation with the view of determining the cost of constructing a municipal electric light and power plant here. At present the city is being supplied by the plant of the Pacific Gas & Electric Company.

SALT LAKE CITY, UTAH.—Le Grand Young has applied for a franchise to construct an electric railway from Tenth South Street on Twenty-first East Street, through Holliday, up Big Cottonwood to Brighton to the mines in the forks of the canyon.

BOISE, IDAHO.—Officials of the Electric Investment Company in Boise state crews of men have been dispatched to Twin Falls to remove the electric distributing system of the Idaho Power & Light Company, which serves the Twin Falls district. This territory is adequately served by the lines of the Great Shoshone Company, the pioneer electric system in southern Idaho, and since the merging of the two companies the Idaho Power distributing system will be unnecessary. At Buell, the distributing system of the Great Shoshone Company will be removed, and the Idaho Power & Light system will remain.

NAMPA, IDAHO.—C. A. Snyder, district wire chief for the Mountain States Telephone & Telegraph Company, has been here in connection with the extension of the company's service northeast from Bowmont to Kuna.

ONTARIO, IDAHO.—It is reported that the Electric Investment Company will make Ontario the central distributing point of its lines, which cover Southwestern Idaho and Eastern Oregon, and that the power lines from Oxbow, Twin Falls, Boise, Horseshoe Bend, etc., will converge at Ontario. W. L. Hall will be in charge of the Ontario offices. It is reported the company will immediately make repairs to the various transmission lines in this section, particularly the lines serving Emmett and Plymouth.

SPOKANE, WASH.—The Spokane Building Owners' and Managers' Association favors the erection of a lighting system on Riverside, west of Washington Street. A report on the cost of ornamental electroliers is being prepared by a special committee, consisting of O. E. Mallette and others.

KLAMATH FALLS, ORE.—Residents of the Malin section, 35 miles south of this city, have asked the assistance of Klamath Falls in securing an electric railway between the two places and through Poe Valley and Olene.

SALEM, ORE.—A permit for the use of one second-foot of water from Elk Creek has been issued to H. L. Ross, of Baker, by State Engineer Lewis. The water will be used in developing 120 horsepower for mining purposes, near Cornucopia. Water for the development will be carried through a pipe line 4,475 feet long, and the cost of the improvement will be $6,000.

SPRINGFIELD, ORE.—According to recent reports the Oregon Power Company will remove its offices from Eugene to Springfield. The local offices will be enlarged and remodeled, and the business in this territory will be handled from Springfield.

AUBURN, CAL.—The Pacific Gas & Electric Company has transferred its force from Christian Valley to Auburn Ravine, in preparation for beginning work on the Wise power house, the lowest on the Drum system.

BARSTOW, CAL.—Preparations are being made by the Southern Sierras Power Company for the extension of its lines from Kramer to this city.

CLAREMONT, CAL.—The Southern California Edison Company has applied for a 30-year franchise to distribute electrical energy in this city, and bids will be received for such a franchise by the City Council up to April 3.

COACHELLA, CAL.—The Board of Supervisors has accepted the bid of the Coachella Valley Ice & Electric Company to install incandescent lights in Coachella at a flat rate of $1.50 per lamp per month.

FRESNO, CAL.—The Board of Trustees has passed a resolution providing for the construction of an electrolier system on J Street, between Mercer and Tuolumne Streets.

LOS ANGELES, CAL.—Following a number of short-term contracts since the first of the year, an understanding has been reached with the Los Angeles Gas & Electric Corporation, under which it has agreed to file a bid for a period of four months for lighting 4,192 arc lamps, which costs the city about $27,000 per month. This agreement will carry the matter up to the beginning of the next fiscal year, when the new budget will be made up.

ORANGE, CAL.—The Board of Trustees has adopted a resolution accepting the report of the street superintendent, recommending the addition of 44 lights at street intersections in the residential district.

SALINAS, CAL.—Mayor Thorup has taken up the matter of cost of installing an electrolier system with the Coast Valley Gas & Electric Company, and will report to the City Council.

SANTA BARBARA, CAL.—A plan is under way for the installation of an ornamental lighting system on State Street.

MEXICO.

SATILLO, COAHUILA, MEXICO.—The State Government has awarded the contract to the General Electric Company, of Dallas, for the installation of an extensive system of ornamental street lighting here. The electric light and power plant is owned by a German company, but it has been taken over by the Government.

Proposals

ELECTRICAL WORK.—Separate bids will be received by C. B. Sawyer, Kankakee, Ill., until March 25, for the electrical work for the new Elks' clubhouse at Kankakee.

WIRING SYSTEM AND FIXTURES.—Sealed bids will be opened in the Supervising Architect's office, Washington, D. C., April 3, for a conduit and wiring system, lighting fixtures, etc., in the postoffice at Lewiston, Me. For details see proposal columns.

ELECTRICAL WIRING.—Separate bids will be received by the president of the State Normal University, Normal, Ill., until March 21 for the electrical wiring and elevator for a dormitory building. Plans and specifications may be obtained from J. B. Dibelka, State Architect, 130 North Fifth Avenue, Chicago, Ill.

LIGHTING SYSTEM.—Sealed bids will be received for the installation of an ornamental and a general street lighting system by the City Council of the City of Berwyn, Ill., until 8 o'clock, March 21, in the Berwyn City Hall, at which time and place said bids will be publicly opened. The estimated cost is about $15,000. Address J. R. Shean, Jr., City Clerk.

TRANSFORMERS.—Sealed proposals will be received by the City of Chicago, March 13, at room 406, City Hall, for furnishing and delivering at the municipal power stations, Twenty-sixth Street and California Avenue and Thirty-first Street and Sacramento Avenue, light and power transformers, according to plans and specifications on file in the office of the Department of Public Works. W. R. Moorhouse, Commissioner of Public Works.

LIGHT AND POWER SYSTEM.—Bids for installing the light and power system in a storage building of the Port of Seattle's East Waterway Terminal Improvement will be received by the Port of Seattle Commission, Bell Street Dock, Seattle, Wash., until 1:30 p. m., March 22. Plans and specifications can be obtained from C. E. Remsberg, secretary. Check for 5 per cent of amount of bid, payable to the Port Commission, must accompany each bid. Bidders are invited to submit alternative bids upon designs of their own.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9363—Newport, R. I., 25,000 feet double-conductor cable, six circuit panels and miscellaneous electrical supplies. Schedule 9364—Boston, Mass., six induction motors. Schedule 9370—Brooklyn, N. Y., 35 ship and motor-boat bells. Bidders desiring to submit proposals should make application for schedules to the Bureau or Purchasing Office nearest to navy yard where delivery is to be made.

Financial Notes

At the meeting of the board of directors of Electric Bond & Share Company for organization, E. W. Hill, formerly treasurer and assistant secretary, was elected a vice-president and A. E. Smith, formerly assistant secretary and assistant treasurer, was elected treasurer and assistant secretary. E. P. Summerson and William Reiser were elected assistant secretaries and assistant treasurers. Other officers were re-elected.

Kansas Electric Utilities Company has sold to Chicago, Grand Rapids and New York bankers $1,150,000 first mortgage 10-year 5-per-cent bonds. Kansas Electric Utilities was organized in 1915 and acquired the Lawrence Railway & Light Company, Emporia Railway & Light Company and Parsons Railway & Light Company. Gross of the company in 1915 was $290,706 and net $120,550. In addition to the Kansas companies, Kansas Electric Utilities also owns all the capital stock of Sidney (Ohio) Electric Company, Union City (Ind.) Electric Company and United Lighting Company of Albion, Pa., and net of these companies, which was $23,509 in 1915, is also applicable, in addition to earnings above, for payment of interest on these bonds.

The American Power & Light Company is offering to holders of its preferred and common stock and to holders of its option warrants for common stock an opportunity to subscribe to an issue of $6,984,000 100-year six-per-cent debenture bonds in the ratio of 50 per cent of their stock holdings at 93 and accrued interest. Stockholders are given the privilege of subscribing to the bonds between March 1 and 15. The net earnings of the company as reported for the year ended December 31, 1915, in-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 6	Feb. 28
American Tel. & Tel. (New York)	127⅜	127⅝
Commonwealth Edison (Chicago)	143	143
Edison Electric Illuminating (Boston)	246	248
Electric Storage Battery common (Philadelphia)	63⅛	64⅞
Electric Storage Battery preferred (Philadelphia)	63⅛	64⅞
General Electric (New York)	166½	169
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	6½	6⅝
Massachusetts Electric preferred (Boston)	36	36
National Carbon common (Chicago)	—	180
National Carbon preferred (Chicago)	122	—
New England Telephone (Boston)	135¾	136
Philadelphia Electric (Philadelphia)	27¼	27¾
Postal Telegraph and Cables common (New York)	80	80
Postal Telegraph and Cables preferred (New York)	67¾	67
Western Union (New York)	88	88¼
Westinghouse common (New York)	62¾	64⅝
Westinghouse preferred (New York)	75	76¼

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cluding the net surplus of subsidiaries, amounted to $1,043,092.

Dividends.

Allis-Chalmers	Q	1.5 %	Apr. 15
Ark. Val. Ry. & Lt. pf.	Q	1.75%	Mar. 15
Braz. Trac., Lt. & Pw. pf.	Q	1.5 %	Apr. 1
Brock. & P. St. Ry. pf.	—	3 %	Mar. 15
Brooklyn Rapid Tran.	Q	0.5 %	Apr. 1
East. Pw. & Lt. pf.	Q	1.5 %	Mar. 15
Elec. Prop. Corp. pf.	Q	1.5 %	Mar. 10
Elec. Stor. Bat. pf.	Q	1 %	Apr. 1
Elec. Stor. Bat. com.	Q	1 %	Apr. 1
Galv.-H. Elec. pf.	—	3 %	Mar. 15
Manhat. Bg. 3c L.	Q	1.5 %	Mar. 1
Manhattan Ry.	Q	1.75%	Apr. 1
Manila Elec. R. R. & Lt.	Q	1.5 %	Apr. 1
Muskogee Gas & Elec. pf.	Q	1.75%	Mar. 15
Standard Gas & Elec.	Q	1 %	Mar. 15
Third Ave. R. R.	Q	1 %	Apr. 1
Twin City Rap. Tran. com.	Q	1.5 %	Apr. 1
Twin City Rap. Tran. pf.	Q	1.75%	Apr. 1
Unit. Trac. & Elec., Prov.	Q	1.25%	Apr. 1
Unit. Lt. & Rys. pf.	Q	1.5 %	Apr. 1

Reports of Earnings.

ELECTRIC BOND & SHARE.

Electric Bond & Share Company reports income account for the year ended December 31, 1915, as follows:

	1915	1914
Gross income	$1,820,337	$1,558,521
Net income	1,401,085	1,137,042
Preferred dividends	344,647	298,392
Balance	1,056,438	838,660
Common dividends	433,778	400,000
Surplus	622,660	438,650

DOMINION POWER.

Dominion Power & Transmission Company report income account for the year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$2,353,956	$2,395,967
Expenses and taxes	1,352,001	1,390,847
Net earnings	1,001,955	1,005,120
Maintenance reserve	109,640	101,024
Interest charges	384,771	377,106
Surplus	507,543	526,990

PACIFIC TELEPHONE & TELEGRAPH.

The Pacific Telephone & Telegraph Company reports for the year ended December 31, 1915, compared as follows:

	1915.	1914.
Gross earnings	$20,114,458	$19,221,602
Expenses	15,385,722	14,396,168
Net earnings	4,728,736	4,825,434
Interest	2,707,136	2,565,258
Surplus	2,021,600	2,260,175
Preferred dividends	1,920,000	1,920,000
Surplus	*101,600	340,175

*Equal to 0.56 per cent on $18,000,000 common stock, against 1.88 per cent on same stock previous year.

MACKAY COMPANIES.

The Mackay Companies has issued its report for the year ended January 31, 1916. The income account compares as follows:

	1916	1915
Income	*$4,274,941	$4,246,014
Preferred stock	2,000,000	2,000,000
Common dividends	2,069,020	2,069,020
Operating expense	55,741	60,585
Surplus	150,180	116,410

*Equal to 5.49 per cent on $41,380,400 common stock, after allowing four per cent on $50,000,000 preferred, as against 5.42 per cent on same stock previous year.

WASHINGTON WATER POWER COMPANY.

Washington Water Power Company reports income account for fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$2,750,485	$2,976,426
Net after taxes	1,510,980	1,613,828
Interest, amortization and discount	462,323	254,093
Depreciation reserve	325,000	325,000
Surplus	723,657	1,094,446
Dividends	851,950	1,094,446
Deficit after dividends	128,293	417

New Incorporations

SCHENECTADY, N. Y.—The Schenectady Power Company has increased its capital stock from $500,000 to $1,000,000.

NEW YORK, N. Y.— Bilt-Well Sign System (Electric), Inc. Capital, $10,000. Incorporators: George Tierman and others, of 64 Wall Street.

REESEVILLE, WIS.—Central Wisconsin Public Service Company. Capital, $25,000. Incorporators: J. O. Meyers, A. R. Meyers and G. C. Schmitt.

ROCHESTER, N. Y.—Wizard Electric & Manufacturing Company. Capital, $10,000. Incorporators: A. F. Bircher, C. H. Sampson and J. L. Whitley, all of Rochester.

NEW YORK, N. Y.—John Bennett Bissell, Inc. Capital, $10,000. Electrical contracting. Incorporators: John Bennett Bissell, W. L. Goeltz and J. A. Anderson, all of 50 Broad Street.

ELIZABETHTOWN, KY.—The Rex Revolving Light Company, Vine Grove, has increased its capital from $15,000 to $25,000. J. R. Davis, Ullie Richardson and W. D. Carter are the principal stockholders.

TRENTON, N. J.—The New Jersey Gas & Electric Company. Capital, $500,000. Incorporators: E. H. Van Wyck, Crawford, N. J.; W. E. McClintock, Dover, N. J., and A. A. Bridgham, New York, N. Y.

New Publications

HOSPITAL MANAGEMENT.—The Crain Publishing Company, Louisville, Ky., has issued the first number of this publication, a feature of which is a department for industrial hospitals. The leading article for February describes the hospital of the Youngstown (O.) Sheet & Tube Company.

CANADIAN MINES.—The Mines Branch of the Canadian Department of Mines, Ottawa, has issued its summary report of 232 pages, with illustrations, for the calendar year 1914. In addition to the director's general report there are individual reports of a number of the staff.

TERRESTRIAL MAGNETISM—The annual report of the director of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, has been separately printed for distribution. It gives a summary of the work done in the magnetic surveys of oceans and land areas in 1915.

STATE LEGISLATION.—A joint committee of the National Association of State Libraries and American Association of Law Libraries, F. O. Poole, secretary, 42 West Forty-fourth Street, New York City, is publishing weekly an "Official Index to State Legislation," which is an index covering all bills in every state legislature.

Electrical Patents Issued February 29, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,173,165. Lightning Arrester. L. S. Brach, New York, N. Y. Electrode carrier resiliently mounted in vacuous container.

1,173,190. Composite Conductor Cable and Method of Making the Same. W. Hoopes, assignor to Aluminum Company of America, Pittsburgh, Pa. Steel core, aluminum envelope, with former under greater initial tensile stress.

1,173,192. Elevator-Signaling Apparatus. P. T. Kenny, New York, N. Y., assignor to Elevator Supply & Repair Co. Up-and-down, push-button, car-signaling system.

1,173,214. Spark-Plug Assembling Machine. C. H. Postel, assigner to Champion Spark Plug Co., Toledo, Ohio. Fluid-operated; for assembling shell and porcelain.

1,173,235. Elevator Safety System. G. S. Williamson, New York, N. Y., assignor to Shurloc Elevator Safety Co. Control of floor light.

1,173,239. Railway Signal-Lantern. A A. Ziegler. Compact structure, comprising two electromagnetically controlled lamps.

1,173,240. Electromagnet. A. A. Ziegler, Boston, Mass. Manner of securing core to carrying plate.

1,173,254. Switch Selector. A. F. Dixon, assignor to Western Electric Co., New York, N. Y. Key-controlled electromagnetic device for telephone systems.

1,173,260. Electric Switch. G. Griffith, Parsons, Kans. Magnetically operated knife switch.

1,173,269. Signaling Device. C. Heidemann, St. Louis, Mo. Device for securing on hand, including push-button-controlled battery lamp.

1,173,280. Focusing Lamp Socket. G. C. Knauff, Chicago, Ill. Permits lamp adjustment along reflector axis.

1,173,324. Spark-Gap Mechanism. D. M. Sweeney, San Francisco, Cal. Details of device having adjustable electrodes.

1,173,322. Telephone Cable Box. K. F. Wincrantz, C. E. J. Nilson and C. F. Petterson, assignor to Aktieboleget Stockholm-Stelefon, Stockholm, Sweden. Structural details.

1,173,334. Electrical Control Apparatus. R. Amberton, London, England. Rheostat lever interlocked with automatic line switch.

1,173,338. System for Operating Time-Recorders or Time-Indicators. J. W. Bryce, assignor to International Time Recording Co., Endicott, N. Y. For indicating time of day and elapsed time.

1,173,346. Method for the Manufacture of Chlorates and Perchlorates of Alkali Metals. A. E. Gibbs, Wayne, Pa. Comprises electrolyzing a chlorid solution.

1,173,360. Apparatus for Displaying Announcements, Advertisements and the Like. A. B. Lang and J. A. Powell, assignors to Telenews (1914) Limited, London, England. Magnetic paper shifter in tele-writer projection device.

1,173,370. Arc-Light Electrode. W. R. Mott, assignor to National Carbon Co., Cleveland, Ohio. Rare earth fluorids and thorium fluorid mixed with conducting material.

1,173,393. Sparking Plug for Internal Combustion Engines. C. Spada, Milan, Italy. Details of structure, including priming means.

1,173,394. Joining or Bonding the Junctions of Metallic Sheathing or Armoring of Electric Conductors. L. Sunderland, Westminster, London, England. Overlapping portions secured by eyelets with caps covering openings.

1,173,400. Suspension Clamp. R. A. Willson, Spokane, Wash. Comprises arcing rods.

1,173,406. Magneto Coupling. C. Balough, assignor to Kelly-Springfield Motor Truck Co., Springfield, Ohio. Permits angular adjustment of driving and driven shafts.

1,173,409. X-Ray Apparatus. C. E. Campbell, Lynn, Mass. Arrangement of table and tube.

1,173,418. Pole Cross-Arm. C. G. Ette, assignor to St. Louis Malleable Casting Co., St. Louis, Mo. Manner of securing to pole.

1,173,438. Automatic Brake for Elevators. P. Kesten and H. Osborne, assignors to Siemens-Schuckert-Werke, G. M. B. H., Berlin, Germany. Car controls electromagnetic brake and field of generator in Leonard system.

1,173,448. Time-Controlled Automatic Switch. R. McKnight, Sarnia, Ontario, Canada. Operated by clock mechanism.

1,173,452. Electric Condenser and Process of Making the Same. M. Meirowsky, Porz-on-the-Rhine, Germany. Plate condenser having dielectric, consisting of alternate layers of paper and synthetic resin.

1,173,460. Electric Switch. C. A. Palmgren, Chicago, Ill. Time-controlled; for recording temperatures.

1,173,467. Process of Treating Zinc Ores. C. C. Titus and W. J. Barenscheer, assignors to New England Electro-Chemical Metals Co., Boston, Mass. Cyclical process of treating complex ores containing zinc.

1,173,471. Coil-Press. N. Wilkinson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. For shaping coils.

1,173,511. Automatic Spark-Controller for Engines. C. V. Hess, Sonora, Cal. Timer controlled from engine governor.

1,173,540. Portable Electrotherapeutic Apparatus. J. E. Seeley, Los Angeles, Cal. assignor to Vulcan Coil Co. Section producing oscillatory currents and detachable current-modifying sections.

1,173,541. Spark-Plug. W. E. Sherbondy, assignor to Bigsby Rotary Mfg. Co., Cleveland, Ohio. Thin, easily heated disk of refractory material in end of casing and surrounding central electrode.

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1,173,552. Train-Controlling Device. A. L. Bower, Boyerton, Pa. Train-stop device having air valves controlled by track circuit and periodically closed train circuit.

1,173,559. Diaphragm Horn. L. Chollet, assignor to Lovell-McConnell Mfg. Co., Newark, N. J. Motor-operated diaphragm.

1,173,560. Semi-Automatic Telephone Exchange System. H. P. Clausen, assignor to Western Electric Co. Party-line system.

1,173,562. Radiotelephone Transmitting System. W. T. Ditcham, Twickenham, England. Spark-gap discharger for wireless telephony.

1,173,564. Operator's Calling Device. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. For telephone system; comprises impulse keys and electromagnetically driven automatic switch.

1,173,568. Fan. G. B. Griffin, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Guard structure.

1,173,569. System of Distribution. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co. Arrangement of circuit breakers in feeder circuit system.

1,73,570. Electrolytic Measuring Instrument. H. S. Hatfield, Brunswick, Germany. Rhodium cathode on gold base.

1,173,572. Lamp Shade. W. F. M. Hawe, Pittsburgh, Pa. Collapsible; comprises flexible fabric on telescoping rings.

1,173,577. Alarm and Signaling Device. M. R. Hutchinson, assignor to Lovell-McConnell Mfg. Co. Horn with motor-operated diaphragm.

1,173,584. Mechanically Actuated Diaphragm Horn. J. W. Jones, assignor to Lovell-McConnell Mfg. Co. Horn with motor-operated diaphragm.

1,173,592. Horn Cut-Out and Motor Control Alarm for Motor-Vehicles. D. A. McConnell, Arlington, N. J. Horn controlled by push button when ignition circuit closed and by gear shift lever when ignition circuit opened.

1,173,593. Trolley-Operated Contact. J. F. McElroy, Albany, N. Y. Combined trolley-wire switch and suspension.

1,173,598. Fuse Device. L. O. Mellor, Evanston, Ill. Fuse plug has arc-extinguishing fluid.

1,173,609. Electric Switch for Automatic Passenger-Fare-Registering Mechanism. H. Savage and W. L. Baker, San Antonio, Tex. Details of rotary disk and plunger contact device.

1,173,616. Storage-Battery Carrier. M. I. Stone, assignor to W. P. Stone, Boston, Mass. Suspended from vehicle.

1,173,621. Terminal Connector for Curling Irons and the Like. F. Thornton, assignor to Westinghouse Electric & Mfg. Co. Automatic switching device.

1,173,630. Method and Means for the Production and Control of Current Impulses. C. I. Zimmerman, Milwaukee, Wis. Condenser charge and discharge sparking arrangement.

1,173,632. Circuit Interrupter. C. Aalborg, assignor to Westinghouse Electric & Mfg. Co. Oil switch with auxiliary shunt resistance break.

1,173,635. Mechanical Horn. O. C. Arlitz, assignor to Lovell-McConnell Mfg. Co. Motor-operated diaphragm.

1,173,641. Turning Signal for Automobiles. J. J. Bassett, Maspeth, N. Y. Device on dash has illuminated globes moved out and inside of vehicle on pivoted arms.

1,173,642. Equalizer-Yoke. W. E. Belcher, Washington, D. C. For supporting insulators; steel plate structure with discharge horn.

1,173,651. Storage Battery. W. A. Crowdus, assignor to J. P. Mentzer, Chicago, Ill. Structure of couple comprising active sheets and separators.

1,173,655. Phantom Circuit. F. H. Fay, T. Shaw and J. J. Pilliod, assignors to American Telephone & Telegraph Co., New York, N. Y. Arrangement of telephone side circuits furnishing a phantom circuit.

1,173,657. Alternating-Current System. L. Fleischmann, assignor to General Electric Co., Schenectady, N. Y. Resonance of circuit maintained with different generator speed. (See cut.)

1,173,673. Electropneumatic Air Brake System. G. Macloskie, assignor to General Electric Co. Interlocked electrical and pneumatic air-brake operating means.

1,173,679. System for Producing High-Frequency Oscillations. M. Osnos, Berlin, Germany, assignor to General Electric Co. In wireless system; alternating generator supplying oscillatory circuit driven by direct-current motor and has fields in shunt and series, respectively, with the motor, a sending key being in shunt with series field.

1,173,684. Trolley Catcher. F. J. Roche, Somerville, Mass. Details of spring-actuated reel.

1,173,699. Electrical Flame-Arc Furnace for Oxidizing the Nitrogen of the Air. H. Bonnevie, assignor to Norsk Hydroelektrisk Kvaelstofaktieselskab, Christiania, Norway. Special structure with magnetically dispersed arc.

1,173,702. Telegraph Transmitter. C. Bell, Centralia, Mo. Details of device comprising vibrator.

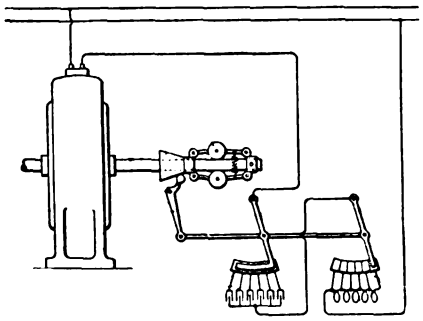
1,173,709. Apparatus for Purifying Water. E. Claussen, Hagen, Germany. Float-controlled solenoids, etc., for regulating water flow.

1,173,711. Circuit Coupling. H. A. Douglas, assignor to Douglas & Rudd Mfg. Co., Bronson, Mich. Push plug and socket.

1,173,716. Magnetic Coin-Testing Mechanism for Coin-Controlled Machines. A. G. Grover, assignor to Autosales Gum & Chocolate Co., New York, N. Y. Insertion of magnetic disk causes closing of gate across coin chute.

1,173,754. Automatic Recorder for Telephone Messages. H. G. Stalker, Navan, Ontario, Canada. Electromagnetic device controlled by receiver hook.

1,173,764. Automatic Valve-Operating Mechanism. I. M. Baldwin, assignor to



No. 1,173,657.—Alternating-Current System.

American Thermostat Co., Elmira, N. Y. Thermostatically controlled switch mechanism.

1,173,772, 773, 776 and 777. Telephony. E. R. Corwin, assignor to F. B. Cook Co., Chicago, Ill. First, second and fourth patents: Subscriber-controlled master switches control link connectors. Third patent: Special connectors at exchange for accidentally grounded lines.

1,173,774 and 775. Telephony. M. L. Johnson, assignor to F. B. Cook Co. First patent: Subscribers notified of terminations of periods of service. Second patent: Arrangement of recording receivers.

1,173,788. Baseball-Game Exhibitor. E. E. Fairchild, assignor to W. R. Hearst, New York, N. Y. Special rotary-contact device.

1,173,791. Combined Fuse and Switch Box. E. Frye, Dorchester, Mass. Unitary structure having oil switch in one compartment and fuse plug in another.

1,173,803. Electric Light Socket. P. M. Hotchkin, Chicago, Ill. For attachment to outlet box.

1,173,804. Offset Floor Fitting and Connection. P. M. Hotchkin. For fitting in floor of show case.

1,173,874. Record-Punching Machine. S. Scogamillo, New York, N. Y. Punches electrically controlled by pattern sheet.

1,173,889. Ventilating Washer for Knife-Blade Fuses. J. W. Steelman, assignor to

No. 1,173,889.—Ventilating Washer for Knife-Blade Fuses.

J. C. Harrigan, Camden, N. J. Ventilates interior of cartridge fuse. (See cut.)

1,173,,896. Chain End. G. B. Thomas, assignor to the Bryant Electric Co., Bridgeport, Conn. For pull-socket chain.

1,173,922. Automatic-Signaling Device. C. L. Bopp, Hawkeye, Iowa. System for indicating location of railway trains.

1,173,945. Burglar-Alarm Apparatus. W. H. Gabel, Kintyre, N. D. Casing having electromagnetically controlled battery and bell circuit.

1,173,951. Manufacture of Sheet Silicon Alloy. O. Graef, assignor to the firm of Bismarckhutte, Bismarckhutte, Germany. Method of treating plate of metal alloyed with silicon to increase permeability and reduce hysteresis.

1,173,957. Wireless Telegraphy or Telephony. W. Hahnemann, Kiel, Germany. Subaqueous or ground-signaling system.

1,173,960. Electric Furnace. I. Hechenbleikner, assignor to Southern Electro Chemical Co., New York, N. Y. Supporting means for movable electrode in arc furnace.

1,173,962. Electric Fuse. W. D. Hensell, Waverley, New South Wales, Australia. Successive portions of continuous fuse wire brought into operation.

1,173,965. Galvanic Battery. W. Hickman, assignor to Chemische Fabrik Griesheim-Elektron, Frankfort-on-the-Main, Germany. Depolarizer for Leclanché cell comprising acid manganite.

1,173,966. Automatic Gas Shut-Off. E. J. Hinkson, Erie, Pa. Electromagnetically controlled; closes when gas pressure decreases.

1,173,984. Portable Electric Lamp. F. M. Rosenfeld, New York, N. Y. Details of battery flash lamp.

1,173,994. High-Tension Insulator. S. Barfoed, Oakland, Cal., assignor of two-fifths to O. Gibson, San Francisco, Cal. Suspension type.

1,174,002. Insulator. V. P. Ettinger, Kansas City, Mo. Details of grooved supporting insulator with provision for draining the groove.

1,174,006. Thermostatic Circuit-Breaking Apparatus for Electrical Heaters. J. E. Harvey, Milton, Mass. Comprises thermostatically tripped circuit breaker and heated body to which breaker is responsive.

1,174,007. Electric Flasher. O. L. Heeger, St. Paul, Minn. Holder comprises spring contacts momentarily closed by striking holder against an object.

1,174,023. Railway-Signaling Device. H. R. Nevins, Hartford, Conn., assignor to Nevins Wallace Train Control Co. Wheel-tripped mechanism for train control, mounted in track.

1,174,024. Train-Stop Mechanism. H. R. Nevins, assignor to Nevins Wallace Train Control Co. Modification of above.

1,174,025. Heating Unit for Meters. H. N. Packard, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Resistor on circular frame for mounting in conduit.

1,174,027. Electric-Circuit Terminal. J. Amon, New York, N. Y. Mounting for conductor terminals providing readily detachable connection.

1,174,029. Telegraphy. W. Finn, assignor to Western Electric Co. Transmitting arrangement.

1,174,030 and 1,174,031. Electric Stove. W. S. Hadaway, New Rochelle, N. Y. First patent: Manner of securing resistor to heating plate. Second patent: Resistor between plates united to form water-tight container.

1,174,032. Electric Heater. W. S. Hadaway. Electrically heated chafing dish.

Reissue 14,076. Electric Controller. A. C. Eastwood, assignor to the Electric Controller & Mfg. Co., Cleveland, Ohio. Original No. 1,013,754, dated Jan. 2, 1912. Motor resistance controlled by successively operated interlocked magnetic switches controlled by master switch.

PATENTS EXPIRED.

The following United States electrical patents expired on March 7, 1916:

620,593. Electrical Storage Battery and Plate Therefor. R. Kennedy, Bradford, Eng.

620,609. Motor. E. S. Pillsbury and Ferdinand Schwedtmann, St. Louis, Mo.

620,626. Electric Measuring Instrument. C. R. Weymouth, Alameda, Cal.

620,640. Electric Incandescent Lamp. F. M. F. Cazin, Hoboken, N. J.

620,654. Electric Railway. R. M. Hunter, Philadelphia, Pa.

620,665. Electric Arc Lamp. M. S. Okun, New York, N. Y.

620,682. Apparatus for Controlling Operation of Motors. C. E. Woods, Chicago, Ill.

620,683. Process of and Apparatus for Reducing and Oxidizing Salts. T. A. Uehling, Cleveland, O.

620,715. Connector for Electrical Conductors. P. Minich, Independence, Mo.

620,733. Telephone System. C. L. Boice, Detroit, Mich.

620,745. Telephone Central-Office Circuit. H. M. Crane, Boston, Mass.

620,746. Means for Impressing Semi-cycles of Electromotive Force on Electric Circuits. A. C. Crehore, Hanover, N. H., and G. O. Squier, U. S. Army.

620,759. Electric Arc Lamp. C. Eschwei, New York, N. Y.

620,778. Transmitter for Multiple Telegraphs. W. A. Houghtaling, New York, N. Y.

620,783. Electrical Regulators. W. H. K. King, Carthage, Mo.

620,806. Electric Train Signaling System. B. C. Seaton, St. Louis, Mo.

620,839. Electric Switch. W. B. Bernardini, Lakewood, and W. Ely, Providence, R. I.

620,852. Electric Railway. J. F. Munsie, New York, N. Y.

620,855. Thermochemical Electric Battery. M. L. Severy, Boston, Mass.

620,864. Electric Clock. J. Butcher, Melrose, Mass.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

THE ELECTRIC GOAT.

The trials and tribulations of the manager of a central station are many. To be successful in his work, he must satisfy four classes of people; his employers, who are the stockholders of the company, his employees, his customers and the public to whom he is indebted for his franchise. To meet all of these obligations is no easy task, and yet it is worth his while to endeavor to meet the obligation at every contact. If the owners of the company are not satisfied, it goes without saying that the manager will soon be looking for another position. If employees are not properly handled, there will be dissatisfaction and friction and a lack of efficiency in carrying on the operation of the enterprise. Unless employees are embued with enthusiasm for their work; unless they are thoroughly organized; and unless they are trained to work with intelligence and good judgment, the work will not run smoothly and efficiently. To achieve these results, good working conditions, human sympathy and fair pay are essential. Every precaution must be taken to avoid accidents both for the good of the employees and from a financial standpoint.

In his contact with customers, the manager must be ready to meet all kinds of complaints, whether they are justified or not, and convince the customer that he is doing everything possible to give good service. In the words of Mr. E. A. Bechstein, of the Sandusky Gas & Electric Company, in a recent address to the students of the Case School of Applied Sciences, a central-station manager must be the "electric goat." He must maintain a courteous attitude toward both customers and public in spite of the many causes for irritation which he meets. He must use tact and diplomacy in upholding friendly relations, and this involves a study of human nature and of the sentiment of the community in which he works. He must be a good fellow under all conditions.

On the other hand, when all of these demands upon him are successfully met, there is satisfaction in having mastered the situation; in being able to give good service, to retain faith, to maintain good control in the face of all difficulties, and to inspire his staff with a desire to keep up the good work. The public is a hard taskmaster or any easy one according, very largely, to whether the manager makes it the one or the other. The willingness to give a square deal is an American trait and when properly handled, an American public can at a critical time be depended upon to support the man who they believe has been doing the right thing by them. But to instill this feeling, it is not only necessary to have done so, but to have let the people know it. Good-will advertising is one way of accomplishing this, and another is to have frank and fair dealings with the public and let them know what the utility company is doing to give good service and to improve it when and where possible. An attitude not only of fair dealing, but of publicity for the affairs of the company, goes a long way towards making the relations with his public pleasant and cordial.

ELECTRIC STEEL FURNACES.

The use of the electric furnace not only for refining steel but for melting the steel in making small steel castings is being rapidly extended, and offers to the central station a field for business which is inviting on account of its excellent load-factor and the large blocks of energy used. The number of such furnaces operated in the United States was increased to such an extent during 1915 that this country now leads the world in number of installations. The electric furnace is in demand not only for making the special alloy-steels so largely required in automobile and aeroplane construction and other special uses, and which bring high prices, but also for the production of steel castings of ordinary analysis which are free from the blowholes so often resulting from the older processes. The electric furnace is useful not only in eliminating the solid impurities but in getting rid of objectionable gases.

The arc type of furnace seems to be the most generally used, and the Heroult model leads all others, and constitutes over one-third of the total used in all countries. Germany at present occupies second place in number of furnaces in operation, but electric furnaces are being rapidly installed in England, no less than thirty new ones being placed in operation in 1915 for the melting of steel. Other countries also are showing an appreciation of the advantages of electric melting, and Russia, which is not distinguished for its manufacturing developments, is said to have eleven already installed.

Several models of furnace have been constructed in this country, whose design is based upon a study of heat losses, and whose efficiency consequently compares very favorably with the older designs, whose aim was primarily to get results. Such refinements of design, especially for small operations, should help to introduce the electric melting furnace in many

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mills where economy is an important consideration. The attention of the central-station solicitor may well be given to a survey of his field to ascertain where opportunities exist for installations of this kind. Undoubtedly much new business only awaits suitable cultivation.

REDUCING ELECTROLYSIS.

A very large percentage of the electric street railways in this country make use of the track for a return circuit. This results in a considerable amount of stray current, which finds its way back to the power house through the earth or through metallic structures in the earth, such as water and gas pipes and cable sheathing. In certain places the stray currents have caused electrolysis to such an extent as to do considerable damage. Pipes and cable sheaths are not only found to be badly pitted, but in some cases have been eaten entirely through. Since the prevention of such electrolytic corrosion is not essential to operation of an electric railway system, it has often been neglected and remedial measures have not been taken until considerable damage has been found to have taken place. One method of reducing the electrolytic corrosion which would be easy of application has not been used at all. This consists in the reversal of polarity in the street railway systems. Such reversal, if made, say, every 24 hours, would greatly reduce the amount of corrosion produced by leakage currents. This fast has been known for many years, but is again brought to attention by one of the papers presented at the meeting of the American Institute of Electrical Engineers, which took place last week in New York City.

This paper, the authors of which were Messrs. Burton McCollum and G. H. Ahlborn, described work which has been carried out at the Bureau of Standards to determine the amount of electrolysis, both with alternating currents and with continuous currents which are reversed at various periods ranging from a minute up to two weeks. It was found not only that corrosion is negligible with alternating currents, but that it is greatly reduced by the periodical reversal of a continuous current. If such a current is reversed weekly, it offers considerable protection to iron pipes as compared with the amount of electrolysis which would take place if the current flowed continuously in one direction. Reduction of corrosion in lead cable sheaths can be effected if the reversal occurs more frequently. A reversal once a day will reduce the amount of electrolysis to perhaps one-quarter of what would be produced with unidirectional current, but the protection to lead is not as great as to iron pipes. It is advisable, consequently, that lead cable sheaths should be drained at least to some extent in order to prevent their corrosion by electrolysis.

The use of insulated negative return feeders for electric railway circuits is generally recognized as an advantage. It not only helps to reduce electrolysis by lowering the drops of potential experienced along the railway track, but in some cases results in a saving of power on account of a lower resistance in the return circuit. It is frequently found that there is a reversal of polarity between underground structures and track with different conditions of load on a railway system, and a condition of this kind produces much less damage by corrosion than would result where the polarity was constantly in the same direction.

This paper serves to emphasize the fact that there is very little, if any, danger to water pipes due to making grounds upon them from the neutral wire of an alternating-current system. With the frequencies in general use the amount of electrolysis which may ensue, even where conditions are such as to produce a current from pipe to ground, is not more than one per cent of what would occur with the same value of current in a continuous-current system. Similarly, there is little danger from alternating currents to gas pipes or lead cable sheaths from this cause, but what danger may exist is rather from the possibility of sparks or arcing due to poor contacts. The trouble which does arise on cable sheaths from stray railway currents is usually due to the concentration of the corrosion at individual points where good contact to ground is made by the presence of water or other conductor. Pitting is thus produced by the localized action and may eventually make trouble by eating a hole entirely through the sheath. Since cable sheaths are continuous and do not involve insulating joints as may occur in piping systems, it is almost always found advisable to electrically drain such sheaths as recommended above.

MAKING POLES ATTRACTIVE.

The wooden poles used by telephone, electric railway and electric light companies for overhead wires are usually regarded as eye-sores and in this respect are worse offenders than poles of other character, such as steel or concrete. This is probably due to their lack of symmetry, their surface characteristics and their lack of decorative elements. Wherever feasible, attempts are made to get rid of them by placing wires underground and by the joint use of poles by the different companies, thus reducing the number necessary.

A movement has lately arisen for detracting from the unsightliness of these poles in a direction which may lead eventually to making them objects of beauty. In White Plains, N. Y., and in Wallingford, Conn., the experiment has been adopted of planting rose bushes of a climbing variety at the foot of the poles. Certainly if a pole can be covered by a blooming plant, an ivy vine or other attractive vegetation, its appearance along the street will be greatly altered and its objectionableness would be very much lessened.

One objection that might be raised to such a procedure is that owing to the presence of the vine, mois-

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ture will be retained upon the surface of the pole and will accelerate the rotting. Since, however, the life of a pole is nearly always limited by rotting of the butt, it is not likely that any deterioration that might thus be induced above the surface of the ground will appreciably lessen the life of the pole, and consequently this objection need not be given a great deal of weight.

SIMPLIFYING MEASUREMENTS.

The electrical industry has from the start had an advantage shared by few others, due to the adoption of a system of electrical units having a simple relationship to each other, and international trade has been facilitated by the fact that these units are not confined to our own country, but are common to the civilized world. This condition probably owes its existence to the fact that the electrical industry has grown out of electrical science, its fundamental developments and especially its methods of measurement being due almost entirely to scientific men. This is in contrast to most engineering work and to most industries. The electrical and magnetic units bear a relation to metric units which is more simple than their relation to the English units in common use, and matters would be still further simplified if the electrical industry had generally adopted the metric units, but this unfortunately has not been the case. There is a well defined movement to substitute the kilowatt for the horsepower and perhaps other changes of equal desirability will be brought about in the course of time.

While the measurement of temperature is not directly connected with the measurement of mechanical quantities, there is nevertheless, a choice here also between the more simple and rational, and the less rational system. The centigrade scale of thermometry is in common use by electrical engineers, but the use of the Fahrenheit scale persists for general purposes. A bill is pending before the present Congress to make the use of the centigrade scale compulsory in government publications, and electrical engineers will generally recognize the advantage in taking a step of this kind. Many of the government departments are already following this practice, but others, such as the Weather Bureau, hesitate to make the change. If the weather reports were given out in terms of the centigrade scale, it would soon become familiar to the public, and when once well known there could be little doubt that it would come into general use. Similar action upon the metric units of weight and measures has been defeated in the past, but may come to the front again in the near future. The trying times brought about by the European war are impressing upon the English people the difficulties under which they labor in using an unscientific system of measures as well as of money. Proposals are being widely and seriously made in that country both for adoption of the decimal system of coinage and for the adoption of the metric system of measurements. Even as conservative a body as the British Electrical and Allied Manufacturers' Association has taken action urging that a government inquiry should be instituted as to the desirability of adopting both the above systems. The use of a simple system of units should make electrical engineers even more than others cognizant of the advantages of a simple system, but the contrast of the American monetary system with that of Great Britain should make evident to any one the advantages which would accrue from the use of a decimal system in all kinds of measurements.

DEPLORABLE LOOSENESS OF SPEECH.

It will be generally admitted that a great many human misunderstandings arise from a failure of individuals to make known to others their desires and thoughts. This may arise from reticence, lack of communication, or inability to give proper expression to ideas or to understand them when properly expressed. Thus, differences of language are often responsible for misunderstandings between nations or entire races of people. It is reasonable to believe that most wars would be avoided if all of the people understood the ideals and motives of their opponents.

Among scientific men accuracy in the expression of ideas is to be expected to a greater extent than among other people, since scientists are trained to accuracy in measurement and in thought. It is most lamentable when the lack of accuracy in expression gives rise to misconception of scientific facts and natural laws. Yet this occasionally takes place under circumstances which are entirely avoidable, if proper care were used in stating natural phenomena. Electrical science is not entirely free from instances of this kind and another example has just come to hand.

The leading article in the last issue of the *Bulletin of the Bureau of Standards* is entitled "Calculation of the Maximum Force Between Two Coaxial Circular Currents." This gives repetition to an idea frequently found in textbooks, but which is entirely at variance with fact. Force exists between conductors which carry electrical currents, but not between the elements of current themselves. If the latter were the case, a continuous current would not be distributed uniformly over the cross-section of a conductor and the conductance would consequently not be proportional to the area of cross-section. The incorrect statement of this relationship may naturally lead one not already informed on this matter to entirely incorrect conclusions, and such looseness of expression is greatly to be deplored. It is all the less excusable in the present instance because attention was called several years ago to this particular case by Dr. Carl Hering. This is not the only inadvertent statement of an intended truth in a misleading way in scientific articles and too much care cannot be taken to insure their exclusion from textbooks and other publications. Cannot the Bureau of Standards set an example, if not indeed a standard, of accuracy of scientific expression?

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Happenings in the Industry

Plans for America's Electrical Week—Compromise Ends Philadelphia Valuation Case—Monthly Meeting of American Institute—Geographic Society Honors Vail and Carty—Final Report on Dallas Situation—Annual Report of Bell System Shows Gains—Northern White Cedar Production—Convention Programs of Southwestern and Minnesota Associations

Plans for "America's Electrical Week," December 2 to 9.

"America's Electrical Week" has been selected by the Campaign Executive Committee of the Society for Electrical Development as the official name for the electrical celebration, December 2 to 9, 1916. A start has already been made on the nation-wide campaign which from every indication will surpass even the results accomplished by the 1915 "Electrical Prosperity Week."

The history, and how results were obtained by the different interests during the week of 1915, has been published by the Society in an attractive 52-page book entitled "The Story of the Week," which will be of value as a guide to local committees during the 1916 campaign.

The name "America's Electrical Week" was chosen this year because of its timeliness, the patriotic thought it conveys, the national aspect the name indicates, its euphony, and its appeal to every citizen. The date is practically the same as that of last year, which was generally conceded to be the best time of the year as it began the Christmas drive for big business.

The Campaign Executive Committee which will direct activities of the campaign consists of the following gentlemen:

Representing jobbers: Gerard Swope, chairman, vice-president, Western Electric Company; Frank S. Price, Pettingell-Andrews Company, Boston.

Representing central stations: Charles L. Edgar, president, Edison Electric Illuminating Company, Boston; Joseph B. McCall, president, Philadelphia Electric Company.

Representing manufacturers: Guy E. Tripp, chairman of the Board, Westinghouse Electric & Manufacturing Company; Anson W. Burchard, vice-president, General Electric Company.

Representing contractors: James R. Strong, president, Tucker Electric Construction Company, New York; George Weiderman, George Weiderman Company.

Representatives-at-large: James H. McGraw, president, McGraw Publishing Company; Thomas A. Wynne, Jupiter, Jovian Order.

The Executive Committee has selected the following representative men to serve as an Advisory Committee: W. H. Atkins, E. H. Edkins, H. K. Mohr, George Williams, F. H. Gale, A. K. Baylor, J. C. McQuiston, A. A. Brown, N. H. Boynton, J. E. Livor, E. W. Rockafellow, P. L. Thomson, T. J. McManis, T. G. Whaling, J. R. Strong, J. R. Galloway, George Weiderman, T. A. Wynne, F. M. Feiker, A. A. Gray, F. B. Rae, Jr., E. E. Whitehorne, H. W. Alexander, J. T. Kelly, Hill Griffith, A. J. Edgell, J. M. Wakeman, chairman.

This committee met at the offices of the Society, March 1, to discuss and take action on preliminary plans for the big movement.

It was decided to have an open poster competition for the best design for the week. America's most prominent artists will be invited to participate. Cash prizes will be awarded for the most appropriate design. The contest will soon be announced throughout the country.

Royalties in Force on Licensed Heating Devices.

Since the publication of an article in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 11, relating the conditions of the licensing arrangement of several manufacturers of heating devices with the Hoskins Manufacturing Company and the General Electric Company, a protest has been made by the manufacturers interested regarding what is an apparent mis-statement with respect to the arrangement in existence for the payment of royalties. In this connection George A. Hughes, president of the Hughes Electric Heating Company, Chicago, one of the leading manufacturers of electric stoves, ranges and other heating appliances, states that royalties have been collected under the license agreement since October 15, 1915. While the payments have been arranged upon a progressive schedule until a full basis of compensation to the owners of the patents shall have been arrived at, the immediate effect has been to affect the standard of prices and the statement above referred to has caused the manufacturers and their salesmen some embarrassment in view of explanations which had already been made to the trade.

Compromise Suddenly Ends Philadelphia Electric Company Case.

The most important case ever brought before the Pennsylvania Public Service Commission, that of the City of Philadelphia vs. the Philadelphia Electric Company, charging excessive rates for municipal and private lighting, was brought to a close on March 9, when it was announced that a compromise had been agreed upon between the plaintiffs and defendants. While the final arrangements must be submitted to the Commission for approval, it is freely predicted that such permission will be readily forthcoming.

The proceedings were originaly brought in October, 1914, and the case heard during the latter part of that year and the early part of 1915, most of the work being spasmodic and of little value in the final determination of the case. However, following the appointment of a new commission in the early part of 1915, it was decided that the case be expedited, and for the past 14 weeks hearings have been held every day. Estimates were made up by Prof. D. C. Jackson for the defendants and by F. W. Ballard for the plaintiffs to show the valuation of the company's property. It had been about decided to admit into the case the valuation of the commission's expert, Milo Maltbie, when the compromise was reached.

The reduction will be based upon the gross earnings of the company for 1915, which were $7,849,267.67, the company agreeing to arrange its new schedules as if it were duplicating the 1915 business, but setting out to earn exactly a million dollars less.

The rates of the company will be reduced about as follows: Residence lighting, 25 per cent; small businesses and manufacturing using both light and power, 20 per cent, and large commercial power customers, railroads and traction companies, no reduction. The city will receive a refund of $150,000 on the 1915 arc-lighting contract and a permanent reduction of $10 on each of its 15,000 arc lamps.

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Based on the past income to the company from these classes of consumers, the householders will save about $200,000; small storekeepers and manufacturing plants about $600,000 on light and about $200,000 more on power, and the city about $150,000. In the case of the city the rate was $97.64 per lamp per year for about 3,000 arc lamps connected to the underground circuits; $81.21 per lamp per year for about 1,100 lamps on the overhead circuits, and $80.30 per lamp per year for 740 lamps connected to municipally owned underground circuits.

As a criterion of the views held by financiers on the results of the reduction of charges agreed upon, the stock of the company advanced from 27 to 27⅝ on the Philadelphia Stock Exchange when the compromise was announced. It was reasoned from the results of similar action by other utility companies that the company may experience temporarily reduced revenues, but the ultimate result will be to greatly advance the gross business and profits of the company.

Plainfield Contract for Free Lighting Held As Valid.

The New Jersey Court of Errors and Appeals has handed down an important decision holding that the contract made by the city of Plainfield with the Public Service Electric Company whereby the latter agreed to furnish free lighting for the municipal buildings of the city is valid and enforceable. This decision, while affirming the judgment of the Supreme Court on certain grounds, indicates a reversal of this tribunal's ruling in so far as the important question involved is concerned.

In 1898, the city of Plainfield granted a franchise to the company with stipulations agreed to for lighting the City Hall and other public buildings free of cost. In December, 1913, the Public Service Electric Company served notice that effective February 1, 1914, it would discontinue such service, it being prohibitive by the public utility act of 1911, as undue and unreasonable discrimination. The city contested this cancellation by an appeal to the Board of Public Utility Commissioners which, on April 4, 1914, upheld the city's contention that the free lighting was not a discrimination, and ordered the company to fulfill the terms of the agreement. In an appeal to the Supreme Court, this tribunal reversed the finding of the Commission (March 27, 1915) on the ground that the spirit of the utility act had been violated. The municipality then carried the case to the Court of Errors and Appeals.

This court in its ruling says that the Board of Public Utility Commissioners, in effect, ordered the specific performance of a contract, which is an equitable power exclusively residing in the Court of Chancery; hence, while the validity of the contract was sustained, the city had not sought the proper tribunal to maintain its rights. Concluding, the court holds that the public utility act is prospective and not retroactive, and accordingly cannot operate upon a contract made with the city of Plainfield in 1898, which was concededly lawful when made.

Municipal Operation in Fremont.

An audit of the accounts of the municipal electric light and water plant at Fremont, Neb., has been made by Harold Almert, of Chicago. The audit covers operation in 1913, 1914 and 1915. It is shown that the receipts have not been sufficient to properly provide for depreciation and taxes. Thus in 1915 gross income was $65,555; operating expenses, $46,742; interest of debt, $6,499; leaving only $12,314. Depreciation is estimated at $11,507 and taxes at $3,489. Merchandizing operations have been conducted at a loss of $2,413. There is thus a deficit of $5,094. Outstanding accounts due from customers and awaiting collection amount to $23,091.

ELECTROLYTIC CORROSION OF PIPES AND CABLE SHEATHING.

Monthly Meeting of American Institute of Electrical Engineers.

The corrosion of both iron and lead by electrolysis is negligible for alternating current and for direct currents which are frequently reversed. This is the most important conclusion reached by the authors of the paper entitled "The Influence of Frequency of Alternating or Infrequently Reversed Current on Electrolytic Corrosion," which was presented at a joint meeting of the American Institute of Electrical Engineers and the New York Section of American Electrochemical Society, which was held in New York City on the evening of March 10. Other conclusions of the authors, Burton McCollum and G. H. Ahlborn, were as follows. The corrosion of both metals decreases with the frequency of reversal of direct current. For lead the corrosion reaches a maximum value with a frequency of reversal lying between one day and one week. For iron, the maximum is not reached until the period exceeds two weeks. The reduction in corrosion with reversed currents appears to be due to the fact that the corrosive process is itself reversable. In the neutral zone of street railway networks, where pipes are continually reversed in polarity, the damage is much less than would be expected from the current values. The algebraic sum of the currents discharged is the best index to the damage. The corrosion of lead with direct current is found to be only about one-fourth the amount indicated by the electrochemical equivalent.

The meeting was opened by President J. J. Carty and the paper was presented by Mr. McCollum. The results given were from experiments carried on at the Bureau of Standards at Washington, D. C., and the paper gave many detailed results of the experiments.

The discussion was opened by Philip Torchio, who pointed out that water companies need have no fear from the grounding of neutrals of alternating-current circuits to their pipes. He expressed surprise that street-railway engineers had not already made use of the advantage of reversing polarity on railway circuits, as similar results had been pointed out in 1902 by A. Larsen.

Alexander Maxwell expressed regret that lower current densities had not been used in the experiments, as this factor is likely to affect the amount of electrolysis, and lower values are the rule under practical conditions. Albert F. Ganz also raised this point, especially with reference to the lead sheathing of cables. He thought the corrosion might be higher in other types of soil. Since cable sheaths are usually destroyed by localized pitting, the danger in practice would not be as small as indicated in the paper. He did not regard it as proved that the corrosive action is reversible.

J. L. R. Hayden disagreed with certain conclusions of the authors and pointed out that ordinary chemical corrosion is a serious source of error in electrolytic experiments. The apparent low value for corrosion of lead may be due to the assumption that lead is bivalent, when the actual valence is four. He had found, like the authors, that iron is more erratic than lead in its behavior.

S. M. Kintner, C. B. Martin and Asa P. Way, gave the results of experiments upon this subject which they carried out. The latter had altered the polarity of pipes by regulating the drop in return feeders through the intermittent insertion of resistance. Mr. Martin had found steel embedded in concrete to be protected by it. L. W. Chubb and Thomas Spooner gave the results of some tests upon corrosion with different frequencies of alternating current. In general the results agreed with the authors. The paper was also discussed by Carl Hering and Thomas M. Roberts.

Colin G. Fink then occupied the chair during the presentation of a paper by William H. Walker entitled "Electrolytic Corrosion of Metals." In the absence of the author, this paper was presented by William K. Lewis.

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Electrolytic Corrosion of Metals.

Professor Walker deplored the rather general lack of a clear conception of the mechanism of natural corrosion on the part of electrical and mechanical engineers due in a large measure to their tardiness in availing themselves of the knowledge of the phenomena now at their disposal. Eight years ago, the author advanced the theory and proof of the function of oxygen in the corrosion of iron. Corrosion is an electrolytic phenomenon and takes place at ordinary temperatures only in the presence of water. Metallic iron electrically neutral interacts with two hydrogen ions present in the water which carry electrical charges and produce iron ion which takes up the two electrical charges from the hydrogen ions and deposits two atoms of hydrogen.

The factors which influence the corrosion are: (1) The solution pressure of iron. When this is practically nil, as in the case of iron immersed in chromic-acid solution, corrosion does not take place. The solution pressure may also be rendered negligible by the impression of an external electromotive force. (2) The number of the hydrogen ions. The greater the concentration, the more rapid will be the corrosive action. Hence, in the presence of acids, corrosion is accelerated and in the present of alkalies, it is retarded. (3) The ease with which the hydrogen ion reaches the iron. For example, an adherent film of iron oxide will protect the metal underneath. Such a film is undoubtedly formed in the case of the copper-steel and accounts for its remarkable resistance. (4) The osmotic pressure of the iron ions. This pressure is usually very small. (5) The deposition of hydrogen and its removal by the depolarizing action of oxygen. This factor is probably the most important of them all. If oxygen be completely removed from boiler feed water, the boilers will not pit nor corrode. By this removal of the cause of the disease not only are all its ill effects avoided but the necessity of drugging with alkali is eliminated.

In conclusion, Professor Walker strongly recommended a closer co-operation between the electrical and mechanical engineers and electrochemists so as to introduce into practice more quickly and effectively the knowledge on the subject of corrosion already at our command.

This paper was discussed by A. S. Cushman, Maxmilian Toch, Frank N. Speller and James Aston. Mr. Cushman referred to the prevalent idea that the presence of a small percentage of copper in iron would enable it to resist corrosion. His own experiments indicated that it was not the copper which was important in this connection, but the presence of gases in the metal. The gas may exist in blowholes, as chemical compounds or in an occluded form. Mr. Toch emphasized the importance of the composition of the soil as affecting corrosion and told of the great difference of different parts of the battleship *Maine* when the hull was raised in 1912. When the Sun Building was torn down in New York City three or four years ago, the steel beams embedded in concrete below ground were found to be free from corrosion.

Mr. Speller discussed the internal corrosion of water pipes, which is found to depend upon temperature, amount of aeration and volume of water flowing. The amount of gas in the water is especially important. Mr. Aston pointed out that physical differences as well as chemical heterogeneity are important in producing localized electrolytic corrosion.

Telephone Progress Told at Dinner of Geographic Society.

The dinner at Washington, D. C., on March 7, of the National Geographic Society in Washington, celebrating the achievements in the art of telephony wrought during the past forty years, was marked by many unique and unusual features. The men who have spent twice as much money in the same length of time for the extension of the telephone service of the United States as the United States Government has spent for the construction of the Panama Canal told the story of the beginning, growth, and glory of the telephone.

During the dinner the Secretary of the Navy conversed with the captain of one of his ships in the Pacific, and received a message urging Washington to stand for preparedness; Gen. Pershing reported from El Paso to Gen. Scott, Acting Secretary of War, that all was well on the border; the Prime Minister and the Postmaster-General of Canada sent greetings to the National Geographic Society, the Postmaster-General of the United States and the American people, expressing the hope that the two countries would go on forever in peace and friendship.

Addresses were made by Franklin K. Lane, Alexander Graham Bell, Josephus Daniels and U. N. Bethell, all of whom paid tribute to the initiative and genius of Theodore N. Vail and J. J. Carty.

Final Summaries on Dallas Utilities.

The final figures in the report of the Dallas utilities situation, as determined by Edward W. Bemis, have been made public. These figures are given in detail below.

The figures show the cost of reproduction of the Dallas Electric Light & Power Company, the Northern Texas Traction Company and the Dallas Consolidated Street Railways Company. The rate-making value of the property is figured as this reproduction cost less accrued depreciation. The figures for the Dallas Electric Light & Power Company are given herewith.

The present points of contention between the utilities and the city are on the items of depreciation and overhead charges, on which there is a wide difference of opinion.

The cost of reproduction, new, of the light plant is given as $3,765,111.24 but taking into consideration the depreciation, this figure is reduced to $2,985,964.42. To this amount $500,000 has been added as the value of the franchise during its present life, making a total of $3,485,964.42 on which it is proposed to allow a return of 8 per cent for the remaining term of the franchise.

Overhead charges claimed by Stone & Webster as necessary in replacing the light plant were found to be $614,413.76. Mr. Bemis reduced this overhead to $490,438.32.

The greatest cut of all in what the company claims to have invested is made in lines east of the river. The total replacement cost claimed was $4,409,366.21, while, eliminating "depreciation" and "overhead" Mr. Bemis claims their values to be $3,434,433.33.

DALLAS ELECTRIC LIGHT & POWER COMPANY.
As of Sept. 30, 1915.

(First column, headed A, shows cost of reproduction new. Second column, headed B, shows cost of reproduction new, less accrued depreciation.)

	A	B
Land	$ 213,312.00	$ 213,213.00
General structure	18,273.72	14,639.57
General equipment	42,164.63	25,973.06
Power plant buildings	212,365.60	184,133.02
Furnaces, boilers and accessories	433,530.15	329,805.44
Steam engines	360,471.23	260,817.15
Electric generators	76,808.00	46,717.22
Accessory electric power equipment	129,744.49	112,930.90
Miscellaneous power plant equipment	111,054.25	89,668.18
Substation building	11,615.71	10,981.06
Substation equipment	117,885.23	93,091.32
Poles and fixtures	290,234.00	217,677.13
Underground conduit	172,418.26	172,418.26
Transmission system	4,695.50	4,286.00
Distribution system	299,739.20	241,754.63
Line transformers and devices	116,722.71	90,212.07
Electric services	113,060.17	87,464.50
Electric meters	229,448.18	139,118.38
Electric meter installation	15,068.00	15,068.00
Street and park lighting	287,796.84	58,119.02
Commercial arc lamps	5,712.44	2,703.92
Electric motors and heaters	4,965.11	4,242.47
Electric laboratory equipment	2,871.02	1,861.82
Other tangible electric property	80,741.04	78,530.98
Total	$3,150,697.48	$2,495,526.10
Promotion expense	60,000.00	
Engineering and superintendence	293,012.50	
Legal expense	55,000.00	
Taxes	14,175.00	
Insurance during construction	6,606.30	
Interest	185,619.96	
Total	$ 614,413.76	$ 490,438.32
Grand total	$3,765,111.24	$2,985,964.42

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ANNUAL REPORT OF BELL TELEPHONE SYSTEM.

Big Increase in Earnings and Many Noteworthy Extensions Mark Year.

That the American Telephone & Telegraph Company and Associated Companies were never as a whole in more satisfactory position financially, physically and particularly in their mutual relationship with the public is clearly shown in the annual report of President Theodore N. Vail, just issued.

The Bell System now connects 9,151,221 telephones, a gain of half a million stations in the past year. The total wire mileage owned is 18,500,000, of which 10,500,000 is underground There are nearly 200,000 miles of phantom circuits which carry an overload from the wire circuits, and 8,652,400,000 telephone connections were made during the year.

The revival of general business is reflected by a growth of 225,300 subscribers' stations in the second half of the year, as against 125,900 during the same period in 1914. The Bell System has been able to respond quickly to the demands made because of its policy of providing plant in advance of requirements.

The net permanent capital obligations of the whole system outstanding in the hands of the public is only $736,-156,756, although the telephone plants stood on the books on December 31 at $880,068,520 and their appraisal value is over $61,000,000 in excess of the book value. There was $32,863,717 added to plant and real estate last year and it is estimated that $57,000,000 will be spent in plant additions during the current year.

The gross revenue in 1915 of the Bell System, not including the connecting independent companies, was $239,900,-000; an increase of over $13,900,000 over last year. Of this, operation consumed $84,500,000; taxes $13,100,000 or 1.64 per cent on the outstanding capital obligations; current maintenance $31,200,000 and provision for depreciation $44,-900,000. The surplus available for fixed charges, etc., was $66,-200,000, of which $18,100,000 was paid in interest and $32,-900,000 was paid in dividends.

During the past eight years the gross earnings have increased $111,300,000 while the assets have increased nearly $445,000,000, with an increase of capital obligations and payables outstanding of only $273,600,000.

As an evidence of the cheapness of telephone service it is shown that net earnings are only 5.84 per cent of the book value and other assets, and that dividends and interest are only 4.76 per cent on the plant and other assets, using in both cases the book value which is less than the appraisal value.

"The low percentage of earnings on the value of the plant, and the average distribution to capital represented by securities issued against this plant, should convince the most skeptical that under no possible conditions could the public get cheaper service. Whether they could get better service must be left to the decision of those who have had the opportunity of comparing the service of the Bell System with that of other systems either of this country or of the world."

In the three years 1913-1915 inclusive, the expenditures from the Benefit Funds of the Bell Companies have aggregated $3,779,896. The reserves for this fund are $9,114,-329 and during 1915 the payments for pensions, sickness, accident and death benefits were $1,397,742.

The net earnings of the American Telephone & Telegraph Company for the year were $41,117,487. The interest charges were $6,498,849, and the dividends at the regular rate of 8 per cent per annum were $29,100,591. Of the resulting balance there was carried to reserves $2,500,000 and to surplus $3,018,046.

The number of stockholders, 65,512, not including the 32,000 "employee" shareholders who are paying for stock out of their wages, shows an increase of 6,097. The majority of the company's shareholders are women. The financing for 1916 was taken care of by the sale of $50,-000,000 of 4.5-per-cent coupon notes.

Northern White-Cedar Poles Being Produced Under Great Difficulty.

The present winter has been most unfortunate for the producers of Northern white-cedar poles. In the early part of the season there was every prospect of a good winter's work in the woods and loggers planned to cut on a large scale. All went well until the early part of January, which is just about mid-season in the Northern woods. N. E. Boucher, secretary of the Northern White Cedar Association, in discussing this situation, said:

"The severe weather which started about that time changed conditions very materially. The woodsman likes snow, but the snow this year was very heavy, being three to six feet on the level. This snow was preceded by mild weather and the cedar swamps were not frozen sufficiently to form a good foundation for the necessary roads, so even if a road were broken through the snow, the lack of foundation made it impossible to haul even normal loads.

"This heavy snow made it necessary to stop operations for a while. After this spell of weather cleared up the woodsmen went at it again, but on a smaller scale. After getting nicely started there was more snow and it would seem that the elements had conspired to make it impossible for the woodsmen to accomplish sufficient to make it profitable to continue operations. As late as February 7, the entire Northern country was visited by a 40-hour blizzard, which left another extreme depth of snow.

"The labor situation has been very grave since early in December, men being very scarce and the scale of wages at a very high mark. It is reported that the labor situation in conjunction with the weather conditions made it necessary for many operators to discontinue further cutting early in January, thinking they would do well hauling from the woods the material already cut. Later reports indicate that they will not even accomplish this hauling, and large amounts of material which is buried under the snow will not come out this winter at all.

"To cap the climax, the railroads seem to be, in fact they acknowledge, that they are powerless to furnish even a small percentage of the equipment that is required. It would seem impossible to have a really severe car shortage in view of the enormous rolling stock of the various railroads, nevertheless, it is true and cars are very much at a premium, with no prospect of material relief until well into the summer. One of the largest trunk lines running west of Chicago, on which the Northern producers depend for a large percentage of their equipment, has 24,000 cars tied up in the eastern territory, and frankly states that it cannot offer any encouragement on equipment. They are selecting their freight with a view to best earnings, which, of course, does not include cedar poles, this commodity being considered low-grade freight.

"This combination of circumstances has made it necessary to ship very heavily from stocks carried over from the past year, leaving the supply greatly reduced. It is evident that the production this year has been severely curtailed, and instead of a good-sized production, which was anticipated last fall, the output will be considerably below normal.

"In view of the present high plane of values on all classes of material it is natural to expect advances in price of cedar poles. For those interested in this material it would seem wise to make the necessary arrangements at once."

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Southwestern Electrical and Gas Association to Hold Convention May 17-20.

The annual convention of the Southwestern Electrical and Gas Association will be held at the Hotel Galvez, Galveston, Tex., May 17-20, inclusive.

Sessions devoted to interurban and street-railway questions will be held May 17; session on lighting and power questions, May 18, and general sessions on topics common to all utilities, May 19.

As an innovation, each session will be in the hands of a committee selected from those members directly interested in the particular interest, kind or branch of utility business to which such sessions are to be devoted. The province of such committees will be to take entire charge of their sessions, select the topics to be made the subject of the papers, addresses, question-box and discussions, appoint the persons who will make the addresses, write the papers or open the discussions, and operate the sessions for the best interests of those engaged in the business to which the session is devoted. A special committee has been appointed on publicity and public relations to obtain the presence of and addresses from authorities on these subjects.

H. S. Cooper, 405 Slaughter Building, Dallas, Tex., is secretary of the Association.

Convention Program of the Minnesota Electrical Association.

The program for the ninth annual convention of the Minnesota Electrical Association, to be held at the Hotel Radisson, Minneapolis, Minn., March 21 and 22, has been announced.

Tuesday morning, March 21, will be devoted to registration, address by President T. D. Crocker, report by Secretary-Treasurer F. A. Otto, and reports of committees. A luncheon will be given by the Minneapolis Jovian League at the West Hotel. In the afternoon Mayor Wallace G. Nye will give an address of welcome, after which papers will be presented by J. D. A. Cross, on "Possibilities and Practicability of the Electric Range"; O. A. Rofelty, on "Attitude of the Central Station Towards the Consumer"; W. C. Beckjord, on "Rates for Electric Service."

Wednesday morning H. S. Wilton and J. L. Lawrence will present a paper on "Boiler Plant Efficiency," to be followed by the report of the Committee on Rural Extension. In the afternoon Prof. W. T. Ryan, of the University of Minnesota, will present a paper on "Some Central Station and Electric Transmission Statistics." Reports of committees and election of officers will conclude the business meetings.

Engineers to Investigate Methods of Sealing River Basin.

William Mulholland, chief engineer of the Board of Water Commissioners of Los Angeles, Cal., the engineer who supervised the construction of the famous Los Angeles aqueduct, 240 miles in length, arrived in Seattle, Wash., March 13, upon the invitation of City Engineer Dimock, to investigate and make report to Seattle city engineer on the most feasible method of sealing the north bank of the Cedar River, in order that the new masonry dam can be made available for use.

Acting on the advice of City Engineer Dimock, the City Council late last fall engaged the services of R. H. Thompson, former city engineer, and Frederick P. Stearns, of Boston, consulting engineer of the Metropolitan Water Commission of Massachusetts, to make an investigation and report on the best method of sealing the basin

Annual Report of Commissioner of Patents.

The annual report of the Commissioner of Patents covering the activities of the United States Patent Office for the calendar year 1915 has been made public. During the year there were received 67,138 applications for patents on inventions; 2,734 applications for patents on designs, and 197 applications for reissues of patents. There were issued 43,207 patents on inventions, the largest number ever issued in a single year; 1,545 patents on designs, and 182 patents reissued. Patents expiring during the year numbered 20,404. Receipts of the office in 1915 amounted to $2,290,773.47; expenditures, $2,053,442.15; surplus for the year, $237,331.32; total net surplus, December 15, 1915, $7,785,506.48.

Referring in his report to conditions in the Patent Office, Commissioner Thomas Ewing calls attention to the fact that the average time that applications, upon which patents are granted, are in the Office, is 22 months, and that the Office completed the examination of nearly ten per cent more applications than it received during the year. The latter is in pursuance of a definite policy to require prompt prosecution by applicants and their attorneys. He states great sums now wasted on needless litigation and fruitless enterprises would be saved if more money was spent in making it possible to make more thorough searches. Preparations are being made for the occupancy of the entire Patent Office Building later in the year, and relief from congested conditions in the Office will be secured.

Among the recommendations made by Commissioner Ewing are: reorganization of examining corps by reducing the number in the lower grades and increasing the number in the higher grading, so as to make them equal; make the filing fee $20 and final fee $15, instead of $15 and $20, respectively; eliminate payments to office by treasury certificate of deposit; refundments to be made directly by the Office; establishment of an assignees' index; requiring the filing with the office of every patent litigation decree; validate patents when applications are executed by attorneys for clients, under certain circumstances, notably those brought about by European war.

Washington State Bureau Files First Report on Seattle Municipal Plant.

The State Bureau of Accountancy has filed its first report relative to the operation of the municipal light and power plant in Seattle, Wash., during the year 1915. According to the report, the gross earnings of the plant during 1915 were $1,067,180.02; net earnings, $199,088.41; commercial lighting revenues, $577,521.95; commercial power, $121,469.75; street lighting, $199,994.95; city buildings and grounds, $26,303.10; city power, $34,048.92; other public buildings, $3,949.35; miscellaneous revenues, $441; miscellaneous rentals, $3,450.

Expenses of the department include $56,160.16 for water power generation; $112,466.26 for steam power generation; $2,079.18 for current purchased; $40,951.99 for transmission and transformation; $323.26 for storage; $160,656.28 for distribution; $85,690.55 for commercial expenses; $101,052.00 for general expenses; $178,627.72 for depreciation; $112,016.61 for interest, bad debts and other items; $9,281.25 for appropriations, and $8,785.96 for profit and loss adjustments, leaving a net balance for the year of $199,088.41.

During 1915, $400,000 of steam plant bonds were sold, bringing the outstanding bonded indebtedness of the light system to $3,923,000. During the year, $71,000 of bonds were retired. The light and power system is given a valuation by State Accountants of $6,786,257.80, including the new masonry dam, which is given an investment value to date of $1,508,821.26.

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Miscellaneous NEWS NOTES

St. Louis Engineers Hear Lecture on Fortifications.—Major Wildurr Willing, of the Engineer Corps, United States Army, spoke before the Engineers' Club of St. Louis March 15 on "Seacoast Fortifications." The lecture showed the development and general principles underlying the use of seacoast fortifications in the United States, and was illustrated with a large number of slides.

Power Company to Refrain from Using Poles of Street-car Company.—In an opinion given to the Board of Supervisors, City Attorney Long states that the San Francisco & Sierra Power Company has no legal right to furnish electric power to customers by using the United Railroads' poles for carrying the wires. He says the franchise for the erection and maintenance of the poles is granted only for the operation of a street-railway system and there is no authorization to utilize them for any other purpose.

Plans for New England Section Convention.—The eighth annual convention of the New England Section, National Electric Light Association, will be held at Hotel Aspinwall, Lenox, Mass., October 17-20, 1916, sessions continuing from Wednesday to Friday, inclusive, with the usual social event the evening of Tuesday, October 17. The nearness of Lenox to Boston, and to the large centers in western Massachusetts and Connecticut, insures the attendance of a very large number of delegates, while the well known charm of the Berkshire country in early autumn will prove a potent attraction to automobilists and others.

Puget Sound Telephone Merger.—The merging of the lines of the Puget Sound Independent Telephone Company, headquarters in Everett, Wash., and the lines of the Pacific Telephone & Telegraph Company, in operation in Snohomish, Skagit and Island Counties, between Seattle and Bellingham, is being consummated. The Puget Sound Telephone Company, recently incorporated and capitalized at $200,000, will handle the business of the merged lines, maintaining headquarters in Everett. The deal involves several thousand telephones, and will have the effect of giving the territory a single, instead of a dual, telephone service. The Puget Sound Telephone Company already has taken over the Independent Telephone headquarters in Everett, but the actual physical consolidation will not take place until about May 1, when an appraisal now under way of the value of the lines of the Pacific Telephone & Telegraph Company in this territory will be finished. Officers of the new company are: W. N. Winter, Everett, president and general manager; W. C. Cox, Everett, vice-president, and J. M. Winslow, Seattle, secretary-treasurer.

Chicago Automatic Telephone System to Be Sold.—By a vote of 46 to 22 the City Council of Chicago, on March 11, approved the sale of the automatic telephone system of the Illinois Telephone & Telegraph Company to the Chicago Telephone Company. The price set is $6,300,000, of which the city will receive $500,000. The capitalization of the Chicago Telephone Company will be increased only $1,532,058; the difference between this and the total purchase price will be taken care of by the American Telephone & Telegraph Company. The automatic system installed by the Illinois Telephone & Telegraph Company was under a franchise which specified that unless the company maintained service to 20,000 customers all its rights and property were to be confiscated by the city. It was found impossible to keep as many as 20,000 subscribers on the automatic system, although the service rendered was very good. Therefore, the city undertook to confiscate the plant, but after prolonged consideration decided to relinquish its claim upon the property for $500,000 and permit its sale to the Bell System. This ends telephone competition in Chicago.

Address on "Journalism" Before Los Angeles Jovians.—The principal speaker at a meeting of the Los Angeles Jovian Electrical League March 8 was Charles E. Jarvis, Los Angeles representative of the *Christian Science Monitor*, who made a plea for clean, wholesome journalism in his address on the subject "Journalism; Its Opportunity and Achievement."

Kansas City Rejuvenation on Board Boat.—The third rejuvenation under the administration of A. P. Denton, First Tribune, and J. D. Todd, Second Tribune, of the Kansas City Jovians, will be held in May on the steamboat *Chester*, during a trip on the Missouri River. The ladies will accompany the Jovians, the ceremonies taking place in the large dining room.

To Appraise Merchants Power Company's Plant at Memphis, Tenn.—William A. Baehr, of Chicago, Ill., has been appointed by the Merchants Power Company, and F. W. Ballard, of Cleveland, by the Commissioners of Memphis, Tenn., to make an appraisal of the company's holdings. The agreement is that the two engineers are to choose a third arbitrator and if unable to agree on the choice or a price at which the city may purchase the plant, the city will build a plant under Mr. Ballard's direction.

Ruling Asked on Competition of Public Utility Companies.—Whether a municipally owned and operated lighting system may enter the confines of another municipality and compete with a privately owned and operated lighting system is one of the important questions now before the State Railroad Commission of California. This question has been raised by the recent application of the Pacific Light & Power Corporation, asking for protection in South Pasadena against possible competition on the part of the city of Pasadena unless the city obtains a certificate of public necessity and convenience.

Kentucky to Have Workmen's Compensation Law.—Electrical utility companies and contractors in Kentucky will shortly be working under a workmen's compensation law similar in its terms to the laws which have been enacted and are in operation in other states. The State Legislature has passed the law substantially as it was drafted by a commission composed of representatives of various commercial organizations. Although it does not create a state insurance fund, it provides for insurance with commercial companies in the state or with mutual companies and it is virtually compulsory since it withdraws certain of the common-law defenses from the employers who do not come in under its provisions.

Pennsylvania Electric Association Establishes Geographic Sections.—At the last meeting of the executive committee of the Pennsylvania Electric Association, an affiliate of the N. E. L. A., held in Harrisburg, Pa., a plan of establishing geographic sections and inaugurating local activities was adopted. The following six sections have been created and the men mentioned have been duly appointed to respectively initiate the work in these sections: Northwest section, E. F. McCabe, Titusville, chairman; southwest section, H. N. Müller, Pittsburgh, chairman; north central section, G. E. Wendle, Williamsport, chairman; south central section, C. M. Kaltwasser, Harrisburg, chairman; northeast section, E. S. Osborne, Scranton, chairman; southeast section, H. H. Ganser, Norristown, chairman; E. D. Dreyfus, Pittsburgh, Pa., chairman-at-large. The plans have been carefully worked out for instituting close co-operation and a helpful relationship between neighboring utilities throughout the state which results will be accomplished through active subsidiary section organizations. Meetings will be held in the cities mentioned above every two months.

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Wiring Cost Limited to $2.00 Per Outlet.—The City of Cleveland, Tenn., has passed an ordinance requiring electricians to pass an examination and take out licenses and limiting wire charges to $2 per outlet.

Must Build Lines Within One Year.—The Railroad Commission of Iowa has issued an order requiring all companies securing franchises for erection of transmission lines to build the lines within one year or forfeit the grant.

New York Jovian League Elects Officers.—At a meeting of the Jovian League of New York City on March 15, officers were elected as follows: Arthur Williams, president; James R. Strong, secretary; and A. S. Devena, treasurer. Board of Governors: E. W. Rockfallow, James R. Pollock, T. Beran and W. H. Rugg.

Wichita Jovians to Entertain Contractors.—J. L. Harvey, first tribune of the Wichita Jovians, has announced that the Wichita Jovians are planning to entertain the Electrical Contractors' Association of Kansas at the state convention May 19. There will be a motor trip over the city in the morning, luncheon with the Electric Club at noon, dinner in the evening, followed by a rejuvenation.

Tampa Company Changes to Oil Fuel.—The Tampa (Fla.) Electric Company is planning to change from coal to oil as fuel in its generating station. The company is preparing to erect large tanks in order to get a big supply on hand. As the central station is located near a residential section of the city the company desires to eliminate trouble due to smoke and cinders.

May Have Certified Copies of Meter Reading.—The city Council, or Argenta, Ark., is considering an ordinance recently presented, requiring the meter records of the public utility companies to leave certified copies of their readings with consumers when the reading is made. An objection has been made to the ordinance, on the ground that it would involve additional expense, in the way of loss of time, without any benefit to the consumer.

Utility Stockholders Must Pay Same Rates as Other Subscribers.—The Public Utilities Commission of Kansas, after investigating at Olpe, rendered a decision that the stockholders of a utility must pay the same rates as other subscribers. The case was that of the Center Township Telephone Company, which had asked to be allowed to increase rates. The commission found that stockholders were paying less than others, and figured that if rates were the same to all they would be sufficient, dismissing the application.

Utility Company Prepares Booklet.—The Northern States Power Company, with main offices at Minneapolis, Minn., owns and operates ten hydroelectric plants with a capacity of 41,000 horsepower, 13 steam-electric plants with a capacity of 74,000 horsepower, and supplies electric light and power to more than 100 municipalities in Minnesota, North and South Dakota, Wisconsin and Illinois, besides gas, heating, telephone and street railway service in a number of communities. The number of customers at the close of 1915 was 81,322. The company represents the constructive work of H. M. Byllesby & Company. These facts and others relating to public service are set forth in a profusely illustrated booklet recently issued by the company. A brief outline of its plan of partnership with citizens is also presented.

Electric Piano Makers to Hold "Week."—It is announced by The National Electric Piano Makers that it has been decided to postpone until the coming autumn the "Electric Piano Week" campaign originally proposed to be instituted during the week of March 13 to March 18. The many central-station companies which had agreed to incorporate in their contracted display advertising for that period a "box" featuring the electrically-driven player-piano and the electrically-operated talking-machine have been notified accordingly. The piano manufacturers urged the delay in order to have more time to educate their retail trade to the degree of co-operation with local electric light and power companies that will be required upon their part. The active aid of the National Electric Light Association in the working out of the "celebration" is assured the electric piano makers.

Maine Hydroelectric Company to Add Two 6,500-Kilowatt Units.—Plans for the extension and additions to the plant of the Rumford Falls Power Company, Rumford, Me., includes the installation of two new vertical water turbines of 6,500 kilowatts rating each. These, together with the two 4,000-kilowatt units now installed, will give the station a normal capacity of 21,000 kilowatts. The construction of a new concrete dam with canal will be begun early in the season, after the time of high water has passed, and the station building will be extended.

Fire Prevention Commissioner to Follow Up Wire Men.—The Fire Prevention Commissioner for the Metropolitan District of Boston has sent out a form letter to all contractors and electricians connected with the industrial establishments in the district, saying that wiremen should be held responsible for careless methods of working, as well as for defective wiring. An example of the former is a recent instance in which a fire was caused by the workman carrying a lighted candle into a portion of the building where loose rubbish was lying about. The Commissioner will investigate and ascertain the names of the journeyman and his employee, in cases where fires are reported as having been caused by electric wiring, and report them to the State Examiner of Electricians for action on the licenses. Recurring fires would raise the presumption of unfitness of any firm to carry on the business, according to the Commissioner.

Turbine Development Described Before Lynn Section A. I. E. E.—On March 1, Richard H. Rice, chief engineer of the turbine department of the General Electric Company, at Lynn, Mass., delivered a lecture on "Lines of Progress in Turbine Engineering." This is the first of three special lectures arranged by the executive committee. The lecture was illustrated by a large number of lantern slides, and the speaker said that great as had been the advance in development, which has brought the turbine to almost apparent perfection, he had no doubt but numerous changes looking toward efficiency would continue to be made. Of exceptional interest was the description of the mercury steam turbine. In this type the steam is heated with mercury vapor, with resulting high temperature and great efficiency. The new type of condenser was also described and illustrated by models brought to the hall for the purpose.

Activities of St. Louis Jovian League.—The St. Louis Jovian League of Electrical Interests will co-operate with the Society for Electrical Development in its National house-wiring campaign, to be conducted from March 15 to April 15. Frank D. Beardslee, president of the St. Louis Jovian League appointed a committee composed of T. H. Stephenson, William Koenneman, Ed L. Gross, H. W. Korhanuer and H. W. Beck, to confer with a committee from the Society. The St. Louis Jovian League will join forces with the National Household Show and give a combination show April 3 to 15. The Jovian League has taken one-third of the space, which will be devoted to the display of electrical household conveniences and appliances. William McChesney Martin, chairman of the Federal Reserve Bank Committee, was the speaker of the day, at the weekly meeting on March 8. In introducing Mr. Martin, Chairman Cliff R. Croninger, said that Mr. Martin represented financial preparedness. "The Federal Reserve Bank," said Mr. Martin, "will not prevent hard times, but it will prevent a panic when the hard times come. If your business deserves credit, you may secure it through your bank."

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Electricity in Leather Manufacturing

A Discussion of the Processes Involved in Tanning Hides; With Data on the Specific Advantages of Electric-Motor Drive and a Description of Two Typical Installations

Industrial Power Series—Article No. 158.

Manufacture of leather is conducted in three distinct ways: tanning by the acid of bodies containing tannin; tawing with alum and common salt; tawing with oil. The whole skin is not converted into leather, but only that portion which possesses a fibrous texture. The skins of almost all quadrupeds may be converted into leather. In practice, the hides of bulls and oxen yield the best leather for soles, harness and for belting, while calves' skins furnish the best upper leather for boots and shoes. Lamb, sheep, goat, and buck skins are generally tawed with alum or oil for the preparation of glove or bookbinders' leather. There is a wide difference in the processes employed, as the uses for hides vary from sole leather to light kid. When first considered there seems to be very little in common in the skins of animals, but the structure is similar although the practical application varies to a considerable extent.

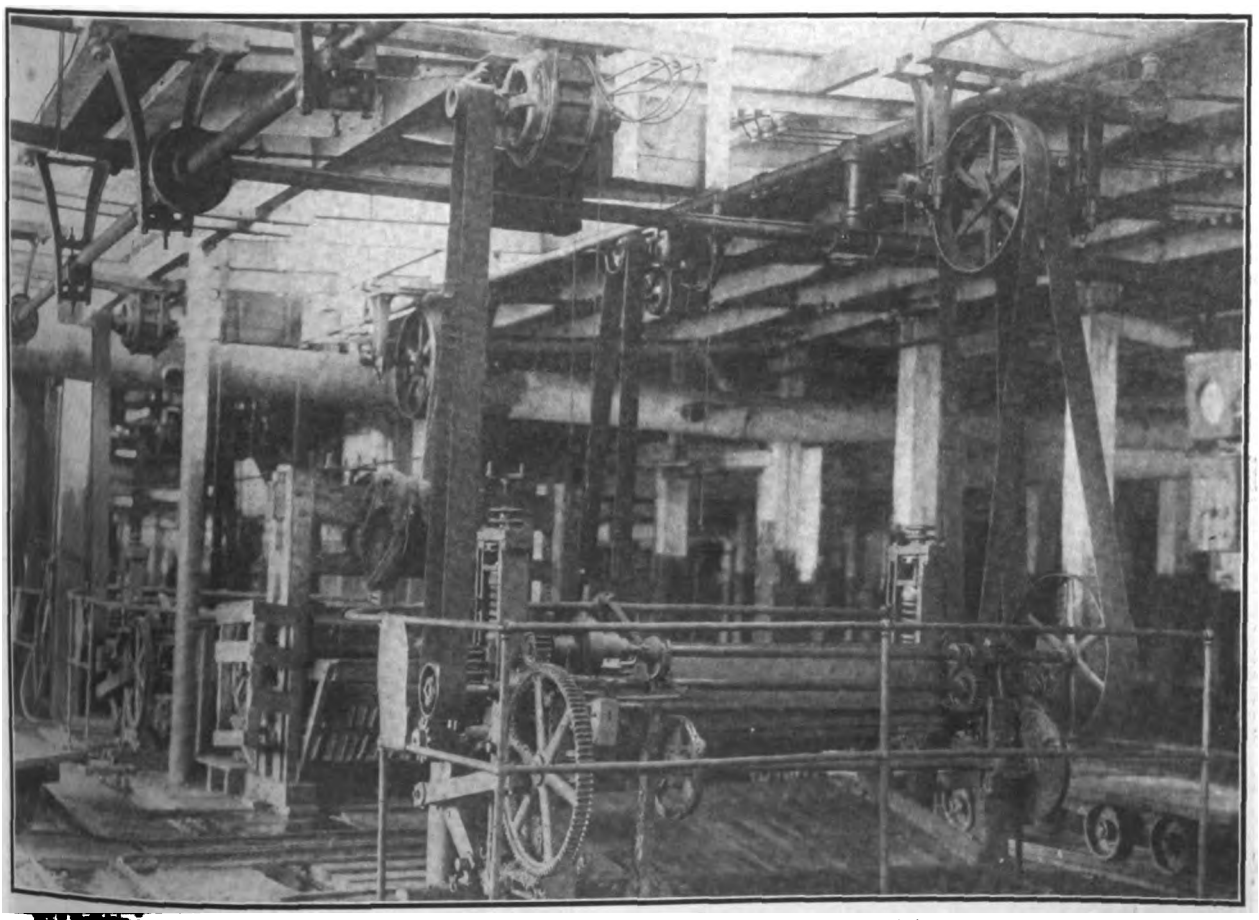
Process of Manufacture.

Green skins, salted skins, and dried skins must be soaked in water to remove the blood and dirt from the first, salt from the second, and also for the purpose of softening the skins. Before entering the unhairing solutions the skins must be free from all foreign matter. Skins are removed from the soaks after they have become soft and pliable and are in a clean condition, after which the ears, tail and adhering flesh are cut off. From a few days to a few weeks, depending upon the condition of the hide, is the time required for soaking. Wash mills are frequently employed for a short time for hides that soften very slowly, to expedite the work.

Fleshing is the next process, after soaking, which removes the accumulation of fat or flesh that may have adhered to the skin. Fleshing machines consist essentially of a spiral-bladed cylinder, right and left hand from the center, by means of which the flesh is removed and the hide stretched in all directions. Loosening the hair is accomplished by sweating, liming, or treating with depilatories.

Liming consists of placing the hides in vats with milk of lime, frequently transferring them from one vat to another, or taking them out or replacing them, to allow the lime to act equally on every part. When the hair is found to be properly loosened the hides are withdrawn. Depilatories are used for skins of smaller animals, which will sustain neither sweating nor liming. Removal of the hair takes place in the unhairing machine which consists of a spiral blunt knife revolving on a rubber roller. The skins are then washed in water.

Bating is next resorted to for the purpose of removing the lime and the lime soaps which have been formed in the skin. Swelling or rinsing the hides is next resorted to in order to swell the fibers, and to make the skins more susceptible to the tanning solutions. Currying is the process



Hide Wringer in Leather Factory Driven by a 10-Horsepower Motor.

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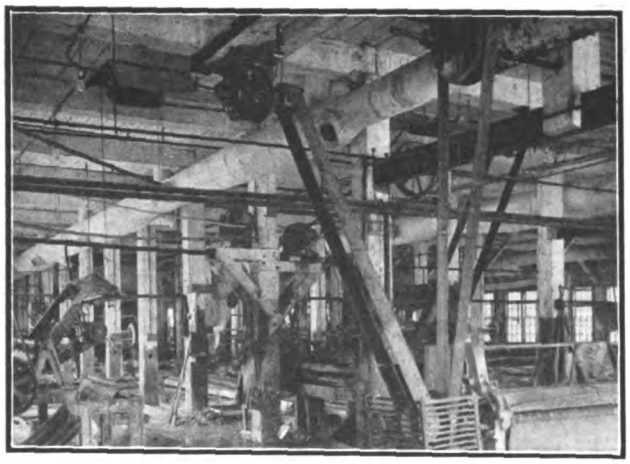
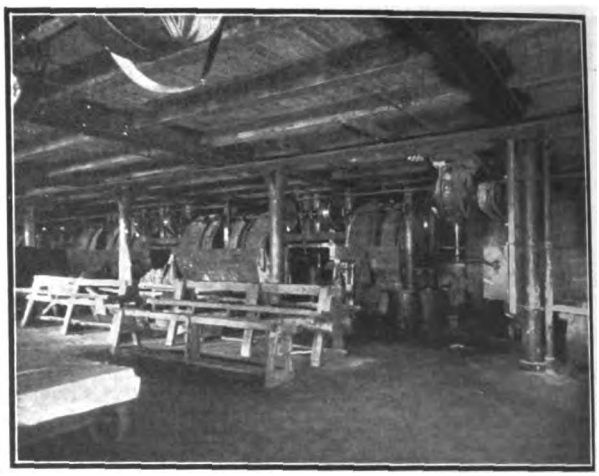


Motor-Driven Fleshing and Unhairing Machines.



Battery of Drums Driven by 75-Horsepower Motor.

by which the tanned skins, after being converted into leather are prepared for use. For sole leather it consists in merely hammering the dried hide to render it more compact. For finer leathers the skins are shaved, the object of this operation being to bring the leather to a uniform thickness. The machine which is used for this purpose is fitted with a spiral knife blade of steel, half of which is right-handed and half left-handed. The leather is placed over a roller, which may be pressed against the cutting edge by pressing on a foot lever. The knives revolve at a very high rate of speed and are constantly sharpened by means of an emery wheel. Splitting has replaced shaving to quite an extent, especially for side leather, which is now almost uniformly split out of the limes. In this process the leather is sliced parallel to the grain surface, so that the split portions have the same area as the original leather. Among the numerous types of splitting machines, the one most used consists of an endless double-beveled knife which passes around two pulley wheels, one of which is motor-driven. The leather is pushed toward the knife, grain upward, by two feed rollers, the grain split passing over the knife and the flesh split under it. The thickness of the split can be varied from one-sixteenth of an inch up to the thickness of the hide.

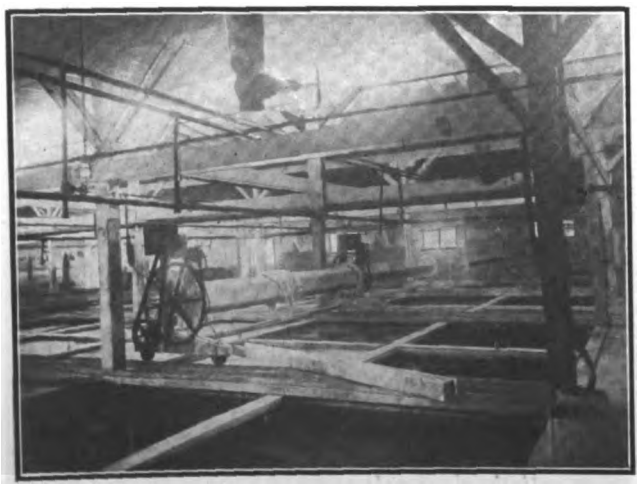
The leather is then grained with the pommel or grain board, finished off with a flattening iron or horn to remove the grease, etc.

The skins must be softened before they can be finished and this process is carried out on the staking machine. This machine works the leather up by a sort of kneading motion and at the same time exerts upon it more or less stretching action. After staking the goods are spread on a table and given a coat of a mixture of flaxseed mucilage and milk, hung up again to dry and again staked. The skins or hides are then rolled in a rolling jack in which a steel roller passes over a bed in such a manner that a great pressure is secured, the object being to work out the wrinkles and give a better appearance to the finished product.

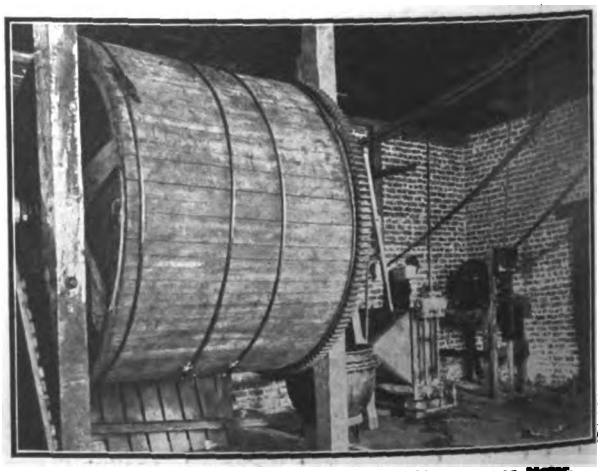
Electricity in the Manufacture of Leather.

The output of 951 establishments reported in the last census as engaged in the manufacture of leather shows an increase in 1909 of approximately 10 per cent over that of 1914, the total production for 1909 being more than 142,700,000 hides and skins. Many of these tanneries are completely electrified, and a still larger number have installed partial equipments to meet the requirements for additional capacity. In general the application of electric motors to the driving of tannery machinery offers the same advantage as in other industries with the distinctly important features of decreased power consumption and increased production for a given equipment. Owing to the extended areas over which power must be transmitted, the losses incurred in steam-driven plants due to shaft and belt friction constitute from 35 to 70 per cent of the total energy consumed. In addition to this loss several engines and isolated boiler equipments are usually necessary with high cost for attendance and maintenance. The major portion of this power cost may be eliminated by the application of the motive power direct to the various machines. The cost of energy in a plant operated in this manner becomes very nearly proportional to the work done.

Existing installations of electric motors for tanning machinery have already proved that a given equipment will do more work when electrically driven, due mainly to the greater uniformity of speed attained and to improved control. Other advantages which indirectly affect the cost and the quality of the production are: Greater cleanliness, materially reducing the percentage of damaged leather in the



Motor-Operated Lime Reel in Tannery.



Eight-Foot Oil Drum Driven by 10-Horsepower Motor.

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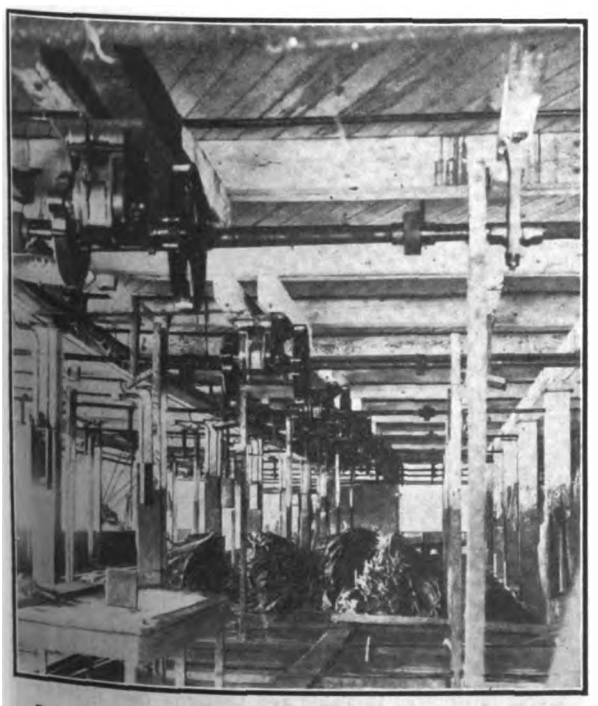
final process of finishing; most convenient and logical arrangement of machines, insuring the handling of the hides from one machine to another quickly and economically; and reliability of operation, since failure of any driving motor can affect only a small part of the plant machinery. This factor is of vital importance in tanneries since the failure of power at certain stages of the process will frequently entail a heavy loss.

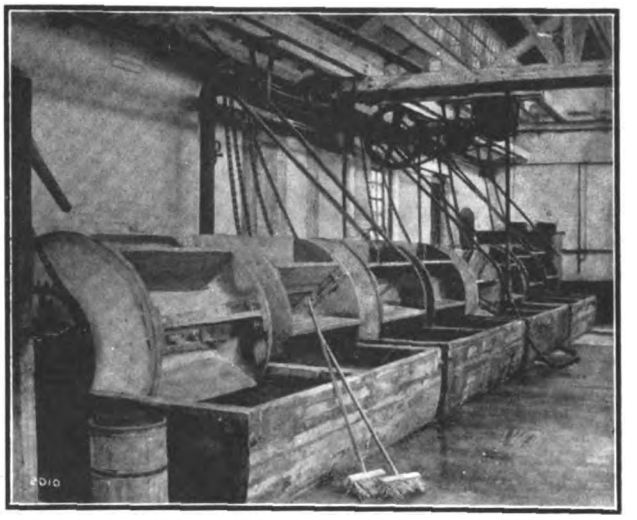
Group drive is used in a large part of the existing motor installations in tanneries. Many of the machines used for preparing leather are best adapted to group drive on account of the intermittent power requirements. This feature is especially true of heavy staking, rolling, and glazing machines having reciprocating motion with the load applied only during a portion of the stroke. On the other hand, machines requiring power for longer periods or high-speed apparatus can well be driven by individual motors. The clumsy and expensive belt-shifting device can be replaced by the electric switch conveniently arranged for control by the operator. Additional machines may be installed without interfering with the operation of those already installed and with no additional outlay except for motors and installation. Overtime work can also be economically provided for, either in large or small quantity, the power requirements being directly proportional to the work done.

On account of the presence of a large quantity of steam, acids or strong alkalis, the motors must be exceptionally insulated to insure uninterrupted service. The squirrel-cage type of induction motor combines features of simplicity and durability which enable it to withstand the most adverse conditions, as may be seen from some of the illustrations. Aside from the inherent superiority of the induction motor over the direct-current type for rough service, the alternating-current system offers further advantage because of the possibility of efficient transmission of power over large areas. Not only can this energy be transmitted at small loss, but the cost of the initial installation is lessened owing to the amount of copper required for transmission wires.

A large number of pumps is necessary in tanning establishments for transferring water and tanning liquids. The pumps when electrically operated may be direct-connected to the motor, and started and stopped by throwing the controlling switch. It is also possible to place the pump in the most convenient location regardless of the source of power. Several fans are usually employed to expedite the drying of the hides or skins between the various operations of tanning, washing and dyeing and these are most satisfactorily driven by direct-connected motors. Many of these fans are required to operate 24 hours a day under conditions which require frequent attention and repairs when driven by mechanical means.



Back-Geared Motors Driving Rockers for Tanning Vats.



Battery of Drums Driven by 15-Horsepower Motor.

Data on Typical Installations.

The electrical equipment of Endicott, Johnson & Company's tanneries at Endicott, N. Y., includes about 120 motors with a combined rating of nearly 1,400 horsepower. Both the group and the individual systems of drive are used, but the latter seems to be the most in favor. The method of driving the fleshing and unhairing machines is a good example of the application of separate motors to each machine. There is a fleshing machine driven by a 10-horsepower motor suspended from the ceiling and two unhairing machines driven by 7.5-horsepower motors which are supported on suitable brackets. The lime mixers throughout the plant are provided with standard three-horsepower motors with back gear for speed reduction. This back-geared type of motor is also used effectively for operating portable lime reels. The use of this device allows a much more compact arrangement than could be obtained by belting or by using one large gear for speed reduction. It is a simple matter, therefore, to totally inclose the motor, thus protecting it from the liquids in the vats over which the reels are required to operate. The paddle wheels for washing the hides in various solutions are mainly operated in pairs by 5 or 7.5-horsepower motors.

Owing to the uniformity of operating speed, the squirrel-cage induction motor is especially suitable for driving leather splitters, producing leather of a much more uniform thickness than is possible with the varying speed conditions which are unavoidable with mechanical drive. These machines are driven by 7.5-horsepower motors suspended from the ceiling. The tanning and washing drums are mainly driven in groups, requiring somewhat less power in motors than would be necessary with individual drive. The shaving and shanking machines are driven in groups by motors rated from 7.5 to 15 horsepower. In one instance five shanking machines are individually driven by five-horsepower motors, each motor being controlled by the operator by means of a specially constructed switch. Following the usual practice, group drive is employed for glazing jacks, seven machines being operated from a 10-

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horsepower motor. Staking machines are driven in the same manner, a 15-horsepower motor in one case driving six machines. Motors of 15 horsepower are also arranged for driving groups of four rolling machines each, for finishing the sole leather.

The Ohio Leather Company, of Girard, O., operates one of the largest tanneries in the Middle West. Its plant is equipped throughout with modern electrically driven machinery. Previous to 1907 the plant was operated by several steam engines, but at this time, on account of the heavy expense involved in maintaining this equipment and also the requirements for additional capacity, it was decided to electrify the entire plant. In applying motors to various types of machinery the individual system of drive was used wherever possible. The installation now comprises 218 induction motors of the squirrel-cage type totaling 872 horsepower. These are operated at 220 volts and 60 cycles. Individual drive is employed for operating belt-knife splitters, fleshing and unhairing machines, color drums, setting out machines and many others. Group drive is employed for operating the glazing jacks, staking machines, and also the shaving and shanking machines. By the installation of electric drive in this tannery the company has been able to eliminate a large percentage of the line shafting and belting and thus reduce the friction loss to a minimum. In making additions to the present equipment it has been found to be a very simple matter to install new apparatus, equipping each machine with its own driving motor. The accompanying table gives the horsepower requirements of a few of the more important machines used in the leather industry.

HORSEPOWER REQUIREMENTS.

Application.	Horsepower.
Fleshing Machines	30
Wash Mill	10
Shaving or Skinning Machine	10
Dry Mill	5
Reels	2-5
Staking Machines	5
Splitting Machines	10

Electricity as a Friend of Animals.

While medical annals have been recording the marvelous work of the X-ray in saving human life and volumes have been written of the work of the great experimenters, an unheralded and modest hero of the X-ray has been carrying this saving light of science into another field, that of our four-footed neighbors. Dr. Louis Griessman's Yorkville Veterinary Hospital and X-Ray Laboratory, in New York City, for the treatment of horses, dogs, cats, birds and all kinds of pets, is the only one, so far as is known, in the world. Certain experimental work along this line has been done in the University of Colorado but Dr. Griessman is the only man to organize an institution for carrying on practical work. He will shortly round out a year of successful work in his chosen field. During this time he has diagnosed under the X-ray hundreds of cases of bone diseases, fractures, dislocations, heart enlargements and tubercular conditions of various tissues and organs. His subjects have been horses, dogs, cows, cats, chickens, canaries and monkeys. His laboratories are equipped for handling all kinds of animals from the largest to the smallest. For horses and cows he has constructed a tilting table operated by an electric motor. The horse stands beside the table while it is in a vertical position. He is put in a sling and shackled and when all is ready the table descends to a horizontal position. Dr. Griessman has invented a scheme for suspending the X-ray tube by means of pulleys and wires so that it can be conveniently swung to any point. Innumerable difficulties were encountered in handling the service in Dr. Griessman's hospital which were solved by Frank V. McGirr, a young engineer of the New York Edison Company. Dr. Griessman has done some remarkable work in detecting the presence of tuberculosis in cattle.

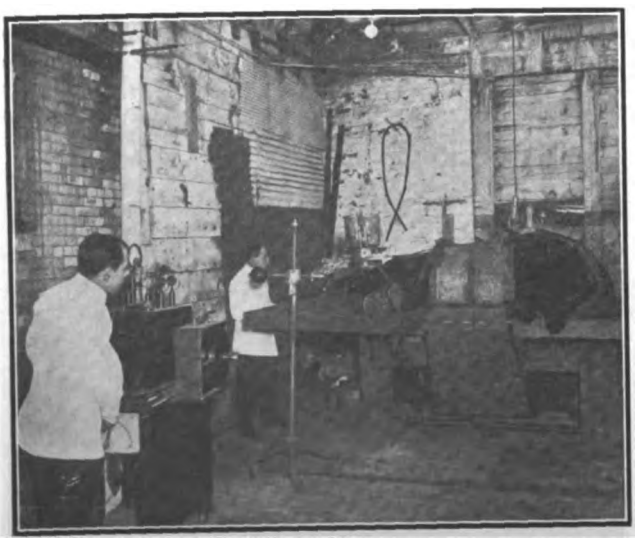
Water Power in Washington Enormous.

The United States Geological Survey and the Washington Board of Geological Survey are co-operating in investigating the water supply of the State and the related physical features that affect the development of power and irrigation.

Yakima River is probably the most valuable stream in the State. It can supply water for irrigating about 650,000 acres of land, besides furnishing 132,000 horsepower continuously and an additional 155,000 horsepower for pumping water during the irrigation season. The fact that only 300,000 acres of land are now irrigated, and that only 14,000 horsepower is available from present power plants indicates great opportunities for agricultural, and industrial expansion. All the power estimates in the report have been based on the assumption that the water is more useful for irrigation than it is for power.

A summary of power available on Naches River and its tributaries shows that 97,900 horsepower can be used continuously, and that an additional 62,000 horsepower can be used during the irrigation season for pumping water to lands which can not be served by gravity systems. Most of the power sites on Naches River will require relatively short transmission lines for the delivery of energy.

A copy of Water-Supply Paper 369 may be obtained free of charge by applying to the Director, United States Geological Survey, Washington, D. C.



Taking Radiograph of Neck Growth on a Horse in New York Hospital.

Horse Is Secured to Table and Latter Is Then Tilted by Motor.

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Commercial Practice in New England

House-Wiring, Concentric Wiring and Building Up Power Load Discussed at Boston Convention of New England Section of the N. E. L. A.

The second Question-Box Convention, under the auspices of the New England Section, N. E. L. A., was held at Boston, Mass., March 7 and 8, with about 200 members in attendance. This convention takes the place of the spring convention, held in former years, and proved, as it did last year, to be a valuable medium for the interchange of ideas among the members.

The sessions were held at the American House, and opened Tuesday morning. R. W. Rollins, of the Worcester Electric Light Company and Section vice-president, called the meeting to order, and introduced C. R. Hayes, manager of the Fitchburg Gas & Electric Company, as chairman of the Question Box Committee. Mr. Hayes outlined the scope of the convention and introduced E. R. Davenport, Providence, R. I., as chairman of the session.

The general topics considered the first day were Station Operating Prices and Distribution, and on the second day Commercial Practice and Accounting. Questions which had previously been sent to the Secretary were read by the presiding officer and discussed informally by members. Particularly interesting sub-topics concerned house-wiring campaigns, the introduction of concentric wiring, electric ranges and the building up of the power load. F. A. Gallagher, of the Narragansett Electric Lighting Company, Providence, R. I., described the results of a two months' house-wiring campaign, which has yielded 391 new contracts, aggregating $41,625, or an average of $106.46 each. The total connected load added is 458 kilowatts. The campaign was conducted at a profit of about $5,000, and the estimated income is $2 per customer per month. Another campaign is soon to be begun by the company.

The Cumberland County Power & Light Company, Portland, Maine, has found it to advantage to enlist the local contractors rather than do wiring itself. The fourteen contractors in the local association, with their salesmen, are equivalent to so many solicitors for the central station, and the company is not under the necessity of carrying a stock of wiring materials.

A. F. Townsend, Woonsocket, R. I., believed in the policy of encouraging the contractors to handle appliances. The Blackstone Valley Gas & Electric Company, of which he is manager, allows contractors to draw on the company supply and enjoy the 10 per cent margin. The company retails its appliances at list price.

The Danbury Gas & Electric Company, Danbury, Conn., reported that it co-operates with the contractors, as far as the outlet, the company carrying fixtures, on which it makes sufficient profit to carry the soliciting expense on wiring contracts.

House-wiring of mill tenements on a rental basis was described by H. M. Parsons, general manager, Central Massachusetts Electric Company, Palmer, Mass., where a large number of "corporation tenements" have been wired with an average of five outlets, at about $30 per tenement. The installation consists of a three-light shower, one two-light fixture, two side brackets in chambers, and a drop light in kitchen and cellar. The tenant pays the lighting company at the rate of 15 per cent per year for the use of the fixtures, energy being supplied at the regular net lighting rate of 15 cents. After the installation has been in several months, the house owner is usually induced to purchase it at cost, charging the tenant the 40 or 50 cents a month extra which the 15 per cent represented. The company has several thousand dollars which it is constantly turning over in making similar house installations.

In Leavenworth, Kan., it was reported, house wiring with about three outlets per installation has been done free of charge, the cost to the central station being $6 to $8 per outlet.

M. R. Griffith, of the General Electric Company's Boston office, reported the following results of the Boston house-wiring campaigns:

1914, 1,186 houses. Income.....$29,096
1915, 1,524 houses. Income..... 35,270

Average, 127 houses a month; 5 hours a day. Payments required as follows:

Monthly payments of $2 to $2.99, 12 months to pay.
Monthly payments of $3 to $3.99, 15 months to pay.
Monthly payments of $4 to $4.99, 18 months to pay.
Monthly payments of $5 and over, 20 months to pay.

The Boston Edison Company's store-wiring campaigns resulted in securing in 1914, 1,307 stores using gas, and in 1915, 1,102 stores. These represented 38,733 equivalents and an income of $133,420. The cost of wiring was $63,745; average income $5.99 per customer. Five outlets were wired for $17.50, four for $15.50 and three for $13.50; over five outlets $2.50 additional.

In Hartford, Conn., a list of all unwired houses and tenements is kept. Last year 545 houses, with 1,300 tenements, were connected. Cleveland, Ohio, wired 3,000 houses in 1915, it being the practice to give a credit of 15 per cent of the cost on the customer's lighting bill. Minneapolis, Minn., has connected 1,990 houses, with 7,000 new customers.

C. R. Hayes, Fitchburg, Mass., raised the question as to gas competition. E. P. Rowell, Plymouth Electric Light Company, reported that both gas and electricity had, in 1915, shown the greatest growth locally in the history of both plants. The electric company added 500 customers—rather more than the gas company, which secured mostly heating and cooking business. C. E. Greenwood, of the Boston Edison Company, reported results in New York City as showing a vastly greater increase in electric lighting. Mr. Hayes said the adoption of British-thermal-unit tests for gas is due to the large consumption in heating and in cooking. Mr. Townsend said that his company is selling less gas and more electricity each year for lighting, and the increased consumption of gas is mainly for domestic uses. Mr. Gallagher reported that in the recent wiring campaign at Providence 280 gas customers had been secured and electric lighting substituted.

To the question whether the gas arc seriously competes with high efficiency incandescent lighting, Henry Schroeder, of the General Electric Company's lamp sales office, pointed out that the Mazda C easily surpasses the larger sizes of the gas arc, and the C E Z burner is about the equivalent of a 40-watt unit. Fifty-watt incandescent units easily compete with the Humphrey 7, 60-watt with No. 20, 200-watt with No. 30, and 300 with No. 50, electricity being considered at 8 to 9 cents, and gas at $1.

The Portland company reported that formerly the gas arc was a competitor for store business. The company rents fixtures with large C units with good effect as an entering wedge. This year it is installing the Equalite lamp at $1 down and $1 per month, giving free maintenance for one year. The C lamp has actually increased the lighting load. One man is kept on the work of introducing the high-efficiency lamp in place of smaller tungsten or carbon units,

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or gas. The Plymouth company reported that the C lamp had increased factory and store lighting business, and the Portsmouth (N. H.) company has secured revenue not otherwise obtainable. The Central Maine Power Company, Augusta, Maine, called attention to the use of the Mazda C lamp in stores where lighting is obstructed, as, for example, in hardware stores.

The use of illuminated flag signs was taken up. It is considered legal to use the American flag in this way, if disassociated from advertising legends. One company is renting a four-foot flag at $10 per week, the user paying cost of connection. Another central station operates two seven-foot flags, each equipped with 7.5-watt lamps. The total cost of a medium sized flag is $66.00, and of the flasher $35. Cost of installation is extra.

Securing New Business.

Proper outlay for commercial development is 2 to 2.5 per cent of gross revenue, which should give $4 added revenue for each dollar expended. Sixteen customers added to one company's business last year added 12.2 per cent to the load and 14.3 to the gross revenue. This represented an outlay of only two-thirds of one per cent, and a return of $20 for each dollar expended in securing the business.

J. E. Spike, Cambridge Electric Light Company, said his company installs motors of 20 horsepower and under, on one week's free trial; often this is the wedge by which a whole factory installation is placed. F. H. Smith, assistant manager, Worcester Electric Light Company, believed it to be more feasible to go after the motorization of an entire plant.

F. C. Hard, Boston Edison Company, described the introduction of irrigation by electric pumping on a 10-acre farm eight miles from Boston. A three-horsepower, single-phase motor operated a pump which discharged through a system of iron pipes perforated at an angle from the horizontal. The cost of watering the whole area was about $36 a year on the company's miscellaneous rates of three cents. During the season when the apparatus is not in use the customer pays a minimum of 75 cents a month.

Eugene Carpenter, Newton, Mass., pointed out the opportunities for irrigation in New England, and particularly on Cape Cod. One acre watered will yield three times the amount of produce that an acre will produce without irrigation, even in the East. Strawberry crops are greatly increased by watering the berries when setting. The hours best suited to irrigation being from 11 p. m. to dawn, the electrically driven pump will produce a good return to the central station, at fairly low rates.

Electric Cooking.

The remarkable progress being made in introducing the electric range was illustrated by the Boston Edison Company's sale of more than 400, at a profit, within a few weeks. Charges on the equipment used in connection with these units is taken care of, in part, at least, by the 10-cent primary rate. The secondary rate is 2 cents.

Water heating by electricity was regarded as a good proposition by some members, and as doubtful by others. The proper use of the electric range has to be studied, said Ralph J. Patterson, of the Central Maine Power Company. If the best results are to be obtained the fireless cooker principle gives electric cooking a distinct advantage over the gas range. Bread, pastry, custards and other foods can be cooked from a cold oven.

The mode of collecting the minimum monthly charge, when less than the equivalent in kilowatt-hours is used, was the topic for much discussion. One company's practice is to rebate the amount due the customer, at the end of the fiscal year, providing he has not used to the value of 75 cents a month, or $9 a year. If the minimum is not used during the last two or three months of the year, or if the customer discontinues service, the charge is adjusted on a pro rata basis. Another company has recently adopted a system of billing not less than the $1 minimum. July 1 adjustment is made of the accounts for the six months previous. If during the summer no current is used no bill is sent. Under a former system, the refunds amounted to 38 per cent.

Concentric Wiring.

The afternoon session opened with a discussion of concentric wiring, C. R. Hayes presiding. R. S. Hale, of the Boston Edison Company, referred to the introduction of the bare concentric system in the country as a central-station movement. The General Electric Company and other manufacturers have spent considerable money in producing the wire and fittings. There are no basic patents. Now it is up to the central station to go ahead. As it becomes more generally adopted the cost will steadily decrease, because of the larger demand for the materials, which will result in a larger volume of manufacture at lower unit costs.

Household Apparatus.

Rental of vacuum cleaners is the practice of the Pittsfield Electric Company. The charge is $1.50 per day when sent and brought back, and 75 cents if the customer gets and returns the apparatus. This helps to meet the cost of demonstrating household devices, and in reducing the depreciation cost.

Mr. Smith, of the Boston Edison Company's Range Division, held that a higher grade salesman is required for the sale of ranges, because a knowledge of construction and fittings is necessary. One division of the work is to cooperate with architects of apartment houses, to the end that provision may be made for electric cooking facilities in each suite. Though some 400 ranges have been sold by the Boston Edison Company during the past three months, Mr. Smith said the real campaign will begin in April, with 1,000 new installations by September as the end in view.

R. S. Hale explained the secondary two-cent rate, as applying only to cooking, heating and refrigeration. Fans and washers require so little power that there is no justification for a low rate. Mr. Hale justified the low rate for domestic uses on the grounds set forth in a decision by the Gas and Electric Light Commissioners in the Reading municipal case, in which the propriety of discriminatory prices for particular uses is recognized.

Ralph Patterson, Waterville, Maine, held that a three-cent rate for range operation is cheaper for the customer than gas. He believed that the householder who uses electricity for various purposes is entitled to be classed as a wholesale customer, and to enjoy a low rate on one meter.

Sessions of March 8.

C. R. Hayes presided at the morning session, when distribution problems were considered.

The use of Mazda C lamps on direct-current series street circuits was a subject of general discussion at this session. D. W. Beaman, of the New Bedford Company, reported that his company had such an installation. Early burnouts were traceable to carelessness or misunderstanding, but trouble is obviated by having the tub transformer set at full load before turning on the circuit.

In Worcester, on 6.6-ampere circuits, with eight lamps in series, renewals of burnouts cost more than the amount received for the use of the lamps. On four-ampere circuits, however, good results have been obtained with high-efficiency units on luminous-arc circuits.

Rockland, Me., reported that it had abandoned type C lamps for street series, and the Boston Edison Company regards their operation on direct-current arc circuits as impracticable, but on alternating-current series circuits good results have been obtained. The company has replaced all alternating-current arcs with these units.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

NOTEWORTHY ELECTRIC DEVELOPMENTS IN KANSAS CITY, KANS.

Electric-Service and Water-Pumping Station on the Missouri River Serves a Community of 100,000 Inhabitants.

Kansas City, Kans., is a city of 100,000 population, with no one among its population who is considered exceedingly wealthy. It has no millionaires, but it is the home of the stable middle class people, the factory workers and the employees of the packing establishments operating in the lowlands along the Missouri and Kansas rivers. The largest store in the city occupies but 62.5 feet front, with three stories and a basement, and the highest building in the city stands but five stories above the street. Apartment houses are almost a thing unknown, development having been distinctly extensive.

The electric plant was first started in November, 1912, supplying the entire city with street lights and about 200 domestic consumers. The lowering of the light rates, however, and the good service which the plant was able to give soon made the demands upon the plant greatly exceed the expectations of its most ardent supporters, also the demand for power service was such that in less than a year the capacity of the plan was doubled.

The plant was primarily built for a lighting proposition, and had for the first installation one 500 and one 1,000-kilowatt, 2,300-volt, 60-cycle, three-phase turbogenerators. Later another 3,000-kilowatt generator of the same make was installed and provision made for supplying power to private industries.

The domestic service demands during this time had been such that over 4,000 customers had been taken on and over 1,000 horsepower in power had been served. In the summer of 1914 it was discovered that owing to the excellent service being given and the increasing number of new industries being established in the city that the plant could, if enlarged, furnish several thousand horsepower, although the capacity of the plant was ample for lighting purposes.

In November, 1914, an additional 5,000-kilovolt-ampere generator was purchased, and is now in service. Additional space for another 3,000-kilovolt-ampere unit is provided.

Power is being furnished at 6,600 volts through step-up transformers, and provision is being made for supplying 10,000 horsepower.

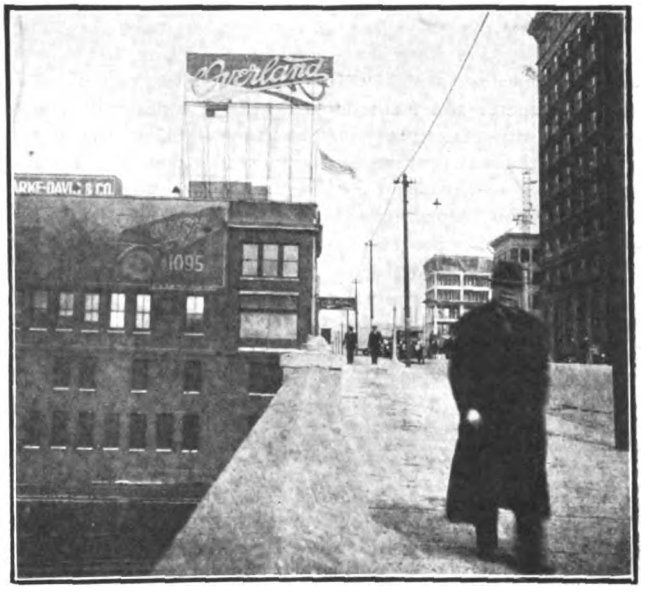
The boiler equipment at present, for both the water and light departments, consists of five 350-horsepower, one 300-horsepower and four 500-horsepower, or a total of 3,700 horsepower. Space for additional boiler capacity of 4,000 horsepower is provided by widening the boiler room and erecting another stack.

The electric light plant is now selling approximately 1,000,000-kilowatt-hours per month. The demand for power and light is such that in two years' time the plant will show a net income of approximately $50,000 per year.

A 24-hour test run of the boiler plant, made February 2 and 3, 1915, under the directions of Professor Schaad, of the University of Kansas, showed an operating efficiency of 74 per cent, with the load varying from 750 to 1,850 horsepower during the run.

Electric Sign Designed to Withstand Heavy Wind Stresses.

The electric sign of the Overland Motor Car Company, of Kansas City, Mo., is an example of heavy sign work adapted to withstand extraordinary stress. The dimensions are 45 by 12 feet, and the entire device, including uprights and braces, weighs seven tons. This sign is situated on the roof of a three-story building, the building being on an



Electric Sign Designed for 90-Mile Winds.

eminence and the sign projecting into a wide thoroughfare, where winds get a clean sweep at it.

Kansas City occasionally has winds of 40 to 50 miles velocity. The sign was designed to withstand a wind velocity of 90 miles an hour, allowance also being made for sleet that might be deposited upon it. Among the factors of safety are guy wires every ten feet, each having a tensile strength of 5,000 pounds. The chief safety factor, however, consists in the special construction in the building to provide for the sign. When the structure was planned the sign was contracted for, and the architect planned the building to care for the additional stresses.

The sign was erected by the Federal Sign System, Kansas City, and has been in use two years. The letters are double-faced skeleton.

Central Maine Company Secures Hospital Contract.

A five-year contract for electric lighting of the Maine State Hospital at Augusta has been entered into with the Central Maine Power Company. The contract provides for the furnishing of all energy needed for light, heat and power, the first 150,000 kilowatt-hours per annum to be paid for at $3,000, and all hours in excess, at 1.5 cents per kilowatt-hour.

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Central-Station Accident Prevention.

Many central-station companies have organized separate departments for supervising safety work. What has been accomplished by Henry L. Doherty and Company, operating about 70 utilities, is told by George O. Smith, supervisor of safety, in *Safety Engineering*.

Some two years ago a Safety and Welfare Department was formed by the Doherty organization to prosecute actively the work of accident prevention. The first work undertaken by this department was the study of methods in vogue. Not only other public-utility holding companies, but the large industrial companies of the country were canvassed. It was the theory of the Doherty organization that accident-prevention work was an absolutely necessary part of successfully operated public-utility companies, so it was rather in the nature of making this work a subdepartment of the operating department than to consider it in the light of some new element to be injected into public-utility operation. Further, it was considered that to be successful it must be conducted along entirely practical lines, and methods used which would fit in with operating conditions as they existed.

After some months spent on study and analysis, definite accident-prevention work was undertaken. Visits to the various subsidiary companies were made; examinations of their physical property and methods of operation conducted, and as a result of these examinations, recommendations were made, so far as physical property was concerned, that it might not present ways and means for the men to become injured. In addition to this, educational work among the employees was undertaken. This was done by means of general meetings and organizing safety committees, composed of the men from all branches of the organization.

In each subsidiary company, one man's entire time, if the company was large enough to warrant it, was devoted to accident-prevention work, and each of the subsidiary companies was assisted by the Central Safety Department, located in New York, in its endeavors along these lines. This assistance takes many and varied forms. A bulletin service is maintained by the Safety Department in New York and each of the companies avails itself of this service, and it stimulates interest of the men in their work. Uniform first-aid equipments, designed with a view to meet the peculiar conditions arising in the conduct of public-utility business, were distributed to local companies.

The Central Safety Department in New York, in addition to other service rendered, makes frequent inspections of the subsidiary company's plant and property, and gives advice to the local safety inspectors. It also furnishes lecturers, equipped with motion-picture films and lantern slides, to go to the different subsidiary companies and hold meetings. In fact every effort is made by the safety department in New York to keep in close touch with accident-prevention work in all local companies and give them the benefit, not only of its experience in this work, but to supply them with a great deal of information which will be of assistance.

The Doherty organization believes that an interest must first be aroused in the mind of the employee, and that the subject must be presented to him in such a way as to appeal particularly to him. He must then be taught to believe that by his efforts he can perhaps prevent injury to a fellow workman, and that by interesting a fellow workman an endless chain is started which has as its object the furtherance of safety first, last and all the time.

Frequently the companies in the Doherty organization are called upon to conduct campaigns, in cities in which they are located, dealing with accident prevention as applied to the public. Campaigns along this line have been conducted with very successful results, and the safety department always keeps itself in a position to render every class of assistance to local companies in this connection.

Statistics are kept by the Central Safety Department of the Doherty organization in its New York office, which show every accident to every employee, which are compiled in the form of reports and bulletins and sent to all employees. Each accident report receives very careful analysis.

The year's work has shown that accident prevention amongst the employees of the Doherty organization has been successful. The results have never been measured in dollars and cents only, nor is it the intention of the Doherty organization to consider the matter entirely in that light.

Absolute continuity of service is demanded in all public utilities, but there are many things upon which this depends, not the least of which is efficient accident-prevention work.

House-Wiring Campaign Planned by Nashville Company.

The vigorous prosecution of a campaign started some time ago will be the part played by the Nashville (Tenn.) Railway & Light Company and Nashville contractors in the national house-wiring campaign, beginning March 15. The advertising feature of this campaign is "A Year to Pay," and includes twelve payments without an initial cash payment The company is making a special appeal to tenants and owners of small houses. The campaign is based on the theory that all of the more expensive houses are already wired, and the chief source of new business is the small homes. The total wiring cost ranges from $11 for three rooms, paid at the rate of $1 a month, to $25.80, for a ten-room house, or $2.15 a month for twelve months. The work is divided among the local contractors, who depend upon the volume of business for securing a material profit.

Circulars setting forth in detail the advantages and economy of electric lighting under this plan are sent to all owners of unwired houses. In addition, similar circulars are sent to tenants, the names having been secured by canvass. By arrangment with the local postoffice, a circular addressed to a tenant who has moved is delivered to his successor, so that the house itself, irrespective of the resident, is reached. In addition a force of ten solicitors is to be placed at work during the month. The appeal is made to tenants that the cost is so low that it can hardly be noticed, and is more than repaid by the added comfort and cleanliness. It sometimes happens that tenants move before the wiring is fully paid for. The company has a lien on the wiring, but there has never been any occasion to exercise it. Practically always the landlord makes an arrangement with the next tenant by which the remainder of the cost is split between them. The percentage of loss, officials state, has been negligble. The plan is resulting in increasing the number of consumers rapidly.

At the beginning of the campaign it was stated that a cash payment would be required, but this was given in so few cases that the request for it was dropped.

Concession Regarding Discount for Prompt Payment.

The rates in force for residence and small-store lighting service on lines of the Commonwealth Edison Company, Chicago, have for some time been on a basis of 11, 6 and 4 cents, respectively, for the first, second and all subsequent 30 hours' use of the maximum demand. A discount of one cent per kilowatt-hour has been offered on each of these rates for prompt payment within 10 days of the date of the monthly bill. To encourage liberal use of current in excess of 60 hours' use of the rated maximum demand, which is covered by the primary and secondary rates, the company has, since February 1, billed all excess use at the rate of 3 cents per kilowatt-hour. In other words, the penalty for failure to pay promptly does not apply to any current used in excess of 60 hours of the maximum demand.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Electrolytic Refining of Tin—A New American Industry.

What promises to be an important new industry in this country has been started at Perth Amboy, N. J. The American Smelting & Refining Company has completed the erection at its works at that point of a new plant built particularly for the smelting of tin ores and concentrates and the electrolytic refining of tin. These ores will be obtained chiefly from Bolivia.

The consumption of tin has been rapidly increasing in this country. None has heretofore been mined or smelted here. About 45,000 tons of tin (valued at about $50,000,000) are imported annually, of which about 90 per cent comes from the Federated Malay States (Straits Settlements). An export duty on Straits tin ores has caused the smelting of the tin in that country, a very pure metal being produced which is especially suitable for tin plate. Aside from the Straits Settlements, Bolivia is the largest producer of tin ores and concentrates in the world; the Bolivian tin, however, contains impurities which, with the smelting methods long in vogue, do not produce a metal suitable for tin plate, the principal use for tin in this country.

Recent analysis of electrolytic tin made in England from Bolivian ores by the most experienced chemists in the tin trade shows it to run 99.98 per cent pure, while the base metal from which this was produced contained only 93 per cent tin. The impurities consist of lead, antimony, and copper, as well as small amounts of many other metals. Tests have also been made by tin-plate manufacturers of this electrolytic tin, and it is pronounced equal in every respect to the best Straits tin.

The new plant at Perth Amboy proposes not only to smelt the impure ores from Bolivia and other countries, but to refine the product electrolytically. The indications are that, after possible slight difficulties have been overcome, it will be a complete success, because the entire work, both smelting and electrolytic refining, is in the hands of expert men.

The Perth Amboy plant will utilize before long about 14,000 tons of tin ore shipped direct from Bolivia. Heretofore this ore has been smelted almost entirely in England and Germany. The new plant should therefore prove of great economic advantage.

Keen interest in the new development is being manifested by various American interests. Among these is the National Lead Company and other manufacturers of solder and tin alloys. The Chamber of Commerce of Portland, Ore., is taking lively interests in the direct importation of Bolivian tin ores and their smelting and refining in the United States. A syndicate at Seattle, Wash., is working on a project for the erection in that city of a smelter for handling the tin ores from its large Alaska mines and is also considering the importation of Bolivian tin ores. The salmon and fruit trades of the upper Pacific coast call for much tin in canning. The abundance of hydroelectric power in that region may aid materially in the production of the refined tin needed.

An important report on the new industry and on the world's trade in tin, covering over 14 pages, appears in *Commerce Reports* for January 6.

Purchased Power Shows Saving of $1,500 Yearly at Concord.

The town of Concord, Mass., is considering the question of purchasing its energy supply from the Edison Electric Illuminating Company, of Boston, which offers to furnish current from its Lexington substation, through duplicate underground lines, both energized, and either one capable of handling future requirements of the town.

The maximum one-half hourly load in December was about 320 kilowatts. A new electric sewage pump will require about 48,900 kilowatt-hours for the year, and this was added to present requirements, as follows:

	Kilowatt-hours.
Current generated at plant, year to June 30, 1915, including 56,000 kilowatt-hours for high service water pumping	861,940
Additional for sewage pumping	48,900
Total requirements	910,840
Total required, metered at high-tension, including transformer and saturation losses	930,000
Maximum one-half hourly load, December 8-22	320
Best demand to purchase 2,200 volts	275
Best demand to purchase high-tension	280
Probable excess hours at above demands	1,000

The cost of this current, at the Edison Company's high-tension wholesale "D" rate, would be $18,065, earning a rate of 1.94 cents a kilowatt-hour.

The company points out that maintenance and operation of the substation can be handled by the town for little additional expense. In Wellesley and Norwood, where Edison current is supplied, one attendant is on duty, only from 4 to 11 p. m.

In the comparative figures submitted, one operative is charged against the operating cost of the electric plant, and one against general expense and sewage and city water pumping.

In case the town should contract for 20 years, the company proposes to extend duplicate underground lines to the present station at its own expense. If at the end of 10 years it is desired by the town to terminate the contract, it may be done by the town paying the difference between the cost of the property, without interest or depreciation, and the appraised value. The company agrees to buy, and the town to sell, the steam and generating equipment which is now in use.

The "D" high-tension rate provides that the town furnish the transformers and substation equipment except the high-tension switching apparatus. Comparative costs would be as follows:

PRESENT OPERATING COSTS.

Year ending June 30, 1915.

Coal	$11,319.99	
Oil and waste	213.35	
Water service at station	47.60	
Wages	7,496.76	
Repairs—Real estate	753.07	
Steam plant	907.46	
Electric plant	74.40	
Station tools and apparatus	50.95	
		$20,863.58

OPERATION WITH EDISON SERVICE.

930,000 kilowatt-hours, 280 kilowatts—1,000 excess hours	$18,065.00	
One attendant, for switchboard operation	1,040.00	
Coal for heating substation, 20 tons @ $8.00	160.00	
Water, same as now	47.60	
		19,312.60
Saving with Edison current		$ 1,550.98

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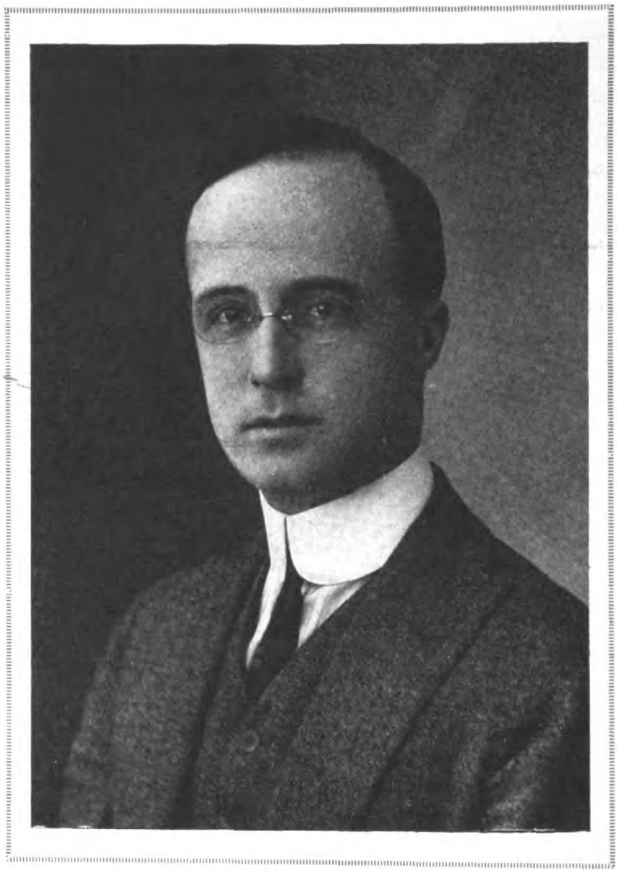
Talks to Central-Station Power Salesmen

Some Pertinent Comments on the Equipment of the Salesman and General Rules That Must Be Observed in Interesting the Prospect

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company



Of many remarkable developments in the central-station industry in recent years there is perhaps none that stands out with such particular prominence as does selling power. Ten years ago many central-station companies considered the signing of a 50-horsepower contract more or less of an innovation, and, therefore, an occasion for publicity and congratulations. Today a contract involving a revenue of ten to twenty thousand dollars per year is received with mild enthusiasm. Contracts involving fifty and one hundred thousand dollars and more per year are not exceptional at the present time, and many companies have reached the point where the power business represents 50 per cent or more of their entire station output.

With this rapid development it is obvious that the requirements of men to handle these propositions have grown in proportion. A few years ago the equipment of a power man was only that he should have technical knowledge of electricity, know something about the application of motors to tools, and perhaps be able to use some stereotyped arguments as to the advantages of electric drive in the smaller installations. Many times he only worked in an advisory capacity to the lighting salesman. Very seldom was he expected to take the initiative in getting power contracts, by presenting advanced sales arguments. Today, with propositions involving revenues such as referred to, it is necessary that the man who handles them must not only have a more thorough technical knowledge of the subject, but must needs be equipped with all the essential qualities of a high-class salesman.

At present there is a demand all over the country for capable men to sell power in large blocks, and it is doubtful if the supply is as great as the demand. This demand though, is not for the old type of power men, who knew the inner workings of a motor and the proper size belt necessary to couple it to a machine, as the colleges are turning out thousands of these men each year. The progressive central stations are looking for men that not only have a more complete engineering knowledge, but who are salesmen capable of handling propositions that involve ten to twenty or even one hundred thousand dollars per year revenue in a manner befitting their importance. It is the right proportion of this engineering knowledge and sales ability that makes the successful power salesman or power engineer, whichever he may be called. They are hard to find, and hence the demand. The field for such men is practically unlimited, and the demand undoubtedly will be far greater in the future than it is now. Therefore, it behooves a man who wants to go into this field, or who is in it now and not making much progress, to consider the qualifications experienced men have found most necessary, and train themselves accordingly. The writer agrees to a certain extent with several noted exponents in salesmanship, that salesmen are born and not made, and that if a man is not naturally endowed with certain requisite qualities which go to make up a successful salesman, it will be much better for the industry as a whole, and particularly to the man himself, if he places his efforts in some other branch of work towards which he has a natural leaning. However, there are a great many ways in which a man may develop himself along these lines, and much help may be given him by his superiors.

Prospective Customer Seldom Receptive.

Assuming then that we have a man who has the necessary equipment of technical knowledge, and at least the fundamental qualities of a salesman, it would be well to first get the proper viewpoints or conception of just what the proposition is. In this connection it is well to look at it from the standpoint of the prospective customer, as well as from that of the company. The position of a prospective customer is something like this: He is operating a private plant for supplying his power and light, in the firm belief that this is the cheapest way to obtain this product. He spent considerable good money for his plant, in the first place, has been operating it for a number of years, and knows that it is cheaper than would be energy purchased from the central-station company, as his engineers have told him so. Furthermore, his engineers have told him that all the steam that is used in the engine is used over again for heating the building. Thus the power does not cost much of anything. He has also had this confirmed by the men who sold him the plant, and perhaps by some consulting engineer, who was called in to report on its efficiency. He firmly believes that there are certain conditions affecting his particular enterprise which are particularly favorable to the operation of the private plant. Being a layman, he does not convince himself further, and aside from looking over the operating cost to see that one year does not exceed another, he continues to make his power. This is a logical sequence, as in his business there are many items to take up his time which have more important bearing upon the operation of his enterprise than does the question of power.

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Such items as labor, raw material and the marketing of his product are the important factors in his business. He has employed men to supply his power in the most economical way possible, and as long as a private plant is used these men will probably have a job. If they should recommend the adoption of central-station power it is very likely that their services will no longer be required. Therefore, it is only natural that they should use every effort to convince the manufacturer that central-station service can only be adopted at a loss. Furthermore, these engineers probably do not know just how much coal is used for the production of power, and how much is used for heating and live-steam purposes. For this reason they need not stretch their conscience to any great extent to advise the owner that the greater part of the coal is used for the heating of the building and for furnishing live steam.

If the manufacturer is about to build a new building he has all the representatives of engine and boiler concerns and salesmen of plant apparatus calling on him, who, although each is there primarily to sell his own particular apparatus, are all working together against the consideration of central-station service, as this would be against their general proposition. All of which confirms the contention of his own engineers, that it is more economical to generate by private means. If at this point the central-station representative should succeed in making an impression against such an array of opposition, the manufacturer may turn the entire matter over to a consulting engineer to decide, and the consulting engineer may be prejudiced in favor of the plant for several reasons. His fee may be in proportion to the amount of money expended on the plant apparatus, and some manufacturers of plant equipment may give bonuses or commissions if their particular make of machine is recommended. It is also very probable that the manufacturer in making up the yearly cost of operating his plant does not consider all the items that properly belong to this account. Interest and depreciation are very often ignored, claims being made that the money has been spent and the plant has run for several years and will run for many more. The yearly cost of taxes and insurance are also very often left out, and repairs not properly considered. The space which the plant occupies is very seldom considered as having a rental value, and usually the cost of executive attention and loss of time through breakdown is ignored. If the power requirements of this factory played a more important part in its operation, these different items would be given their proper value in the books of the company, but as this feature receives only a small part of the time and consideration of the owner it must necessarily suffer in this respect.

This briefly is the position that the average prospect is in, and to this may be added many special conditions, such as some erroneous idea that all public service companies are grasping monopolies, who give but little and take much.

Position of the Central Station.

Of course, from the standpoint of the central station it is all quite different. We know that if our rates are even close to the cost of operating a private plant that the manufacturer has no more real excuse to make his own power than he has to make his own clothes. We know that he should be spending his time and energy on the larger items affecting his business, and that he cannot afford to carry the responsibility of a plant, if he can put it on another's shoulders. We know his heating from exhaust steam is not all velvet. We know his operating cost will increase with the steady advance in coal prices. We know that the fixed charges on his plant are vital items which go to make up a yearly cost, and that his plant takes up considerable space that could be used for some other apparatus if it were taken out. We know, further, that if he is considering a new plant that the representatives of engine and boiler concerns will make claims and even guarantees on their apparatus, which although possible under test conditions, have no particular bearing upon the everyday operation of a plant. We know that we have the best proposition for this manufacturer from all standpoints, and, if he will stop to think for a minute, we know that he will agree with us, if we can properly put these facts before him. As a shrewd business man he is open to reason, or he would not be where he is. Therefore, it is up to us, and if we call on him and come away without making an impression there is only one answer: We haven't put it up to him right. The proposition was all right, it was what he wanted, but we didn't convince him.

Talk to Prospect in Language He Can Understand.

Now the question is, what are the proper ways and means to convince a prospective customer of the merits of the service we have to offer, and to get his name on the dotted line. Here are a few suggestions:

First, it must be assumed that we have the necessary technical knowledge to handle the engineering features that present themselves, both mechanically and electrically, and that we can use this knowledge practically. We should have all the technical points of the game at our finger tips and be able to explain them so that the layman wil be able to know what we are talking about. The average manufacturer does not care how many heat units he has used during the year. He is in complete ignorance as to the relation of British thermal units to power, but he does know that his coal bill was $6,324.62. What he is vitally interested in is how to reduce that figure for the coming year. Therefore, we must be able to explain the B.T.U.'s, K.W.H.'s, K.V.A.'s, etc., in the equivalents of dollars and cents, if our arguments are to bear weight. Also, in testing out a plant we must mix our technical results with horse sense, to see that they sound reasonable. For instance, if we are making a load test on a plant we should at the same time get the output of the factory for that day to see if it is an average condition. Sometimes the engineer has been known to throw on an extra load while the test is being made, which shows the power consumption to be much greater than it normally would be. If it is a textile mill, the weather conditions have a bearing upon the power requirements, and if the product is governed more or less by seasons, proper addition or deductions must be made. In figuring the amount of coal necessary to heat the building the peculiar conditions of the premises under consideration have an all important bearing. There are so many different elements that are important factors in these calculations that each building must be considered almost in a class by itself. Taking any given condition and applying to it several standard formulae on heating, the results obtained will be far apart. The best data that can be obtained on this subject are those which the central station is in a position to get itself by making a tabulation of the amount of coal actually used during a heating season in some of the buildings which it is supplying with power, and giving in detail the specifications of such buildings.

Salesmen Must Keep Posted on Current Topics.

We must not only have this technical training, but there is a broader field of knowledge with which we must be equipped to successfully handle these larger deals. We must be in active touch with the social and economic developments of our community. These are matters of vast importance to the manufacturer, and will furnish us with a common topic of conversation with him. Not only this, but such items have a direct bearing on the future growth of the power business. A new manufacturer contemplating the erection of a plant wants to definitely know what class of labor he can obtain, what the working hours will be, approximately what wages he will have to pay, and the

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shipping facilities and freight rates to different parts of the country. The successful power engineer must have more than a general knowledge of such conditions in order to approach the customer not only as a solicitor of a power contract, but as a man capable of discussing the entire economic aspect of the business in question.

Salesmanship cannot be governed by any hard and fast rules, and large blocks of power are not sold in the same manner as other commodities. Any salesman must have enthusiasm and confidence in his work, and this holds particularly true in the selling of power. The power salesman need not try hard to be very enthusiastic with his proposition. He need only to consider that he is the direct representative of one of the largest and best established institutions in his community, is following a profession equal to the best, and he is marketing a product which is even conceded by his competitors to be second to none. With these facts in mind he surely should have the necessary confidence to go with his proposition to the biggest concerns and men in his community, and feel that he is not in the class of an agent or a petty salesman, but that he has a perfect right to be there and to present his arguments. If the proposition be one where a new plant is involved and competition is keen from the makers of plant apparatus, the salesman must be firmly convinced that he has the best proposition and is the best man on the job. This last point is very necessary, as any salesman to be successful must have absolute confidence in himself as being "the best salesman on the job." The salesman who goes after a contract thinking that the man who is trying to sell the engine is a better man than he, has the battle lost before he starts.

After the salesman has the customer interested, of course there is a great deal of technical work done in testing out the plant and preparing a report, but as this part of the business will be taken up in detail in another issue of this publication, we will, for the time being, assume that such work has been done, that the report has been submitted.

Diplomacy a Necessary Qualification.

Although confidence is very necessary, too much confidence may be detrimental to the cause, for although a salesman has a perfect right to a belief in his proposition, the prospective customer also has certain rights to his belief that he is operating more economically by private means, and the salesman very often makes the mistake in not recognizing these rights. A manufacturer does not particularly care to have a salesman go into his office and tell him in so many words that he has been wrong in the management of his business. This reflects on his business integrity, and he is sometimes very justly antagonized. This manufacturer is willing to be shown that he has been wrong, but it must be done in a diplomatic way.

Some Points to Remember.

The arguments used inclosing a contract, after the figures have been submitted, vary more or less according to the nature of the particular proposition in hand. In some cases, the figures show such a material saving over the cost of operating the private plant that it is only necessary to convince the manufacturer that they are correct and that "now is the time to make the change." Where the figures submitted are comparatively close to those of the private plant, special stress must be laid upon the convenience, reliability, adaptability, flexibility and many other advantages of central-station power over any other. Economy in operation for overtime work is a most important point, and constant speed, which means an increase in the output of the factory, cannot be over-emphasized, as sometimes a very small percentage of increase in the factory output will amount to as much in money at the end of the year as a much larger percentage of decrease in the power item. The up-to-date manufacturer, as a rule, realizes most of these points, that is, in a general way he knows that electricity is the best power, and that, if supplied by the central-station company, it is the most reliable, but it is up to the salesman to emphasize and elaborate on these advantages and show how each one is of direct and vital importance to this particular manufacturer's business. He must show where his proposition is sound and conservative, as the central station must not only get a customer, but keep a customer in order to show a profit, while the engine dealer is practically through with the deal when the engine is sold. Where the manufacturer brings up the argument that he has been approached by the agent of some producer-gas plant that will make a kilowatt-hour on a pound of coal, the salesman's best argument is that when these plants or any other prime movers will reduce the coal consumption to any appreciable extent, the first people to put them in will be the central stations—and that they will work day and night to get them installed.

E. E. I. Co., Brooklyn—Power Eng. Bur.

CONCRETE .....

Occupied as	Shoe Factory	System Direct 1 Pipe	
Exposure	Total	Sq. ft. Rad. Sur.	15,000
Plot	60 × 200	Boilers 2-80 H.P.	Fire tube
Stories	8	Steam Pressure	B. 80 lb. H. 4-6 lb.
Sq. ft. fl. sp	96,000	Kind of Coal	No. 1 Buck
Ht. of Ceiling	13 feet	Avg. Build. Temp.	68°
Cu. Contents	1,248,000 cu. ft.	Max. Daily Coal	4½ Gross Tons
Exp. Glass Area	35,120	Avg. Daily Coal	3¼ Gross Tons
Exp. Area	52,680	Sum. Daily Coal	½ Gross Ton
North Exp.	20,800	Total Tons per Season	
Thick. of Wall	23 inches	Heating Tons per Season	453
Thick. of Glass	Single	Daily Avg. sq. ft. per lb. coal	15.58
		Daily Avg. cu. ft. per lb. coal	202.25

Remarks:—
Glass area exposed unusually large.

Date 4-5-13 Subject HEATING Page 2-B

Form Used for Tabulating Heating Specifications.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Maladjustment of Motors.

It sometimes seems as though better co-operation might be obtainable between electrical manufacturers and manufacturers of machines to which motors are applied, to insure correct adjustment of the electrical equipment when it finally arrives at the customer's plant. A recent case in question illustrates the point and is typical of a number of cases of varying nature which have arisen within the writer's experience.

An interpole motor was purchased for individual drive of a certain machine tool. The motor was shipped by the maker directly to the machine-tool manufacturer to be mounted upon the tool, the whole unit to be delivered thence to the purchaser. Mounting of the motor involved changing from floor mounting to side suspension. The change was made at the machine-tool plant by simply throwing the bearing flanges 90 degrees. This reversed the armature without reversing the interpole, hence the rotation was reversed and the relative interpole direction was incorrect. This fact was noted and corrected by the purchaser.

But another trouble arose. The motor was of the type having the brush studs rigidly connected to the bearing flanges, brush shift being secured by throwing the entire commutator and flange. At the machine-tool factory the flange had been rotated approximately 90 degrees; near enough so as to bring the oil wells on the bottom side, but far enough from the exact amount to cause the brushes to be considerably off neutral. After the interpole connection had been reversed to avoid the excessive sparking, the motor showed a tendency to race when run under a light field at high speed. Further tests located the off-neutral position of the brushes. This fault being corrected, the motor operated excellently.

In this particular case no great injury was done through the incorrect adjustment of the motor upon its arrival at the customer's plant. But, under less favorable circumstances, or had the tool gone to a small user not versed in the ways of motors, considerable trouble might have ensued and no little expense might have been involved, with injury, perhaps, to the motor manufacturer not wholly warranted.

Would it not be well if the tool makers had the fact well impressed upon them that motors should not be tampered with except under the direction of a certain authorized employee to whom should be explained the necessary procedure and to whom should be furnished simple printed instructions covering the points involved?

Gordon Fox.

Use of Lead Plugs When Expansion Bolts Are Not Available.

In many cases in securing conduit, cutout cabinets and various other electrical appliances, to brick, stone and concrete walls, where expansion bolts are not available to secure same, it is customary to use wooden plugs driven into the holes that are drilled and then put wood screws into the plugs. These do not give a very good support, as in time the wood dries out and the plugs work loose.

When expansion bolts are not at hand, I find that a good and satisfactory support can be had by using a piece of sheet lead or wire solder, which should be well packed and hammered into the hole, completely filling same, and thus make a good, tight fit; a nail or center punch can be used for making a hole in the center of the lead, to take whatever size wood screw is desired.

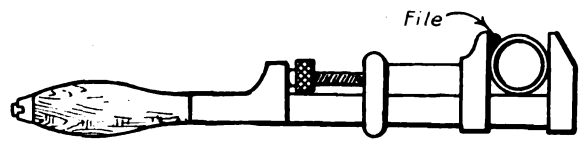
Where better support is desirable, a larger hole should be drilled and a carriage bolt or stove bolt with washer can be used, the head of same to be placed in hole, leaving the threaded end with the nut projecting from the hole. Sheet lead should be packed securely around the bolt with hammer and chisel.

Both these schemes have been in successful use, but a great many wiremen still use the unreliable wood plugs.

Otto Weber.

Improvised Pipe Wrench.

Several times when a pipe or Stillson wrench was not convenient, but a monkey wrench was on hand, I have



An Improvised Pipe Wrench.

made use of the following expedient, which I believe many wiremen are not familiar with.

Draw the jaws of the monkey wrench to size of pipe, rod, bar or fitting, then put a short piece of round file between material to be turned and lower jaw; see diagram of the wrench. The file will roll and grip between the jaw and work, taking the place of a regular pipe wrench.

This arrangement will take more time than using the proper tool, but it is certainly worth knowing in a pinch.

Robert Oster.

Wiring Data for Direct and Alternating-Current Motors.

The third edition of a book with the foregoing title has just been published by the Underwriters' Equitable Rating Bureau, Portland, Ore. It has been compiled by F. D. Weber, electrical inspector of this bureau, and the present, or 1916, edition has been fully brought up to date. Included in the booklet are many valuable hints, tables and formulas useful in installing direct-current and alternating-current motors of various types. Among other features are specifications for the installation of several types of motors. Aside from the numerous wiring data and tables for various types of induction and other motors, there are also tables on stranded copper conductors, copper busbars, etc.

Copies of this booklet, which contains 32 pages, can be obtained from the Underwriters' Equitable Rating Bureau, Lumbermen's Building, Portland, Oregon, for 20 cents each.

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Chicago Electrical Rules Revised.

In accordance with its custom of revising every two years the rules and regulations covering the installation of all electrical wires and apparatus in the city of Chicago, the municipal department of gas and electricity has just issued the 1916 edition of the Chicago Electrical Code. As usual, the Chicago Code follows quite closely the National Electrical Code, even as to the numbering of the various rules and sections thereof. However, in many cases its requirements call for a higher standard of construction than is specified in the National Code, whereas, in a few cases the requirements are somewhat more liberal than those of the National Code. Since the Chicago rules are a guide to many cities, the chief changes therein are briefly summarized in the following:

Rules 1*c* and 8*a*.—Generator and Motor Frames.—New rules require the base frames to be permanently grounded. The former rule required the frames insulated.

8*c*.—Small Motors.—Vacuum-cleaner motors of three horsepower or less, in residence and apartment buildings, may be connected to lighting mains of No. 6 B. & S. gauge or over.

8*d*.—Autostarters.—The casings of autostarters must be grounded.

11*b*.—Instrument Transformers.—Cases of instrument transformers must be grounded, unless they are properly guarded.

12*c* and 12*f*.—Overhead Services.—Additional specifications for overhead service connections.

12*i* to 12*m*.—Underground Services.—A junction box must be placed over the service stub, and wires from the stub to the service switch must be run in conduit.

14*a*.—Transformers.—Must not be attached to walls of buildings, but must be mounted on poles or placed in standard vaults.

15*a*.—Grounding Low-Potential Circuits.—Neutral wires must be effectively grounded.

18*a*.—Carrying Capacity of Wires.—Additional rule at end of table limiting wires in parallel to 500,000 circular mils or over.

19*a*.—Switches and Automatic Cutouts.—Location of trip coils specified for two and three-phase circuits.

19*c*.—Switches.—Requires that switches and cutouts located in wet places, or outside of buildings, must be mounted in weatherproof cutout boxes.

23*a*.—Cutouts.—Service switches may be so connected that current comes to switch first. That is, the fuse does not have to protect the switch. When the switch is connected in this way it must be so arranged that the blades are dead when the switch is open.

23*b*.—Neutral Fuses.—The fuse must be omitted in the neutral wire, except in two-wire mains or branches.

23*d*.—Branch Circuits.—New rule requires sufficient circuits to provide one circuit for every 880 square feet, or fraction thereof, of floor space. The method of determining sizes of mains and service is explained. Previous rule required a circuit for every 660 square feet of floor space; new rule decreases this to 0.75 watt per square foot.

23*e*.—Cutouts.—Additional rule on paralleling of fuses.

24*b*.—Knife Switches.—Requires that knife switches be inclosed in dust-tight cabinets.

24*c*.—Switches.—Additional rule forbids use of single-pole switches on circuits located in wet places.

24*d*.—Floor Outlets.—Change in rule allows ordinary outlet box to be used for floor outlets in varnished, waxed or carpeted floors on wood joists, and requires the cutout box to be equipped with a cover which leaves no opening when attachment plug is removed.

26*c*.—Wires.—Rule requires all exposed work to be installed in conduit, armored cable or metal molding.

26*l*.—Metal Molding.—Additional rule allows four wires in metal molding.

26*n*.—Wires.—Allows use of single-braid wire not larger than No. 6 B. & S. gauge in conduit.

26*p*.—Wires in Conduit.—Change in rule allows installation of 12 wires in a single conduit, in place of 10, as previously specified, without special permission; latter must be obtained for installation of more than 12 wires in single conduit.

27*b*.—Armored Cable.—Change in rule requires exposed armored cable to be protected by iron pipe where it passes through any floor.

27*c*.—Armored-Cable Grounds.—Addition to rule allows armored cable to be grounded to cold-water pipes only, and requires protection for ground wire.

28*d*.—Conduit Outlet Boxes.—Addition to rule requires support of outlet boxes.

28*f*.—Conduit Grounds.—Addition to rule allows conduit to be grounded to cold-water pipes only, and requires ground wire to be run in conduit for protection, except that where the largest wire in the conduit system does not exceed No. 0 B. & S. gauge; the conduit may be used to serve as the ground wire.

28*k*.—Size of Conduit.—New rules specify the sizes of conduit for the different sizes of wire.

29*d*.—Metal-Molding Grounds.—Addition to rule allows metal molding to be grounded to cold-water pipes only, and requires ground wire to be protected.

30*a*.—Fixtures.—Special attention is called to approved methods of supporting fixtures.

31*d*.—Socket Bushings.—Sockets for drop cords must have an inlet of three-eighth-inch pipe size. This rule becomes effective April 15, 1916.

35.—Gas-Filled Lamps.—New rules covering the installation of gas-filled incandescent lamps.

38*c*.—Theater Switchboards.—Must be of the dead-front type.

38*v*.—Special Motion-Picture Machines for Slow-Burning Films.—Must be of approved type and installed in accordance with an ordinance passed by the City Council, January 24, 1916.

38*Ad*.—Schools.—Wiring for class-room lights must be kept independent of wiring for assembly-hall lights.

38*C*.—Garages.—Additions and changes made in rules covering garages. In private garages a portable lamp must be installed before certificate is issued.

39*A*.—Festoon Lighting.—New rules covering the wiring of temporary and permanent festoons.

45*b* to *d*.—Transformer Vaults.—New rules give specifications for transformer vaults.

50*c*.—Single-Braid Wire.—Permits use of single-braid wire, in sizes from Nos. 14 to 8, inclusive, in conduit.

68*f*.—Fuses.—Classification of fuses from 0 to 30 amperes changed to allow the use of plug fuses on all 220-volt circuits on three-wire system with grounded neutral.

70*a*.—Cutout Cabinets.—If there are more than four circuits the cabinet must have a gutter at the side or a wiring space back of the cutout blocks, unless the circuits leave the cabinet directly opposite their terminal connections. This rule becomes effective May 15, 1916.

77*a*.—Fixtures—Outdoor fixtures or others exposed to moisture must be constructed so that water cannot enter wireways, sockets or other electrical parts.

81*g* to *i*.—Toy Transformers.—Additional rules giving specifications for toy transformers.

The new edition of the rules also contains as a supplement specifications covering the installation and wiring of fire-pump motors. Also numerous sketches showing location of meter fittings and size of meter board required in such installations. Ordinances relating to electrical work, inspection and licenses are also included.

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Direct-Method Job Cost for Contractors

By George W. Hill

In this article, which is the fifth of the present series by Mr. Hill, the importance to the contractor of an accurate and yet simple accounting system is pointed out in order that he may set an intelligent selling price for the work he undertakes to execute. A very simple job-cost system is described and illustrated. Other articles by Mr. Hill on accounting methods will follow in subsequent issues.

The income-tax law, which is already in force, and other laws of a similar nature which will no doubt be enacted have made it necessary to keep a much more comprehensive system of accounts than the very simple forms which have done service for a large majority of mechanical contractors.

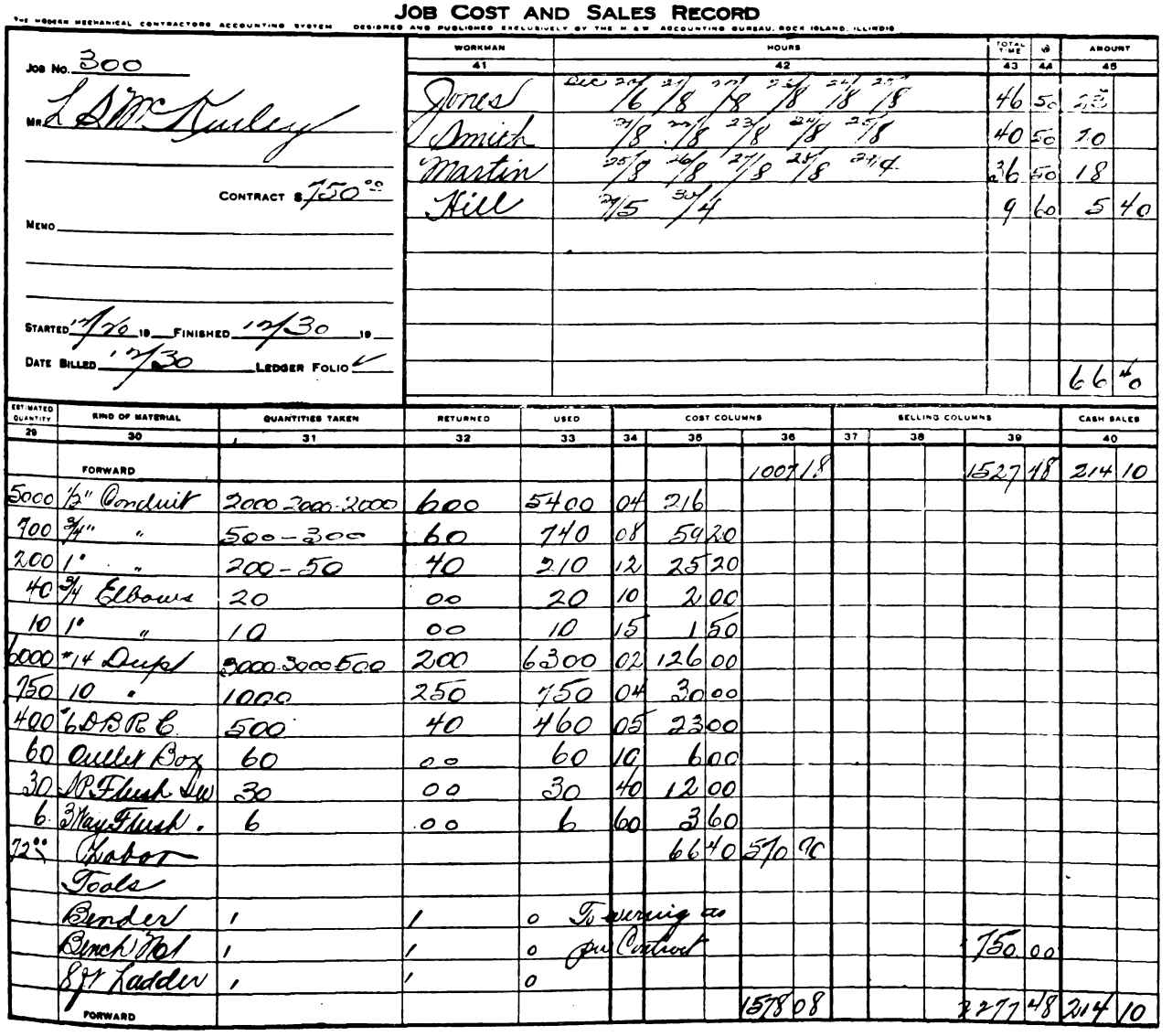
In addition to this the banks are becoming more strict in regard to statements required from their patrons, and jobbers and manufacturers are declining to extend credit, without satisfactory evidence of the strength and business methods of their customers.

The successful business man of the future must keep in close touch with his business affairs, in order to keep his business properly balanced, and to meet these needs several different designs of job-cost records have been produced, but the writer believes the form represented in the accompanying cut is the most simple, comprehensive and direct method he has ever seen.

Need for Accurate Accounting by Contractors.

Too many contractors are satisfied to know that they have secured the job, and the very fact that they have received it in competition with others who are conducting their business in a more or less haphazard manner causes them actually to fear to know the results of this particular job. My admonition to this misled and misguided brother is to grab your business by the ears at least once each month and look it fearlessly in the face. Be brave. Don't be afraid to know the truth about the results of your business as a whole or in part. It may require some courage, I admit, but it's the only sure way to success. If you have not a comprehensive accounting system in your business from which you can produce a financial statement readily, you are at sea, and you should use care not to permit your creditors to find this out.

An accounting system is to the contractor what the com-



JOB COST AND SALES RECORD

THE MODERN MECHANICAL CONTRACTORS ACCOUNTING SYSTEM DESIGNED AND PUBLISHED EXCLUSIVELY BY THE H & W ACCOUNTING BUREAU, ROCK ISLAND, ILLINOIS

Job No. 300

Mr. L. A. McKinley

Contract $750.00

Memo

Started 12/20 19__ Finished 12/30 19__

Date Billed 12/30 Ledger Folio ✓

Workman 41	Hours 42	Total Time 43	@ 44	Amount 45	
Jones	Dec 20/16 21/8 22/8 23/8 24/8 27/8	46	50	23	
Smith	21/8 22/8 23/8 24/8 25/8	40	50	20	
Martin	25/8 26/8 27/8 28/8 29/4	36	50	18	
Hill	27/5 30/4	9	60	5	40
				66	40

Estimated Quantity 29	Kind of Material 30	Quantities Taken 31	Returned 32	Used 33	Cost Columns 34	35	36	Selling Columns 37	38	39	Cash Sales 40
	Forward						1007 18			1527 48	214 10
5000	½" Conduit	2000-2000-2000	600	5400	04	216					
900	¾" "	500-300	60	740	08	59	20				
200	1" "	200-50	40	210	12	25	20				
40	¾ Elbows	20	00	20	10	2	00				
10	1" "	10	00	10	15	1	50				
6000	#14 Duplex	3000-3000-500	200	6300	02	126	00				
750	10 "	1000	250	750	04	30	00				
400	6 D B R C	500	40	460	05	23	00				
60	Outlet Box	60	00	60	10	6	00				
30	N P Flush Sw	30	00	30	40	12	00				
6	3 Way Flush	6	00	6	60	3	60				
72%	Labor					66	40	570 96			
	Tools										
	Bender	1	1	0	To earning						
	Bench Vise	1	1	0	per Contract					750 00	
	8 ft Ladder	1	1	0							
	Forward						1578 08			2277 48	214 10

Job Cost and Sales Record for Contractors.

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pass is to the sea captain. It guides his course, and if you haven't a system with which to guide your course you are in as much danger of going on the rocks as is the sea captain.

I find the most successful men in the contracting business are those who know their costs and who are able, from their records, to tell me their percentages of profit or loss on any certain-sized job.

The fallacious policy of conducting business in a haphazard manner has become so prevalent in this country that it has attracted the attention of our Federal Trade Commission, and on July 10 last there appeared an article in the Chicago *Herald*, by E. N. Hurley, vice-chairman of the Commission, which advocated strongly governmental aid (not interference) to the small business men in the way of providing them with some simple yet comprehensive accounting system.

Intelligent Selling Price.

Mr. Hurley said: "Teach them to know their costs, that they may intelligently set a selling price." Why does he say this? Simply for the reason that it has been discovered that the smaller business men, yes, some of the larger ones also, are not setting an intelligent price.

I take it that an intelligent selling price would be one which would carry with it a reasonable profit. Anything sold at a profit must be sold at a price in excess of all costs. The writer desires to relate an occurance while he was traveling in the South, which might interest many in this connection:

I called upon one of the larger contractors in a thriving city many miles below the Mason and Dixon line. After the usual salutation this contractor brought up the question of overhead by asking me what I thought was the average overhead per cent of the contractors of the country. I told him that I believed the average overhead was about 40 per cent. He replied that he was surely under the wire all right, as his overhead was only 17 per cent. I then asked him how much he was adding for profit. He replied: "Twenty per cent." I said to him: "Look here, you are either doing a much larger business than I think you are, or your overhead is more than 17 per cent, for I can see that much overhead standing around here looking at us and wondering who that pale-faced Yankee is and what he is doing down here." He insisted that he was right. I then asked him how much gross business he was doing. He told me. I then figured his profit based on the percentage he had given for profit, and his profit should have been something like $6,000. I said to him: "Now, Mr. ———, if your figures are correct, you have something like $6,000 more this year than you had last, either in the bank, in property, or in some available asset. Where is it?" He stammered some, and replied that he was not quite sure where it was. I finally made him a proposition that I would remain in his city a couple of days and run over his last year's books roughly with him, and see if we could not find that $6,000. We took the books into a private room that afternoon and began our investigation. On the second evening we finished a rough draft or abstract of the situation; it developed that his overhead was, roughly speaking, 30 per cent. No wonder he could not find his $6,000. He had given it away to his customers. It is admitted, however, that perhaps if he had set an intelligent selling price he would not have done so much business in competition with others who were conducting their business along similar lines, or perhaps, worse, but he was expending energy for nothing. He could have just as well taken life easy and probably had as much, if not more, and been much better satisfied with the result.

Job-Cost System.

The job-cost system in question consists of a spring-back binder for work in progress, a cost binder for completed business and the blank forms. The blanks combine the principle of direct-cost accounting (which is the most accurate method of obtaining costs) with a sales record and show at a glance:

First. The amount of labor and material which has been charged to a job.

Second. The amount of labor and material due on a job, according to the estimate.

Third. The gross profits accruing when the job is completed.

How to Handle a Contract.

The first step toward securing a contract is a proposal to the owner or agent to do a certain thing for a certain amount of money or consideration. This sum of money represents the cost of the various materials which will be required, the cost of the labor necessary to install this material, the overhead or general operating expenses, and the profit. The summary of these items is called the estimate, a description of which was published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN under date of January 29, 1916.

We will assume that the proposal has been made and accepted and the contract awarded. The job should now be given a number and started through on the job-cost sheets. See illustration herewith.

Enter the number of the job, the name of the owner, and location of the building. The contract price may also be entered, if desirable. Enter in column 29 the quantity and in column 30 the kind of material required according to the estimate sheet. As the charge slips covering the material sent on the job are received in the office, the amount or quantities are entered in column 31 on the same line with the estimated quantities. If more of the same kind of material is sent later enter as before, in column 31, with a short dash between the quantities, thus: 2,000—2,000—2,000 feet. This shows that a total of 6,000 feet has been taken to date. If during the progress, or at the completion of the job, material should be returned, enter the amount so returned in column 32 on the same line as the charge. If 600 feet was returned from the job and entered in column 32 and 6,000 feet had been charged out, as shown in column 31, it will be readily seen that 5,400 feet has been used, which amount should be placed in column 33. If the cost of this item was four cents per foot, this $0.04 would be entered in column 34. The cost of 5,400 feet at four cents per foot would be $216, and should be placed in column 35. Each item should be treated in the same manner. The labor is taken into account at the top of the sheet. Enter the name of the workman in column 41. Enter date and hours worked in column 42. Thus: Jones—December 20/6, 21/8, 22/8, 23/8, 24/8, 25/8, making 46 hours. Enter the total hours, which would be 46 in column 43, and the rate per hour in column 44. If the rate was 50 cents per hour the amount would be $23, which would be placed in column 45. The footing of column 45 represents the cost of labor on the job. When the job is completed the word "Labor" should be written in column 30, and the amount, as shown by column 45, is entered in column 35. This column is then footed up, and the amount placed in column 36, which shows the total cost of material and labor ($570.90) used on the job.

All transactions, where labor or material or both are sold, whether contract, time-and-material or cash sales, are treated exactly alike up to this point. To obtain the selling price on time-and-material work enter the unit selling price (or price for each) in column 37, the prices for the quanity used in column 38, and the footing of column 38 in column 39.

You are now ready to make the invoice. As soon as the job or charge is completed, an invoice should be made and mailed to your customer. The amount to be billed is shown

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in column 33, the kind of material in column 30, the unit price in column 37, the amount of each item in column 38, and the total amount of the charge in column 39. If the job is a contract the price is entered in column 39, leaving columns 37 and 38 blank.

The sheets should then be transferred to the post binder, paged, and the charge posted. In the event of cash sales enter the items exactly as in the time-and-material job, and treat in the same manner, except that the footing of column 38 is placed in column 40, leaving column 39 blank.

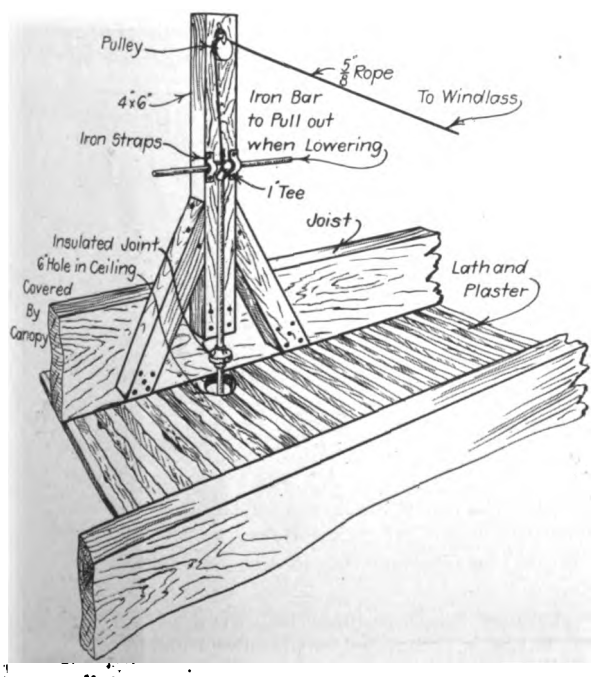
A job-cost system very similar to this has been in use in the office of the Electric Construction & Machinery Company, Rock Island, Ill., for nearly 15 years, and has proved to be a valuable record. You will notice that the difference between columns 36 and 39 or 40 shows at a glance the gross profit. This sheet is a very complete history of the job from beginning to end, and instantly shows the result desired, what has been the gross profit or loss; from this can be readily determined whether the gross profit is sufficient to cover overhead and a reasonable net profit. It affords an opportunity of checking the estimator on every particular item entering into the job; comparing column 33 with column 29 produces the evidence at once.

The Electrical Review and Western Electrician will be pleased to furnish full-sized samples of the system, as descriped, with the exception of the binders.

It is the intention of the writer to follow this article with others on accounting methods, and to furnish cuts of blanks carrying the entire accounting to a final conclusion, showing the use of the multi-column journal, an especially designed ledger, and a most simple yet comprehensive profit-and-loss statement and financial statement. The following article will cover a unit-cost time-card system and pay-roll blanks.

Method of Suspending Heavy Electroliers for a Church.

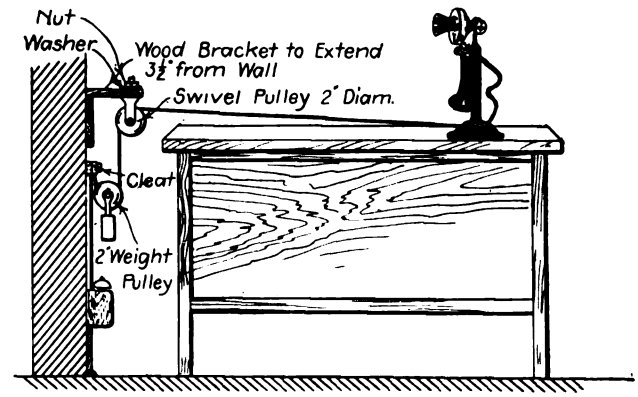
In a recent job of wiring a large church I had a problem of arranging a mounting for some heavy electroliers in such a way as to permit lowering the fixtures for lamp renewal and cleaning. The fixtures were installed so high as to make it impracticable to reach them by a ladder. The method of mounting the fixture is shown in the accompanying diagram, which is practically self-explanatory. When the fixture is to be lowered, it is disconnected from its supply wires through convenient insulated couplings and the iron bar which passes through the top of the fixture stem is pulled out. The fixture then can be lowered by means of the windlass and pulley arrangement. It is to be noted that ordinarily the weight of the fixture is not supported by the rope and pulleys. This prevents subjecting the rope to continual strain, which would not be very safe. The supply wires are not shown in the diagram for the sake of simplicity. J. B. Story.



Method of Suspending Heavy Electroliers.

To Take Up Slack in Telephone Cords.

We have had quite a little trouble in our office from telephone cords getting tangled up by themselves and mixed among drawings and papers on a flat-top desk or table. We have two telephones, a Bell instrument and an automatic, that are kept side by side for convenience. I arranged the simple scheme shown in the drawing to remedy this trouble. Only one telephone is shown for the sake of simplicity. We actually have two sets of pulleys and two weights side by side to take up the slack in each telephone cord independently. The cords are never tangled now. F. C. Petersen.



Method for Taking Up Slack in a Telephone Cord.

How to Find Conduit for Combination of Wire Sizes.

The four tables forming rule 28*i* of the National Electrical Code give the trade size of conduit to be used for various numbers of wires of any one size. They do not give the proper size of conduit, however, where a combination of wires of different size are to be used. This matter has been nicely solved by Washington Devereux, of Philadelphia, Pa., to whom we are indebted for the following.

In order to readily determine the proper size of conduit to be used for a combination of wire sizes, the table below may be used to advantage.

For example: What size of conduit is required for four No. 8 and three No. 10 B. & S. wires?

Answer: According to the National Electrical Code, four No. 8 wires require one-inch conduit, three No. 10 wires require three-fourths-inch conduit. Equivalent area of one-inch conduit as given below is 1. Equivalent area of three-fourths-inch conduit is 0.5. Adding these areas we have 1.5. The nearest size of conduit to equivalent area of 1.5 is one-and-one-quarter-inch conduit.

Conduit Sizes.	Equivalent Area.
½	0.25
¾	0.50
1	1.00
1¼	1.50
1½	2.25
2	4.00
2½	6.25
3	9.00

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Novel Advertising Scheme for the Electrical Dealer.

An electrical goods and novelty store in Southern California has devised a unique publicity plan for increasing trade and good will. By promoting the sale of postage stamps in its advertisements in local papers and capitalizing this universal product the shop has become known throughout the community and is making new friends and customers every day.

In connection with an advertising appropriation for the regular electrical specialties handled, arrangement is made for incorporating in each announcement, with panel border and attractive style, some little fact regarding the particular service along postal lines that the store is in position to render. Smaller individual announcements also are printed from time to time dealing specifically with the sale of postage stamps.

The message of "Postage Stamps for Sale," arranged as the important feature of the advertisement, is so novel and unusual that it catches the eye and arouses curiosity. It carries the idea of utmost service, convenience and satisfaction to the customer, not only in the furnishing of postage stamps but indirectly in the sale of the regular merchandise handled. This appreciative spirit cannot help but draw people into the store. Circulars and boosters issued at frequent intervals to set forth some special sale of electrical goods also give useful postal information and make a special point of the fact that postage stamps are available. These activities make to individualize the store and impress its advantages upon local consumers.

Through this original plan of promoting the sale of postage stamps, the shop is far out-distancing its former records for business. People are induced to enter who otherwise would hardly be likely to do so. After making any stamp purchases at a special postal desk arranged for the purpose, they are permitted to look around without interference, and many an order is received for stock merchandise.

This store has had the enterprise to see the substantial trade and good-will to be derived through building upon a spirit of added convenience to customers and possible customers. Realizing the frequent difficulty and inconvenience met with in obtaining postage stamps, it has capitalized this general commodity in a way to bring unusual interest in its establishment, with direct results in increased sales in electrical goods.

An Attractive Window Display for Washington's Birthday—Preparedness is Emphasized.

MONTHLY COMPETITION RESULTS IN EFFICIENT AND TIMELY WINDOW DISPLAYS.

By H. Thurston Owens.

The Westchester Lighting Company, of Mount Vernon, N. Y., operates in six districts, those of Mount Vernon, New Rochelle, Port Chester, White Plains, Tarrytown and Yonkers. In each of these cities the company maintains a show room for the sale of electrical appliances, and has succeeded in keeping up a keen interest in window displays by means of monthly competitions.

The "Lincoln" and "Washington" window displays illustrated, while attractive in their arrangements and ideas presented, have a note of timeliness that makes a positive appeal. One of the signs in the "Washington's Birthday" window read: "Washington at Valley Forge was getting prepared for his spring campaign against the British." The other sign read: "We are now prepared to help you in your spring campaign against hard work. 'Do it electrically.'" Thus a note of preparedness was combined with that of timeliness.

In the "Lincoln Birthday" window was shown an axe, the means used by the "rail-splitter" in doing the work. In the same window the work was shown as being done in the modern way by an electric motor. Thus, with timeliness was combined motion. The latter element can be made most effective, and usually can be applied directly to the apparatus or commodity for sale, as instanced in this window display.

E. S. Bellows, the treasurer of the company, is highly gratified with the results obtained to date and is giving the men in the commercial department every assistance to make these displays the success they evidence.

Lincoln's Birthday Window which Combines Timeliness with Motion.

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A METHOD OF SIMPLIFYING COLLECTION RECORDS FOR THE MERCHANDISER.

By W. B. Parker.

This is the third of a series of four articles on the subject of collection and credit efficiency. The first two, which appeared in recent issues, indicated a practical and inexpensive method of taking care of slow accounts by mail, and the diplomacy necessary in handling the various classes of slow debtors. This article will deal with a different, but fully as important, part of the work of the collection department—the keeping of all collection records in such simple yet systematic form as will make for regular and prompt attention to the slow accounts with the least effort on the part of this department.

It is so undoubtedly true that many slow accounts are actually lost through inattention, due in large part to cumbersome records, that it is not necessary to dwell on this fact. The experience of every collection manager will verify this, but, while some have profited by the knowledge, many have felt that a thoroughly efficient system was too expensive for them to adopt, both in first cost and the expense of upkeep. This belief, however, is far from the fact. It is the lack of such a system that is truly expensive. Even an energetic collection manager is apt to neglect giving his slow accounts the proper attention if it is necessary to go through the ledger to ascertain the exact status of each one. Even in a small business memory is a very uncertain substitute for handy records. The proper attention to slow accounts is the only means of clearing them up, and Mr. Debtor will be quick to note that his account is being watched closely if every promise to pay is followed up at the right time.

If Mr. Debtor's account is overdue this should automatically come to the attention of the manager at brief and regular periods. Also if Mr. Debtor promises a payment at a certain date the promise should also be remembered at the right time. Experience has proved that no ledger system, either old style, loose leaf or card, will produce these results except at a time-cost so great that few men can spare it. The right method is to keep a separate card record of all accounts that are past due, and to keep this record partially in duplicate. That is, there should be an alphabetical card record, giving all the ledger data as well as notations of promises to pay in the future, and there should also be a chronological card record which will call the attention of the collection manager to each of these accounts at the right time.

At first thought it might seem that such a system would be still more cumbersome as well as too expensive, but this idea is based on the supposed necessity of installing regular card filing cases, ordering specially printed cards, and overlooking the slight amount of time actually required to keep up such a record, as well as the time saved in having the data wanted in handy form to get at. While a regular filing equipment, including specially printed and ruled cards, is a fine thing to have, yet it is quite possible to get the same results with a couple of cigar boxes and cards cut from old stock that can be found at any printer's. It is thus possible for the smallest business to make use of the most efficient business methods without the usual cost.

The important point is to have the method of keeping the records as nearly automatic as possible. When the monthly statements are made out each overdue account should be entered on the duplicate card system mentioned. The accompanying form of entry will be found very convenient.

This card shows at a glance a past due balance of $251.10, and a promise to pay February 20. It is a handy record to refer to in case more credit is requested before settlement is made and no printed card or special ruling is required in order to carry out the idea.

At the same time this card is made out another one should be filed in the chronological file to come up February 20 with simply the name of the debtor on it, so that attention will be called to this account at exactly the right time. In the case of past-due accounts, where no promises have been made, the card should come up weekly until some definite arrangement has been secured. Where a filing clerk is employed it should be his duty to bring these cards to the collection manager daily, with the morning mail.

In the absence of a regular filing clerk it should be made a matter of the first importance for the collection manager himself to take up the cards daily as well as to attend personally to the making of the proper notations and the proper filing. The time required is so little that it is merely a question of getting into the habit. There is another way of handling that some managers prefer when taking personal charge of the collection files, and this is what is known as the signal system. Various colored clips are utilized, each color representing a different day in the week. Where this system is used a chronological file is not required as the clips are placed on the cards in the alphabetical file with a different colored clip to indicate

Mr. Slow Pay,
Chicago, Ill.

Charges				Payments		
1/1/16	160	80	2/5 Promised balance 2/20	1/5/16	100	00
1/7/16	240	30		1/15/16	50	00

Suggestion for Duplicate Card System for Entering Names of Customers Whose Accounts are Overdue.

the particular week in the month that the day clip refers to. This method does not appeal to the writer as being as simple and effective as the chronological file, but it is certainly better than making no effort at all to bring accounts up for attention at the proper date.

In one large business house, where the writer was at one time employed, the method of making the proper notations on the cards and keeping them up to date was as follows: When the mail came in it was opened by the office boy at a table next to the bookkeeper's desk. Any mail containing remittances was handed to the bookkeeper, who made the proper entry in the ledger and then sent the letters on to the credit man, who could then make the proper entries on his alphabetical card files, answer any part of the letter that pertained to his department, and pass them on to the sales manager. The mail not containing remittances followed the same route, except that it did not require the attention of the bookkeeper.

In this connection there is another point worth at least passing attention, and that is that one of two rules should be made and rigidly adhered to. Either only the collection manager and filing clerk should be allowed access to the cards at all, or, if others are allowed to look them over, they should not be allowed to take them out of the box. Many persons, especially the younger clerks, are often careless as to the proper return of filing cards to the files, and carelessness of this kind is liable at any time to prove exceedingly costly.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Fittings for Use in Installations of Concentric Wire.

On account of the agitation in favor of concentric wiring which has been going on for over a year, special interest attaches to the line of fittings which has recently been developed for use with concentric wire. This type of wire and also the special fittings for it are being manufactured by the General Electric Company, Schenectady, N. Y.

The movement in favor of concentric wiring has exploited this system almost exclusively for use in small houses whose owners probably cannot afford to put in the standard systems of wiring now in use on account of their relatively high cost. Therefore, the concentric system is expected to be installed almost entirely as a surface wiring system and all of the fittings for it described in this article are based on the use of the wire on wall and ceiling surfaces, which will permit of installation without disturbing wall decorations to any great extent. The way in which such an installation can be made is shown in the large accompanying diagram, Fig. 1. This shows not only the general system followed in running from outlet to outlet, but also the actual fittings, and their corresponding catalog numbers, best suited for each particular place.

The bare concentric wire, a sample of which is shown in Fig. 2 with a portion of its outer sheath pulled up, is primarily an inner conductor, surrounded by a rubber insulation and braid, which is protected on the outside by

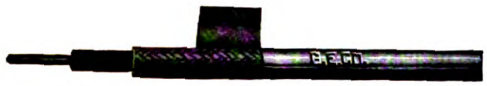

Fig. 2.—Sample of Concentric Wire.

a metal sheath that has a current-carrying capacity at least as large as that of the central wire. The diameter of the finished wire is 0.22 inch. The inner conductor is a No. 14 B. & S. single-braided, rubber-insulated, solid wire, which conforms as far as insulation is concerned to the National Electrical Code standard. The outer conductor, which also serves as a protecting sheath, is made of tinned sheet copper folded longitudinally around the wire with a full

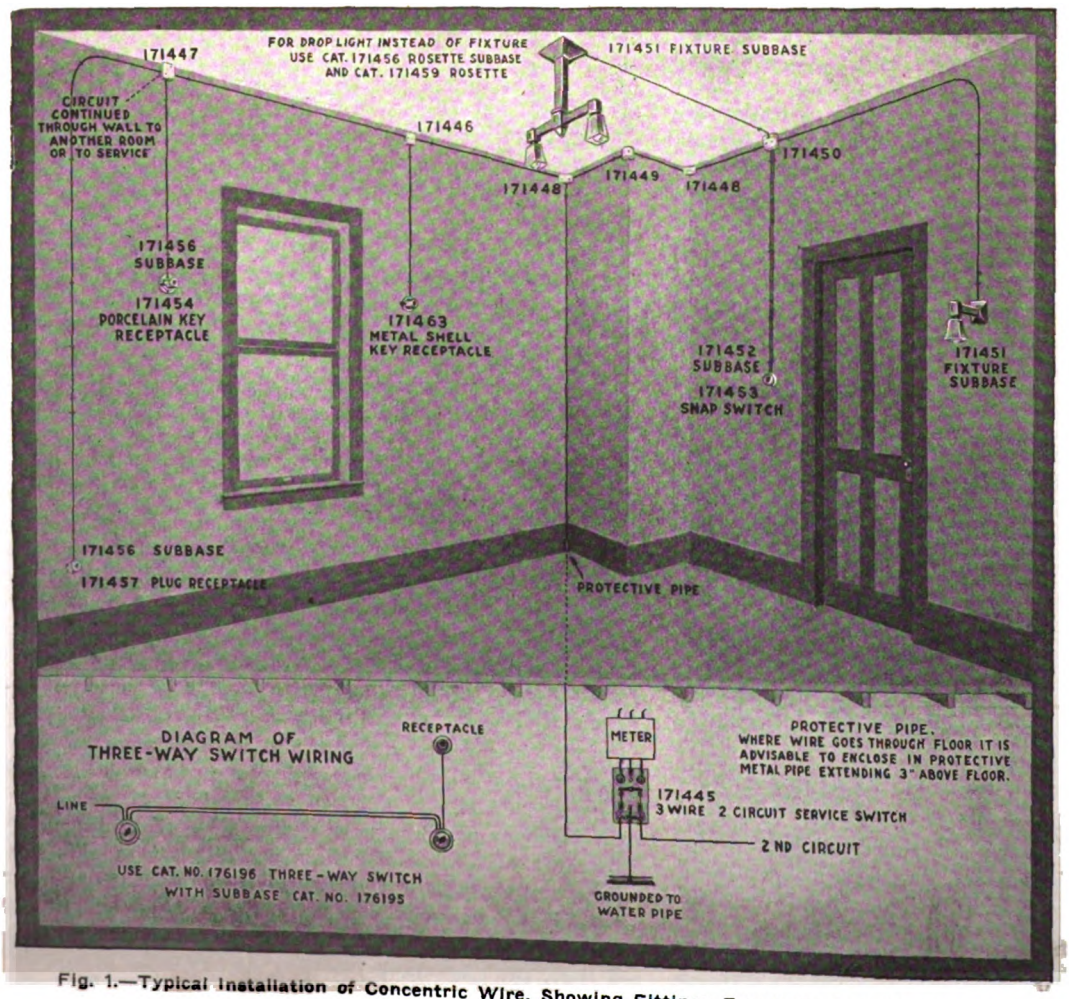

Fig. 1.—Typical Installation of Concentric Wire, Showing Fittings Especially Suitable Therefor.

Fig. 3.

Fig. 4.

Fig. 5.

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lap, giving double thickness throughout. The sheath is soldered where it overlaps so as to form a continuous water-tight and gas-tight jacket, having in itself a conductivity and carrying capacity larger than that of No. 12 B. & S. wire.

The fittings developed for use with this wire are intended

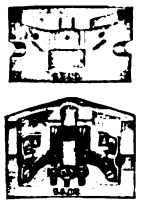

Fig. 6.

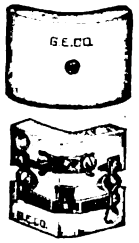

Fig. 7.

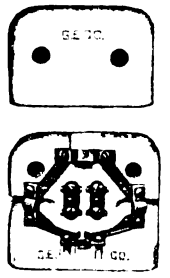

Fig. 8.

for use on single circuits or 660-watt branch circuits. All of the fittings are so arranged that joints between the wires and fittings can be quickly and well made by expert wiremen. The fittings are so designed that the grounded sheath is continuous throughout the system. The use of solder in making joints is considered inadvisable because of the possibility of injuring the rubber insulation of the inner wire. The outer sheath must be carefully grounded at the service switch and possibly at other points so as to insure that the whole system is thoroughly grounded.

A combined switch and plug cutout arranged as a two-circuit, three-wire device is shown in Fig. 3. As shown in the large view, this switch can be used as the service switch. The middle point is the ground, or neutral wire which is connected to the outer sheath. Edison plug fuses are used with this switch. Figs. 4 and 5 show three-way and four-way branch junction boxes. In these it will be

Fig. 12.

Fig. 13.

Fig. 14.

observed that a strap is provided in each outlet by means of which the outer sheaths of the wires are thoroughly connected together. Figs. 6 and 7 show corner junction boxes, of which the former is arranged for an inside corner and the latter for an outside corner. The covers of these devices have been removed so as to show their interior arrangement. The straps for connecting the sheaths and the connecting busbars are also clearly shown. A junction box for a snap-switch circuit is shown in Fig. 8.

Fig. 9 shows a supporting base on which can be connected either pendent or bracket lighting fixtures. Fig. 10 is a subbase for a snap switch, in this case the switch being of the single-pole type. A similar fitting is made for three-way snap switches. Fig. 11 shows a single-pole, five-ampere, indicating snap switch designed for 125 volts.

Fig. 12 is a subbase for lamp receptacles, wall receptacles and rosettes. A rosette is shown in Fig. 13.

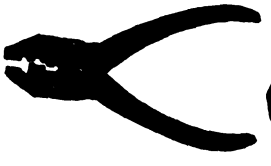

Fig. 19.

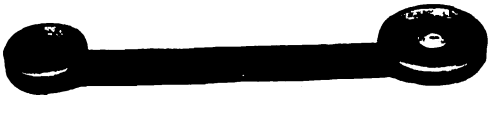

Fig. 20.

This is a porcelain device which in external appearance is identical whether the rosette is of the fused or fuseless type. A separable type of porcelain receptacle is shown in Fig. 14, on which is mounted a polarity cap. Fig. 15 shows a porcelain key receptacle; this is also made in the keyless type. A key receptacle with porcelain base and of the fluted-catch type is shown in Fig. 16; this device is also made in the keyless and pull types. A typical socket of the fluted-catch type is shown in Fig. 17; similar

Fig. 9.

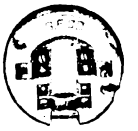

Fig. 10.

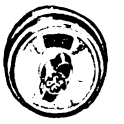

Fig. 11.

sockets are also made of the key and pull-chain type; all of these are provided with one-eighth inch caps.

For supporting the concentric wire, clamps of the type shown in Fig. 18 are used. It has been found that the use of a few special tools greatly facilitates the installation of this wire. Special pliers for cutting and stripping concentric wire have, therefore, been made (Fig. 19). A bending tool, shown in Fig. 20, facilitates and insures making proper bends in the wire.

Although the various fittings shown herewith are designed only for surface wiring, and surface switches and receptacles, a line of flush switches and flush plug receptacles is now being developed to make this system adaptable to semi-concealed use.

A number of installations of the concentric system using these devices have been made, but since this has not yet been approved and recognized in the National Electrical

Fig. 15.

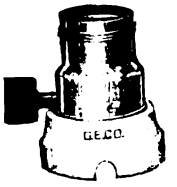

Fig. 16.

Fig. 17.

Fig. 18.

Code, such installations require a special permit from local insurance bureaus or municipal inspection departments.

Improved Construction for Duraduct Flexible Non-metallic Conduit.

An improved construction has been followed for some time in the manufacture of Duraduct flexible non-metallic conduit, and this improvement has been so successful that public announcement thereof has been made. The conduit tube is woven of natural warp-twist cotton yarns on tubular looms especially constructed for the purpose. This tube is treated with the best known waterproofing and fireproofing compounds, making the finished conduit thoroughly safe against the two destructive agencies of water and fire. Due to the construction of the body of the tube from the highest-grade cotton yarns, a structure is obtained which allows the insulating and protective compounds to thoroughly permeate the entire wall of the tube; the ordinary methods of making fiber conduit do not provide for such thorough penetration and consequently a mere surface protection is obtained. The finished con-

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duit is of superior quality than any rules or specifications laid down in the National Electrical Code or any other regulations require. By the new and improved construction, both the interwoven wall and the roller-bearing wireway, which have made this type of duct so favorably known in the past, have been retained.

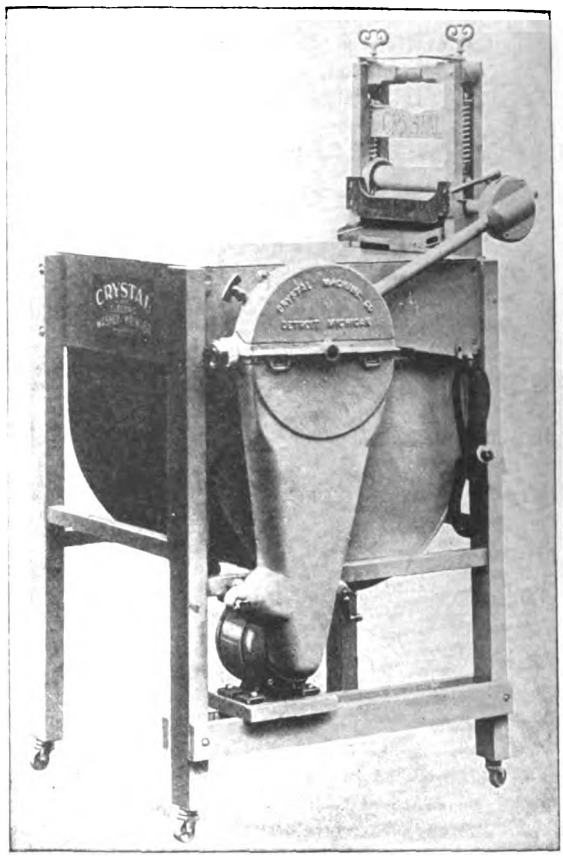
Duraduct is manufactured by the Tubular Woven Fabric Company, Pawtucket, R. I. It is sold exclusively by A. Hall Berry, 97 Warren Street, New York City.

The Crystal Dish-Washing and Clothes-Washing Machines.

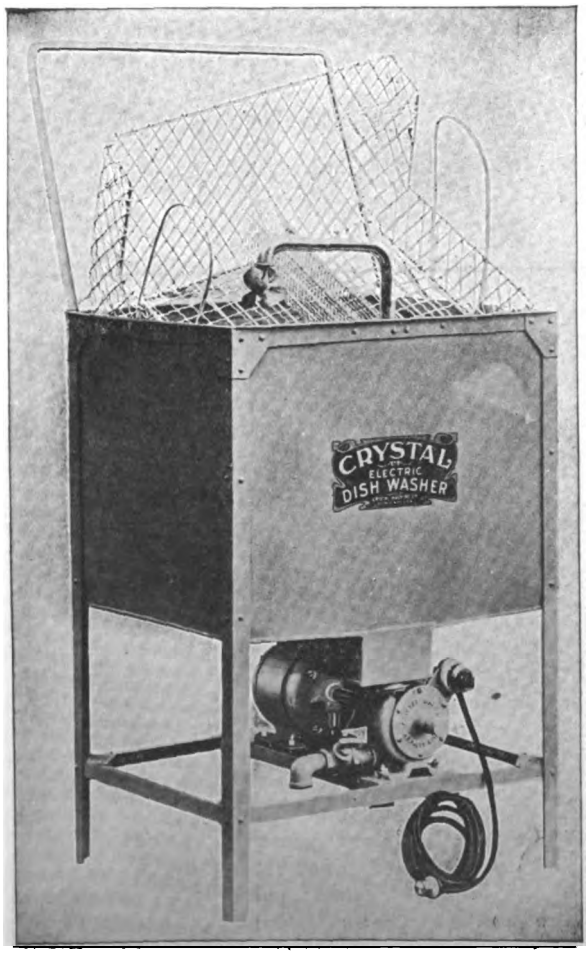
There are many tasks of drudgery about a woman's housework that are now eliminated by that ever-willing and untiring servant, the electric motor. The electric dish-washer and the electric clothes-washer and wringer, for example, are booms to the housewife. Two new types of these machines are illustrated herewith.

The simple, solidly constructed Crystal dish-washer is equipped with electric motor, pump, cord, plug and switch, and sewer connection. The dishes are placed in racks to hold the plates, cups, glasses, silverware, etc., and the water is forced through and over them by means of the pump. The dishes do not move and breakage is therefore impossible. After the first washing the dirty water is drawn out and hot, clean rinsing water is put in. This rinses, sterilizes and leaves the dishes so hot, that when the washer is opened the dishes are dry and all ready to be put away. The formerly disagreeable dish-washing is thus done without even wetting the hands and yet with a great saving in time and labor and great safety for the glass or china.

The Crystal clothes-washer, which is also manufactured by the Crystal Machine Company, of Detroit, Mich., has a different design from other washers of the cylinder type and is said to be particularly effective. The cylinder does not reverse but the clothes do reverse inside it, due to the unique construction of the cylinder. This elimination of the reversing feature allows a marked saving in maintenance. The clothes in the Crystal cylinder are raised out of the water and dropped back into it continuously, taking fresh suds, air and steam with them. This combines the tumbling process with the recognized advantages of the vacuum process and gives the Crystal machine a distinctive cleansing power. Every moving part in the mechanism of this washer is entirely inclosed, thus removing all danger of being caught in the mechanism in any way. The wringer can be swung down out of the way, leaving the machine with a flat top which can be used as a stand when the washer is not being used for washing.



Electric Clothes-Washing Machine.



Electric Dish-Washing Machine.

Both these Crystal machines are driven by Westinghouse splashproof motors which are fully protected against moisture and have ample ventilation to insure cool running. There are no exposed electrical contacts, so the motor, as well as all working parts about the machines, are protected.

Electric Foot Warmer for Traffic Policemen.

Pittsburgh's traffic policemen have gone through a rather severe winter with no frost-bitten toes. The officers who stand at the windy street corners regulating vehicle traffic have kept their feet warm. The secret is in the appliance known as the "Tootsietherm."

Early in the winter the City Council took up the subject of installing some device that would assure comfort to the policemen whose duties keep them at street intersections nine or ten hours every week day. Drew Johnston, of the Duquesne Light Company, was called into consultation as an expert and the result was a practical foot-warmer. Its success was immediate and several other cities have made inquiry concerning the Tootsietherm. It is quite probable this electric heater will be installed by the public safety departments in many of the larger cities of the country before another winter season comes.

The first idea discussed in the Pittsburgh Council was to

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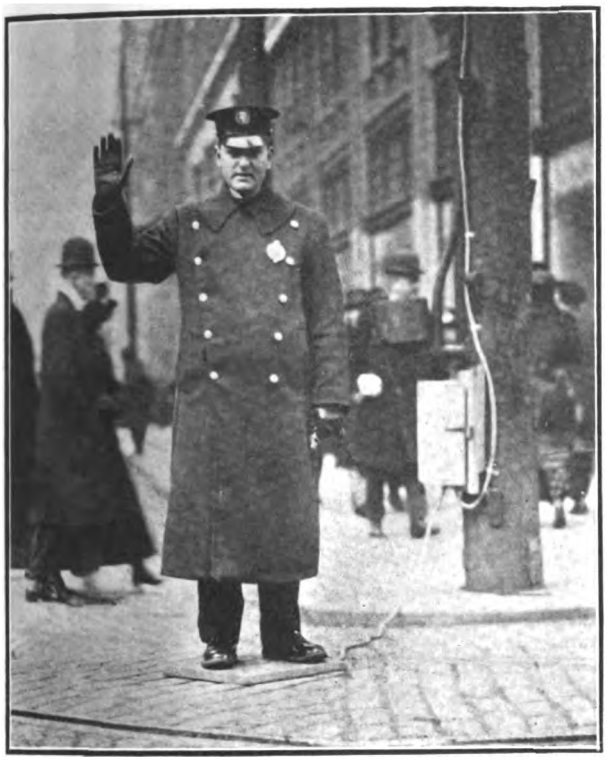

Photo from Pittsburgh Industrial Development Commission.
Electric Foot Warmer In Use on Busy Pittsburgh Corner.

have a stationary heater on the curb but this would have made it necessary for the policeman to leave his post and would, on severe days, be a constant temptation to neglect duty and favor cold feet. Another proposal was that the heater be placed firmly in the paving, but the cost of installation would have been prohibitive for experimental purposes. The final decision was for a warming plate 18.5 inches square and 1.5 inches thick. It resembles a griddle and is connected with an electric plug and switch on a pole at the curb. The intermediate connection is a flexible armored conduit about ten feet long. The cornerman, when he leaves his post or when the weather is not severe, carries his heater to the curb and pulls the plug from the socket.

Mr. Johnston, when he had completed his plans, took the matter up with the experimental department of the Westinghouse Electric & Manufacturing Company and the heaters were made by it. The company is receiving inquiries, especially from cities in the northern part of the United States and from corporations that have employees at fixed outside stations.

The switch controlling the heater permits of four temperatures, which can be changed to meet the rigors of the weather. At no time does the foot plate develop a temperature that will burn the soles of the shoes. The idea is not so much to warm cold feet as to keep the feet from getting cold. For all ordinary weather conditions the heater can be operated on less current than is required for two ordinary 40-watt lamps, such as are used in residence illumination.

The accompanying photograph shows Policeman C. L. Dye, of the Pittsburgh traffic squad, at his station, Sixth Avenue and Smithfield Street. This is one of the most congested street intersections in the country.

Dumore Electric Cloth Cutter for Tailors and Dressmakers.

One of the largest elements in the tailoring cost of a suit of clothes, overcoat or other garment is in the cutting of the goods; the cutters are high-priced men who are experts in laying out and cutting the cloth to the best advantage. This is true of clothing manufacturers and dressmakers as well as of custom tailors. Therefore anything that facilitates the work of the cutter is in the line of efficiency and reduced production

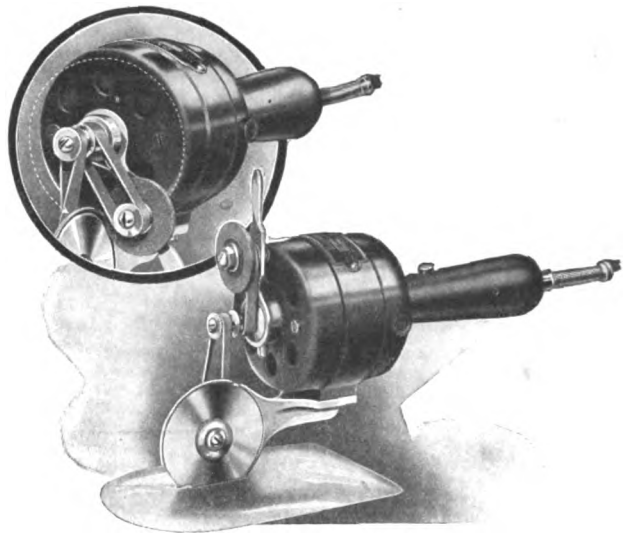

Fig. 1.—Electric Cloth Cutter and Method of Sharpening It.

cost. A means of improving the efficiency of the cutter is by relieving him of the burden of actually cutting the goods by hand with tailor's shears or knife.

In large clothing shops this has been done to a large extent by means of electric cloth-cutting machines, which have heretofore been made only in quite large sizes suitable for cutting through some 20 or more layers of cloth at one operation. To meet the evident need of smaller shops and of all tailors for a machine that would cut one, two, three or so layers, there has been now placed on the market a handy electric appliance especially designed for this purpose. It is particularly suitable for work on overcoatings and similar heavy goods, the hand cutting of which is slow and tiresome.

The machine is compact and light in weight, making it easy to handle. It is equipped with a small Dumore universal motor that can be operated on either direct-current or alternating-current circuits and takes only a very small current. It operates at a speed of 6,000 revolutions per minute. Through a belt it drives the cutting wheel, thus eliminating the noise of gears. The blade edge of the wheel has a razor-like edge, which is easily maintained in perfect condition; a special emery wheel for the purpose is included in the outfit.

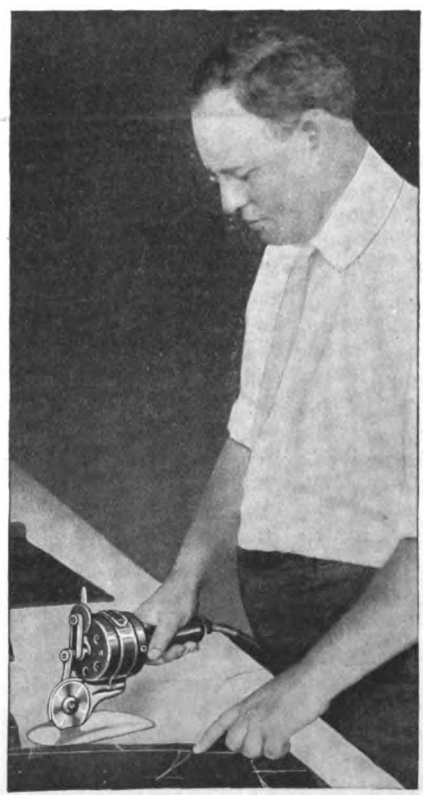

Fig. 2.—Dumore Cloth Cutter In Use.

In the main part of Fig. 1 it is shown turned up; in the insert at the upper left corner the emery wheel is shown turned down against the cutting blade so as to grind it to a hollow-ground edge. The blade is protected by a guard, the lower part of which acts as a support and guide.

This cloth cutter is made by the Wisconsin Electric Company, Racine, Wis.

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INDUSTRY ACTIVITIES

Wesco Supply Company, St. Louis, Mo., has issued a supplement and discount sheet which applies to its Catalog No. 200.

The Globe Stove & Range Company, Kokomo, Ind., held the first of its 1916 sales conferences for its electrical department at the home office March 16-18.

R. Martens & Company, 24 State Street, New York City, has prepared an economic map of Russia for distribution among manufacturers interested in the development of United States foreign trade in Russia. Copies may be obtained upon request.

Daniel W. Mead and F. W. Scheidenhelm, consulting engineers, announce their association in the practice of engineering with offices in the Equitable Building, 120 Broadway, New York City. They will continue to give their attention to reports, designs and construction, covering hydraulic and electric developments, water supply and reclamation works.

Stow Manufacturing Company, Binghamton, N. Y., manufacturer of flexible shafting for electric-motor or rope transmission, announce that a special arrangement has been made with the American Express Company for the execution of orders by customers in foreign countries. No buying commissions are charged, only those for handling credits or remittances being made.

The Electric Service Supplies Company, manufacturer of railway material and electrical supplies, Philadelphia, Pa., has issued the March number of the "Keystone Traveller," which illustrates and describes Keystone triangle arms, truss pins, and ground clamps, lightning arresters, rail bonds and other electrical devices manufactured by the company. The headlight and lamp business of the Esterline Company, Indianapolis, Ind., recently has been purchased by the Electric Service Supplies Company, thus increasing the variety of its railway specialties.

Panama-Pacific Medal-Winners' Exposition.—Hughes Electric Heating Company, Chicago, Ill., winner of a gold medal for electric ranges and ovens at the Panama-Pacific Exposition, maintained an exhibit at the Panama-Pacific Medal-Winners' Exposition, held at the Coliseum, Chicago, March 1-12. Among the other exhibitors identified with the electrical industry were the Dover Manufacturing Company, Canal Dover, O., winner of a gold medal for electric irons; Mathias Klein & Sons, silver medal for linemen's, electricians' and mechanicians' tools.

Hubbard & Company, Pittsburgh, Pa., has issued a complete catalog of its standard pole-line hardware and construction specialties. This book is an encyclopedia of line material, each article being illustrated and a description and table of dimensions given. In many instances illustrations and detail drawings show the manner in which the material is used in actual practice. The book contains 260 pages, 8.5 by 10 inches, with flexible cover, and is intended for use as a handbook by overhead construction linemen. Over 17,000 copies of the book have been distributed to the electrical trade, and a copy will be sent free to anyone making request.

The Emerson Electric Manufacturing Company, St. Louis, Mo., in the March issue of its publication, the Emerson *Monthly,* calls attention to the profits that can be made by dealers on fan-motor spare parts. Dealers who have more than an occasional demand for parts can handle them at a substantial increase in profit by ordering those commonly required in dozen lots. Ceiling-fan blades, blade flanges, balls, bearings, switches, switch handles and switch covers are parts constantly called for in sections where ceiling fans are in general use. Desk-fan blades of the 12 and 16-inch sizes, suitable for either oscillating or non-oscillating fans, can advantageously be purchased in dozen lots and carried in stock. The Emerson company and other fan manufacturers offer a substantial discount to dealers on such orders.

The Snyder Electric Furnace Company, Chicago, Ill., has recently added Robert M. Keeney to its staff of metallurgical engineers, and he will be in charge of all development work for the company. Mr. Keeney has had a broad experience in electric furnace research, covering the production of iron, steel and ferroalloys in the electric furnace, and the electric smelting of lead, copper and zinc ores. He has visited many electric furnace plants in Sweden, England, France and Germany. Before his connection with the Snyder Electric Furnace Company, Mr. Keeney was electrometallurgist of the United States Bureau of Mines at Pittsburgh, Pa., and Salt Lake City, Utah; mill superintendent of the Baker Mines Company, Cornucopia, Ore., and metallurgist of the Standard Chemical Company, Canonsburg, Pa. In the latter connection Mr. Keeney was engaged in the production of ferrovanadium and developed a process for the manufacture of ferrouranium. While in the western states, he made an extended study of the application of the electric furnace to the smelting of ores, flotation, concentrate and cyanide precipitates.

Westinghouse Club Banquet.—At the sixth annual banquet of the Westinghouse interests in the Pittsburgh district, held under the auspices of the Westinghouse Club, March 11, at the Fort Pitt Hotel, the principal speaker was W. L. Saunders, vice-chairman of the Naval Consulting Board, and chairman of the board of directors of the Ingersoll-Rand Company, New York City. Mr. Saunders chose for his subject, "Industrial Preparedness for Peace and War," and in the course of his remarks said: "If the industrial strength of the United States became known, no foreign country would dare attack us. The United States is the largest and richest of all industrial nations, and it is industrial wealth which offers the greatest protection to a nation in time of war. It is obvious that this industrial wealth cannot be utilized in full measure unless it is organized, and it is obvious that it takes a long time to organize a country so big as the United States, hence the importance of beginning now to place our industries in a position where they will respond quickly and fully to the needs of the Government in case of trouble." A plan has been formulated by the Naval Consulting Board, involving a directorate of five engineers in each of the forty-eight states of the Union. These men have been selected by their respective engineering societies and will have the aid of all other engineers in the states in tabulating and co-relating our industrial resources. There were about 500 Westinghouse men present, who were welcomed by President G. H. Lewis, who in turn introduced the toastmaster, Truman P. Gaylord, acting vice-president of the Westinghouse Electric & Manufacturing Company. The other speakers were Wesley G. Carr, patent attorney of the Electric Company, who spoke on "The Potency of Service," and the Rev. Samuel M. Lindsay, of Pittsburgh, who spoke on "Imagination and Life."

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PERSONAL AND BIOGRAPHICAL

MR. ROBERT FERRIS, who was elected president of the South Dakota Power Association, an organization of central-station owners formed at Sioux Falls February 22, is secretary-treasurer of the Yankton (S. D.) Light, Heat & Power Company, president of the Watertown (S. D.) Light & Power Company, and secretary of the Osage (Iowa) Light, Heat & Power Company. Mr. Ferris was born in Scotland in 1870 and came to this country in 1879 with his parents, who settled in Lowell, Mass. He spent the early years of his business career in factories in the East, specializing in the production of electrical machinery. Later he became a salesman and was in the Chicago offices of the General Electric Company for some time. During 1900, he and three of his brothers formed the "Ferris Brothers System," which owned and operated public utilities in Indiana, Illinois, Iowa and South Dakota. Mr. Ferris was president of the Yankton Commercial Association for two terms and now represents that association in the United States Chamber of Commerce. He is also a director of the Federal Reserve Bank of Minneapolis, Minn., and has many financial affiliations. Mr. Ferris resides in Yankton. The three brothers mentioned, all of whom were at one time connected with the General Electric Company, are MR. W. J. FERRIS, of the Electric Bond & Share Company, New York City; MR. THOMAS FERRIS, manager of the Osage (Iowa) Light & Power Company, and MR. JAMES W. FERRIS, manager of the Watertown Light, Heat & Power Company.

Robert Ferris.

MR. THEODORE N. VAIL, president of the American Telephone & Telegraph Company, left New York City last week for an extended trip to Guatemala.

MR. H. C. MASON has resigned as general manager of the Benton Harbor-St. Joe (Mich.) Railway & Light Company, and is now in Alhambra, Cal., where he owns considerable property.

MR. NORMAN B. HICKOX, formerly with Thomas Cusack Company, Chicago, Ill., has resigned to accept a position in the Chicago offices of the National X-Ray Reflector Company.

MR. ALBERT J. SLAP, formerly manager of the Royal Eastern Electrical Supply Company, Bronx Branch, New York City, is now connected with the Harrislap Specialty Company of that city.

MR. THOMAS C. HAWKINS has been appointed western representative of the Holophane Glass Company, with headquarters at Chicago, Ill. His territory will include the middle western states.

MR. E. E. LARRABEE, manager of the Twin State Gas & Electric Company, Bennington, Vt., has been chosen a director of the New England Section, National Electric Light Association, to fill the vacancy due to the resignation of MR. W. H. VORCE, of St Albans, Vt.

MR. A. E. SMITH, who has been assistant secretary and assistant treasurer of the Electric Bond & Share Company, New York City, was recently elected treasurer and assistant secretary of the company, succeeding MR. E. W. HILL, who was elected a vice-president of the company.

MR. E. C. JOHNSTON has been appointed purchasing agent of the East St. Louis & Suburban Railway Company and associated companies, with headquarters at East St. Louis, Ill., succeeding MR. S. P. BROOME, formerly assistant purchasing agent, who has resigned. The appointment became effective March 1.

MR. R. J. CLARK, formerly comptroller of the Kansas City Railway & Light Company, has been appointed secretary and treasurer of the Kansas City Light & Power Company. The office of comptroller has been abolished. MR. T. R. HARBER, for 13 years with the light company, has been made purchasing agent of the Kansas City Light & Power Company.

MR. PRESSLEY H. BAILEY has been appointed commercial manager of the Harrisburg (Pa.) Light & Power Company to succeed R. W. Kiple, formerly of Easton, Pa., who died soon after he assumed the position. Mr. Bailey is well known in electrical engineering circles of the Middle West, having served nearly 14 years with the Logans Gas & Coal Company of Columbus, O., and the Louisville (Ky.) Gas & Electric Company.

MR. E. S. FLETCHER, formerly manager of the Temple and Taylor (Tex.) district of the Texas Power & Light Company, of Dallas, has been made assistant general manager of the entire system. Mr. Fletcher graduated from Cornell University, after which he became manager of the Temple power plant. When this plant was transferred to the Texas Power & Light Company, he was retained as manager and later made district manager. MR. F. W. WILKERSON, formerly manager of the Palestine (Tex.) plant of the same company, has been assigned the position made vacant by Mr. Fletcher's promotion.

MR. A. VON SCHLEGELL, for several years general manager of the Michigan State Telephone Company, has resigned that position and been made a vice-president of the company. Mr. Von Schlegell will hereafter be actively engaged in the executive and managerial work of the Hupp Motor Car Corporation, Detroit, Mich., of which he has become vice-president. For the past 21 years he has been active with the Bell System in Chicago and the Northwest and as general manager of the Michigan State Telephone Company. MR. G. M. WELCH has succeeded Mr. Von Schlegell as active head of that company.

A. von Schlegell.

OBITUARY.

MR. J. C. HOOVEN, president of the Hooven, Owens, Reutschler Company, Hamilton, O., died at Hamilton March 1. Mr. Hooven has been identified with the manufacture of steam engines and machinery for many years, and his death will be mourned by his large circle of personal and business friends.

MR. JULIEN P. FRIEZ, widely known for his work in the manufacture of scientific instruments, died March 9 in Baltimore, Md. He was with the General Electric Company for many years and made the first key and sounder for telegraph service for that company. He was the pioneer in the manufacture of the heliograph signal apparatus, used by the Government before electricity came into use. Mr. Friez assisted in the development of the Rowland multiplex telegraph system.

MR. MERRITT GALLY, credited with having patented nearly 500 devices affecting the telegraph, telephone, linotype, and player piano, died March 7 at his home in Brooklyn, N. Y. He was born in Rochester, N. Y., 76 years ago, and, after receiving his degree at the University of Rochester, went to Auburn Theological Seminary. Mr. Gally was one of the first to develop the multiplex telegraph system. He also tried to invent an instrument which would turn telegraphic messages into type for newspapers.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

PORTLAND, ME.—The Cumberland County Power & Light Company, W. M. Bradley, president, has been granted authority by the Public Utilities Commission to issue bonds to the amount of $250,000. Part of the issue will be used for extensions and improvements.

SWANTON, VT.—Plans for additional generating equipment for the municipal hydroelectric plant, C. J. Parker, superintendent, include two 500-kilowatt units and necessary auxiliaries.

CHELSEA, MASS.—City Engineer Maggi has prepared plans for additions to the present street-lighting system.

CHICOPEE, MASS.—Complete rearrangement of the city's street-lighting service will soon be necessary, according to a statement of Manager Benedict of the municipal electric lighting plant. Extensions and improvements in the feeder system are needed.

MILFORD, MASS.—The Milford Electric Light & Power Company is planning extensions to its high-tension distribution lines.

NEW BEDFORD, MASS.—Work on the new power plant of the New Bedford Gas & Edison Light Company is being rushed to completion. Arrangements have recently been made to supply electrical energy to two large spinning mills now being built here, and the additional facilities are necessary. The initial capacity of the new plant will be 22,000 kilowatts, provision being made for an ultimate capacity of 80,000 kilowatts.

NEWBURYPORT, MASS.—The Council has passed an order calling for the rearrangement of the city lighting system and for additional lamps.

NORTH ANDOVER, MASS.—Extensions to the municipal lighting system are being planned.

OSTERVILLE, MASS.—A transmission line from Falmouth and a distribution system for this city will be installed by the Buzzards Bay Electric Company of Falmouth.

WORCESTER, MASS.—The lighting committee of the City Council has recommended orders for 132 additional luminous arc lamps to be installed during the summer.

CHATHAM, N. Y.—The Chatham Electric Light, Heat & Power Company has filed with the Public Service Commission an application for permission to begin construction and exercise franchises and distribution systems in the towns of Austerlitz, Claverack, Hillsdale, Copake and Taghkanic. The application was accompanied by the local franchises for the extension of the company's lines.

LYONS, N. Y.—The report of the committee on ornamental street lighting, calling for the installation of 35 one-light concrete posts, probably will be adopted by the Municipal Board.

NEW LEBANON, N. Y.—The Lebanon Valley Lighting Company has given up its plans for the operation of a generating plant and is preparing to secure energy for distribution in the towns of New Lebanon and Canaan by means of a transmission line from Stockbridge, Mass.

NEW YORK, N. Y.—Plans have been filed for the power plant the New York Steam Company is to build at the northwest corner of Water Street and Burling Slip. It will be five stories, with a frontage of 116.8 feet on Water Street and 107.4 feet on the slip. Starrett & Van Vleck, architects, estimate the cost at $370,000.

UTICA, N. Y.—The New York Central Railroad will build a large electric lighting plant here, according to information received recently. With the opening of a new station here it is understood that more power will be needed, and the company is making arrangements to furnish its own power.

HARRISBURG, PA.—Twenty-seven electric companies which desire charters to operate in Mercer, Beaver and Lawrence Counties have petitioned the Public Service Commission for certificates of convenience preparatory to incorporation. The companies are projected by several groups of men and cover townships and boroughs.

WAYNESBORO, PA.—The Waynesboro Electric Light & Power Company contemplates the extension of its distribution lines to Mont Alto, in order to furnish electrical energy to the towns of Nunnery, Quincy, Goods Siding, Knapper and Mont Alto.

JANE LEW, W. VA.—If the plans of a number of representative citizens of Jane Lew and nearby country districts are carried out, a trolley line will be built from Jane Lew to Berlin during this summer. The new line would connect with the Monongahela Valley Traction Company's interurban line at Jane Lew.

WILLIAMSON, W. VA.—The Williamson Light & Ice Company is planning to build an electric lighting plant, ice factory and cold storage plant, to cost about $50,000.

DURHAM, N. C.—The Durham Traction Company is planning to install a 300-kilowatt rotary converter and additional switchboard equipment.

NASHVILLE, N. C.—Bonds in the sum of $45,000 have been voted for the establishment of electric lighting, water and sewerage plants.

UNIVERSITY, N. C.—The University of North Carolina has completed a fund of $40,000 which will be used for the installation of a heating and electric lighting plant to replace the present equipment.

ZEBULON, N. C.—An election will be held to vote on the question of issuing $10,000 bonds for the erection of an electric lighting plant.

COLUMBUS, GA.—The Columbus Power Company will establish a substation and install equipment at the Goat Rock station to increase the pressure from 13,200 to 66,000 volts. A substation will also be installed at Hogansville.

OCALA, FLA.—Bids will be received until March 30, by the City Council, for the construction and equipment of an electric lighting and power plant here. Twombly & Henney, 55 Liberty Street, New York City, are the engineers, and H. C. Sistrunk is city clerk.

WEBSTER, FLA.—E. W. Evans, of Brookville, has petitioned the City Council for a franchise to supply the city with electric service.

NORTH CENTRAL STATES.

CANTON, O.—Manager Golding, of the Canton Electric Company, is handling arrangements connected with the purchase of large power units for the new plant of the American Gas & Electric Company, near Wellsburg, W. Va., which is to cost $5,000,000 and have an ultimate capacity of 180,000 kilowatts. The plant is to be connected with Canton by transmission lines.

CINCINNATI, O.—The city of Norwood has sold $15,000 worth of bonds for the purpose of providing funds for the extension and improvement of its street-lighting system. Contracts will be let shortly.

CINCINNATI, O.—M. E. Springer, of Chatfield & Company, is in charge of a plan for the construction of a large building near Third and Vine Streets, which will include arrangements for large garage and repair-shop. Elevators and other equipment, besides the power and generating machinery necessary for a large building, will be required.

HAMILTON, O.—James O'Toole, superintendent of the municipal electric lighting plant, in a report to the City Council, has recommended the purchase of new generating and boiler equipment, an ornamental lighting system and other improvements, all to cost about $60,000.

LONDON, O.—Cluster lighting on Main Street, including the laying of cables and the purchase of standards and lamps, will be paid for by a bond issue of $2,500 which has been authorized by the Council.

QUINCY, O.—Plans to install an electric lighting plant are being considered by the City Council.

SALEM, O.—Showers & Taylor, of Zanesville, have the contracts for the erection of the new addition to the Salem Light Company's plant here at their bid of $14,000.

SPRINGFIELD, O.—The city authorities have entered into a contract with the Springfield Light, Heat & Power Company for street lighting, under arrangements which contemplate the installation of several hundred ornamental cluster lights, including 175 250-candlepower Mazda lamps and 392 600-candlepower Mazda lamps, which are to be placed within four months.

WEST MILTON, O.—The Stillwater Valley Electric Light Plant, L. A. Pearson, owner, is planning to extend its transmission lines.

ELWOOD, IND.—The City Council has granted a ten-year contract to the Indiana General Service Company, of Elwood, for 150 arc lamps and a number of incandescent lamps.

ERIGHTON, ILL.—The Council has granted a franchise to Arthur Farrell to furnish energy for light and power.

GALENA, ILL.—The Union Electric Company, of Dubuque, Iowa, has closed a contract with the Interstate Light & Power Company, of Galena, Ill., to furnish electric energy for both light and power in the mining district of Southwestern Wisconsin, which includes, among others, the towns of Platteville, Benton, Cuba City and Hazel Green. The Union Electric Company will span the Mississippi River with a transmission line, to be 2,200 feet in length and supported on steel towers.

HARDIN, ILL.—Peter A. Gotway has petitioned for a franchise to establish an electric lighting plant here.

HUME, ILL.—Mayor J. M. Lewis will present to the Town Board a proposition to purchase a municipal electric lighting plant.

OLNEY, ILL.—City officials here are considering a proposition to erect a municipal electric lighting plant.

SALEM, ILL.—The City Council has accepted the proposal of the Varney Electric Company, of Evansville, Ind., to install new equipment at the electric lighting plant.

SPRINGFIELD, ILL.—A contract for electrical equipment has been awarded by the City Commission to the General Electric Company, of Chicago, as follows: potential transformers, street light panels and substation panels, $2,560; pendant units, $5,452.

SPRING VALLEY, ILL.—The Spring Valley Utilities Company, R. W. Brown, manager, is planning to build 15 miles of transmission line and install three 200-kilowatt transformers.

GREENVILLE, MICH.—A petition is being circulated here to bring before the voters at the spring election the question of installing a boulevard lighting system on the main streets here.

HASTINGS, MICH.—The Thornapple Gas & Electric Company, L. W. Heath, manager, is planning to install additional generating equipment, and to extend its transmission lines to Vermontville, where a new lighting system will be installed.

JANESVILLE, WIS.—The east side head gates and wing wall of the Fulton power plant, owned by the Janesville Electric Company, have been washed out as the result of the undermining of the cement walls during the high water some time ago. The plant will be out of commission for two months.

MANITOWOC, WIS.—The utility committee of the Common Council has recommended that the city advertise for bids

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immediately for the new electrical equipment for the electric power and light plant. J. J. Kelly is city clerk.

NORTH MILWAUKEE, WIS.—Construction of an electric distribution and transmission line between North Milwaukee and Granville is contemplated by the North Milwaukee Light & Power Company, a branch of The Milwaukee Electric Railway & Power Company, of which S. B. Way is president.

OOSTBURG, WIS.—The Oostburg Light, Heat & Power Company has been organized with a capital of $10,000 by H. W. LeMahieu, L. LeMahieu and John Borthouwer, for the purpose of supplying this city with electrical energy for light and power.

VIOLA, WIS.—A proposition to purchase an electric lighting plant will be placed before the voters at the spring election.

FARIBAULT, MINN.—Northern States Power Company, Faribault division, has secured a five-year contract with the Faribault Packing & Provision Company covering electrical power for the operation of their new plant which is being erected here. The power load will be approximately 360 horsepower which includes 100 horsepower for the operation of a 165-ton refrigerating plant. It is estimated that the revenue to the power company will be from $500 to $750 per month.

JACKSON, MINN.—This city has voted $30,000 in bonds for extensions and improvements to the municipal power plant and lighting system.

MILAN, MINN.—The Milan Light & Power Company is planning to install an additional 25-horsepower generating unit.

GRINNELL, IOWA.—The Iowa Light, Heat & Power Company of Grinnell has incorporated with a capitalization of $1,000,000. Lindsey Hooper is president and Charles A. Olson is secretary-treasurer of the company.

OXFORD JUNCTION, IOWA.—The Electric Light Company, of this place, Walter Coon, manager, is planning to supply all the small towns between Cedar Rapids and Clinton with electric light and power service.

TIFFIN, IOWA.—Citizens here have voted to install an electric distribution system in this city and secure energy from Iowa Lighting & Power Company, of Cedar Rapids.

POPLAR BLUFF, MO.—Sealed proposals will be received until April 17 for furnishing electrical supplies, line materials, etc., to be used by the municipal electric light and power plant. H. H. Wilcox, city clerk.

BUHLER, KANS.—A special election will be held this week to vote $5,000 bonds for a street lighting system. Service will be secured from either the Kansas Gas & Electric Company, Wichita, or the United Water, Gas & Electric Company, Hutchinson. Both companies have submitted propositions, and if that of the Hutchinson Company is accepted the transmission lines will be extended from Buhler to Inman, where electric service is also desired.

EASTON, KANS.—At the spring election a proposition to establish a municipal power plant will be considered by the voters.

PRESTON, KANS.—This city has voted bonds to secure an electric lighting system. It is proposed to build a transmission line and purchase energy, rather than construct a municipal plant.

FULLERTON, NEB.—Fire recently destroyed the plant of the Fullerton Electric Light & Power Company, valued at $20,000. Preparations to rebuild are being made.

HOLDREDGE, NEB.—The Intermountain Railway, Light & Power, which is building transmission lines to Funk, Wilcox and Hildreth, expects to have the work completed this month.

SYRACUSE, NEB.—Plans are being considered for the installation of a municipal electric lighting plant.

VALLEY, NEB.—A proposition to dispose of the municipal electric lighting plant and to buy electrical energy from other sources is receiving the attention of voters here.

PIERRE, S. D.—Action looking toward the ultimate development of power at Big Bend in the Missouri River, several miles below this city, is contemplated in the articles of incorporation filed here for the Missouri River Power Company with headquarters at Pierre, and a capital of $1,000,000. The incorporators are J. E. Mallery, Doane Robinson and Harry Quackenbush, of Pierre. The plan is included in a bill introduced in the South Dakota legislature.

DATES AHEAD.

Railway Signal Association. Annual convention, Chicago, Ill., March 20 and 21. Secretary, C. C. Rosenberg, Times Building, Bethlehem, Pa.

Minnesota Electrical Association. Annual convention, Minneapolis, Minn., March 21 and 22. Secretary, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

American Society of Mechanical Engineers, Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

National Electric Light Association. Annual convention, Chicago, Ill. May 22-26. Secretary T. C. Martin, 29 West Thirty-ninth Street, New York City.

Arkansas Association of Public Utility Operators. Annual convention. Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

The bill attempts to meet the conditions regarding rights of private companies in the development of power. This action puts the Missouri River Power Company in a position to take up the work if conditions are favorable.

LEAD, S. D.—The City Commissioners have taken preliminary steps toward providing this city with a municipal lighting system.

WESTHOPE, N. D.—C. M. Condit has been granted a franchise to erect and maintain electric transmission lines and equipment in this city for a period of 20 years.

SOUTH CENTRAL STATES.

FRANKFORT, KY.—The city of Frankfort has received $32,000 in government bonds, and other considerations from the Kentucky Utilities Company, in return for which the city relinquishes a first lien on the property of the company. It is proposed that the $32,000 be set aside as the nucleus of a fund with which the city later may construct a municipal lighting plant.

HICKMAN, KY.—Stanwood, Taylor & Company, of Chicago, operating under the corporate name of the Kentucky Light & Power Company, has purchased from the Public Service Company of Western Kentucky, the electric light and power plant at Hickman. The same property, though since improved, had been purchased from local owners three years before by the Western Kentucky corporation. It will be continued under the present management, with Doyle Jurney as general manager.

PADUCAH, KY.—The Home Electric Company, of Paducah, is slated to be the purchaser of an electric lighting franchise which the Fiscal Court of McCracken County will sell in April. This will provide for establishment of a plant and service to the community of Lone Oak, Ky.

PRESTONSBURG, KY.—The Prestonsburg Electric Light Company has increased its capital stock from $10,000 to $25,000. Service extensions probably will be made.

CHATTANOOGA, TENN.—The Park Commission will install a new lighting system in Eastland Park.

FRIENDSHIP, TENN.—W. H. Sudbury has sold the local electric lighting plant to Pony Fisher, of Crockett Mills.

NASHVILLE, TENN.—Incorporators of the Nashville, Hartsville & Red Boiling Railroad, to run from Hartsville to Red Boiling Springs, have not decided whether this will be a steam or electric line. J. C. Shofner, Perkins Baxter and others, of Nashville, are interested.

BIRMINGHAM, ALA.—The Alabama Power Company has completed arrangements whereby sufficient funds are at its disposal for improvements in this district during the next ten years. The company plans enormous developments in the near future. Another power unit at Lock 12 on the Coosa River is contemplated immediately, this new unit to furnish 17,500 horsepower. Another improvement will be the erection of piers and cranes where the Louisville & Nashville Railroad crosses the Coosa, above the dam. This will enable the company to handle the heaviest machinery, and will entail an expenditure of $750,000. This work will be under contract shortly, with completion probable in November. The Alabama Power Company also contemplates in the near future the erection of a steam electric plant on the Warrior River. This enormous expenditure will be undertaken to furnish an emergency station as a safeguard against possible droughts, lowering the waters of the Coosa. The steam power plant will be built in the coal regions, and the company may buy coal properties to add to its holdings.

M'COMB, MISS.—The announcement has been made that the Magnolia & McComb Electric Lighting & Railway Company will be in operation within six months. Guy M. Walker of New York, who recently purchased the McComb City Electric Light & Power Company, is here arranging for the proposed improvements.

LITTLE ROCK, ARK.—W. N. Kindrick has made recommendations in the City Council for additional street lights in the Fifth Ward.

LITTLE ROCK, ARK.—George B. Blanchard, of Chicago, promoter of the recently organized Hot Springs, Pine Bluff & Mississippi Railroad, with a capital of $5,000,000, states that it will be either electric or gasoline-operated.

NEWPORT, ARK.—The Arkansas Light & Power Company has filed a mortgage of $5,000,000 thirty-year gold bonds given to the Guaranty Trust Company, of Newport. The funds thus secured are to be used in the purchase of electric lighting plants in Arkansas and the construction and improvement of others. The Newport plant, it is understood, will be enlarged.

ALLEN, OKLA.—P. L. Linebaugh, of Duncan, has made application to the City Council for a franchise to install a power plant and furnish electric service in Allen.

COYLE, OKLA.—The city contemplates building an electric lighting and power plant.

FOSS, OKLA.—Line improvements are contemplated by H. D. Cobb, superintendent of the municipal electric lighting plant.

FT. COBB, OKLA.—The city is planning to construct an electric lighting plant and water works system.

BEEVILLE, TEX.—The Texas Southern Electric Company of this city purchased city property and will erect a modern electric lighting and power plant at an early date.

BELTON, TEX.—The Texas Power & Lighting Company, of Dallas, plans to reconstruct the municipal lighting system here.

CLEBURNE, TEX.—The Cleburne Traction Company has been incorporated here with a capital stock of $15,000, for the purpose of operating an electric street railway and a generating plant for power and lighting purposes.

COMMERCE, TEX.—Arrangements have been completed by the Texas Power & Light Company to extend its transmission line, now being built from Jenkins to Royse City, to Commerce, connecting here with the present transmission line which connects Paris, Bonham, Honey Grove, Ladonia and other towns. This will connect the Paris-Bonham-Commerce district with the Central Texas transmission lines of the company and make available an almost unlimited supply of electrical energy. The line will operate at 33,000 volts.

DALLAS, TEX.—The Texas Light & Power Company has authorized the sale of $200,000 bonds, the proceeds to be used in paying for improvements to its power transmission system.

GUNTER, TEX.—The Gunter Power & Light Company has arranged to install an electric light plant here in the near future.

MARLIN, TEX.—C. C. Moser, of Dallas, and associates are promoting the construction of an interurban electric railway between Marlin and Waco, a distance of about 55 miles.

RIO GRANDE, TEX.—C. Valle & Brothers will construct an electric lighting plant here.

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SAN ANTONIO, TEX.—The San Antonio Gas & Electric Company, subsidiary of the American Light & Traction Company of New York, will install additional equipment in its electric light and power plant at a cost of about $150,000.

WESTERN STATES.

COKEVILLE, WYO.—At a meeting of the Town Council a 50-year electric light and power franchise was granted to W. F. Pitt, of Kemmerer, Wyo.

ALAMOGORDO, N. M.—The City Council has entered into a tentative contract to purchase the properties of the Alamogordo Light & Power Company, the Alamogordo Water Works Company and the Alamogordo Improvement Company for a total consideration of $300,000. The contract will be submitted for ratification of the voters on April 4. If it is approved improvements will be made to the plants.

CARLSBAD, N. M.—The Public Utilities Company will install new equipment in its electric power and light plant here.

PRESCOTT, ARIZ.—Plans are under way for the installation of another electric plant at Verde River to develop 8,000 horsepower to be transmitted 70 miles by distribution lines to Gila County mining camps.

SPRINGVILLE, UTAH.—The city of Springville is planning to enlarge its municipal light and power plant, application having been made at the office of State Engineer W. D. Beers for rights to ten cubic feet per second on Little Spring Creek. The municipality expects to develop 300 additional horsepower. Application of Junius J. Hayes of Kanab for nine cubic feet per second from the east fork of the Rio Virgin River was also filed with the State Engineer. The application is for a power plant that will develop 200 horsepower.

RENO, NEV.—City officials and the Reno Power, Light & Water Company have agreed upon plans for the installation of an electrolier lighting system to cost about $5,000.

OAKVILLE, WASH.—It is reported that the City Council contemplates purchasing the local electric lighting plant from Frank Leisner, extending and improving same and operating it as a municipal utility.

TACOMA, WASH.—The City Council is considering petitions for the installation of ornamental lights in various parts of the city as follows: the Park Board has petitioned the Council for new light standards in Wright Park and Point Defiance Park; property owners along South Ainsworth Street have petitioned for ornamental lights on Ainsworth Street from Steele to South Sixteenth Street; South Seventeenth Street on the corners of M and K Streets.

ASTORIA, ORE.—Judge T. S. Cornelius of the Clatsop County Court reports the court will install a 50-horsepower motor, a centrifugal pump and electric drill and equipment in its rock-crushing plant at Tongue Point, near Astoria.

EUGENE, ORE.—An ordinance providing for the installation of ornamental lights on Stevens Street has been passed by the City Council, and it is reported bids for materials and installation of the system will be received at an early date.

MEDFORD, ORE.—The stockholders of the California-Oregon Power Company, of Medford, have assessed themselves $3.30 per share on outstanding stock, while the bondholders have co-operated by waiving interest on bonds outstanding for five years, in order to secure funds for immediate construction work, which includes the completion of the great power project at Capco, Ore., on the Klamath River; the doubling of the capacity of the Prospect Power plant, and extension of power lines to mining and timber regions. According to J. D. Grant, of San Francisco, president of the company, this method of financing new construction was deemed preferable to a new bond issue, which would increase the interest charges on the company. Mr. Grant states in addition to bonds deposited to secure borrowed money, there are $3,200,000 first and refunding bonds outstanding. The company is paying interest on $1,200,000 underlying bonds and on its floating debt, and is earning enough to pay interest on the first and refunding bonds. Other officers of the company are John D. McKee, Medford, vice-president, and J. P. Churchill, Yreka, Cal., second vice-president.

MYRTLE CREEK, ORE.—Initial steps have been taken by the City Council toward securing better light and water service by the employment of engineers to report on the probable installation of a power project in the South Umpqua River near the mouth of Myrtle Creek.

NORTH BEND, ORE.—About $5,000 damage was done the power plant of the Oregon Power Company here in a recent fire. Manager Jennings states repairs will be made at once.

ROSEBURG, ORE.—John Kiernan, a Portland capitalist, has purchased the interest of A. Welch in the Douglas County Water & Light Company, of Roseburg. Mr. Welch's interests also included half of the stock of the Seaside Light & Power Company. The Douglas Water & Light Company has a capitalization of $600,000. Mr. Kiernan reports additions and extensive improvements will be made at the Roseburg plant.

ANAHEIM, CAL.—The Southern California Edison Company has been awarded the contract for furnishing electric current for the municipal power plant, the minimum amount to be used each month being placed at 31,666 kilowatts, at a cost of $400.

LOS ANGELES, CAL.—The matter of having a transmission line for aqueduct power extended to the harbor district will soon be presented to the power bureau by the Harbor Commission.

LOS ANGELES, CAL.—The City Council has adopted the report of the Board of Public Works with reference to ornamental lights on certain streets, and an ordinance will be prepared.

PORTERVILLE, CAL.—Upwards of 100 men are being employed in this district on construction work for the Mount Whitney Power & Electric Company. At present they are replacing the present main lines from Exeter south to Porterville with equipment better adapted to the heavier loads which have become necessary through a steady increase in business. Considerable work is to be done in Porterville in connection with the new substation under construction on the company's property in Puttman Avenue, which is being built at a cost of $40,000.

SANTA MARIA, CAL.—The Midland Counties Public Service Corporation reports having completed arrangements for the transfer of its local power station to Betteravia, where it is proposed to spend $175,000 in buildings and machinery for the plant. The reason given for this change of location is that a large contract has been obtained from the Union Sugar Company for light and power to be furnished by the electric company.

Proposals

FUSES.—Sealed proposals will be received until March 21 for furnishing and delivering electric fuses, f. o. b. municipal warehouse, Thirty-first Street and Sacramento Avenue, Chicago, Ill., according to plans and specifications on file in the office of the Department of Public Works, Room 406 City Hall. W. R. Moorhouse, Commissioner of Public Works.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9380—Great Lakes, Ill., one Roentgen-ray machine. Schedule 9398—Brooklyn, N. Y., 20 120-volt electric heaters. Schedule 9405—Norfolk, Va., eight five-kilowatt, radio motor-generators; eight automatic, contactor-type panels; 14 radio transformers. Bidders desiring to submit proposals should make application for schedules to the Bureau or Purchasing Office nearest to navy yard where delivery is to be made.

Financial Notes

Negotiations have been completed by Borton & Borton, of Cleveland, O., and J. R. Woodhull & Company, of Dayton, O., for the purchase from an eastern banking house of its holdings of preferred stock of the Dayton Power & Light Company, which was recently issued to finance extensions during 1915. The stock will be sold by the brokers in Ohio.

At a meeting of the board of trustees of the Northwestern Electric Company, Portland, Ore., a quarterly dividend of $1.50 per share was declared, payable April 1, 1916, on preferred shares of stock outstanding as of record at close of business March 24, 1916, said dividend being at the rate of 6 per cent per annum. Until further notice preferred stock dividends will be paid quarterly instead of semi-annually.

The San Diego (Cal.) Consolidated Gas & Electric Company has applied to the State Railroad Commission for authority to increase its capital stock from $3,500,000 to $6,000,000, and to issue and sell $500,000 of its preferred stock. The proceeds are to refund $56,000, par value, of 6-per-cent debenture bonds and reimburse the company for expenditures from its income for additions and betterments to its service, totaling $115,564. The company serves about 600 square miles of territory.

In a recommendation to the City Council of Tacoma, Wash., Charles D. Atkins, Commissioner of Finance, urges that the City of Tacoma invest a part of the light and power reserve fund in city bonds, which have been offered by the present owners to the city. The bonds, which mature in 1932, are for the new Eleventh Street bridge, of which $475,000 has been issued. The reserve fund has more than $100,000 idle. The bonds offered have a par value of $50,000, and bear 4.5 per cent interest.

The New Jersey Power & Light Company has sold to N. W. Halsey & Company, New York City, $550,000 first-mortgage 5-per-cent bonds due in 1936. The company was organized in December, 1915, as a subsidiary of General Gas & Electric Company and supplies electric current for light and power in nineteen communities in Morris and Somerset Counties, New Jersey, being properties formerly operated by Eastern Pennsylvania Power Company and affiliated corporations. Plans are underway by the company to erect a new central generating station near Dover with an initial installation of 3,500 kilowatts. The new station will take the place of the present stations at Dover, Rockaway and Bernardsville, which will be held as reserve stations.

Dividends.

	Term.	Rate.	Payable
Am. Pub. Util. pf	Q	1.5 %	Apr. 1
Bell Tel. of Canada	Q	2 %	Apr. 15
Buffalo Gen. Elec. com	Q	1.5 %	Mar. 31
Cent. States Elec. Corp. pf.	Q	1.75%	Apr. 1
Duluth Edison, pf	Q	1.5 %	Apr. 1
Interborough Rap. Tran	Q	5 %	Apr. 1
Montreal Tramways	S	2.5 %	Apr. 1
Springfield Ry. & Lt. pf	Q	1.75%	Apr. 1
United Gas Imp	Q	2 %	Apr. 15
West Penn Rys. pf	Q	1.25%	May 1
West Penn. Trac. pf	Q	1.5 %	Apr. 15
West Penn. Trac. extra	—	0.5 %	Apr. 15

Reports of Earnings.

GENERAL GAS & ELECTRIC COMPANY AND SUBSIDIARIES.

Earnings for the seven months ended January 31:

Gross operating revenues	$1,526,773.14
Operating expenses and taxes	978,976.27
Operating income	547,796.87
Miscellaneous income	6,697.47
Gross income	554,494.34
Deductions from income	291,497.60
Dividends	77,083.33
Balance after deductions	58,737.87

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 13	Mar. 6
American Tel. & Tel. (New York)	128⅝	127⅜
Commonwealth Edison (Chicago)	143	143
Edison Electric Illuminating (Boston)	245	246
Electric Storage Battery common (Philadelphia)	63⅛	63⅛
Electric Storage Battery preferred (Philadelphia)	63⅛	63⅛
General Electric (New York)	169	166½
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	7	6½
Massachusetts Electric preferred (Boston)	37	36
National Carbon common (Chicago)	—	—
National Carbon preferred (Chicago)	122	122
New England Telephone (Boston)	136	135¾
Philadelphia Electric (Philadelphia)	27¼	27¼
Postal Telegraph and Cables common (New York)	78	80
Postal Telegraph and Cables preferred (New York)	66⅞	67¾
Western Union (New York)	89¼	88
Westinghouse common (New York)	65	62
Westinghouse preferred (New York)	75	75

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New Incorporations

MILWAKEE, WIS.—Ruess & Beyer Electric Company. Capital, $5,000. Incorporators: O. J. Ruess, John Beyer and others.

EAST ST. LOUIS, ILL.—Saunders Motor Power Company. Capital $10,000. Incorporators: Roy Saunders, J. N. Keys and R. B. Logan.

INDIANAPOLIS, IND.—Everett-Buschmann Company. Power plant specialties. Incorporators: W. J. Everett, O. L. Buschmann and others.

CHICAGO, ILL.—Toto Electric Manufacturing Company. Capital, $5,000. Incorporators: G. H. Powell, A. B. Clements and E. O. Eakin.

WESTBORO, MASS.—Goddard Spark Plug Company. President, A. H. Goddard; secretary, A. R. Cummings; treasurer, L. E. Thurber.

BIRMINGHAM, ALA.—Southern States Electric Company. Capital, $12,000. Incorporators: W. E. Mitchell, V. H. Hanson and F. W. Hansman.

MEMPHIS, TENN.—Memphis Armature Works. Capital, $10,000. General electrical business. Incorporators: S. J. Swanson, John Deeth, J. W. Marshall and others.

WORCESTER, MASS.—Franklin Square Electric Company. Capital, $5,000. Electric fixtures and supplies. Incorporators: W. R. McLaughlin, A. W. Wilson and E. F. Coghlin.

DOVER, ILL.—Best Electric Company has been incorporated in Delaware with a capital of $10,000 to manufacture electric lamp sockets and lighting appliances. Incorporators: F. R. Hansell, Philadelphia, Pa., G. H. B. Martin and S. C. Seymour, Camden, N. J.

New Publication

BULLETIN OF BUREAU OF STANDARDS.—No. 3, Vol. XII, of the *Bulletin of the Bureau of Standards*, contains the following articles: "Calculation of the Maximum Force Between Two Coaxial Circular Currents," by Frederick W. Grover; "Construction of Primary Mercurial Resistance Standards," by F. A. Wolff, M. P. Shoemaker and C. A. Briggs; "Note on the Resistance of Radiotelegraphic Antennas," by L. W. Austin; "A Method of Measuring Earth Resistivity," by Frank Wenner; "A New Relation Derived from Planck's Law," by Paul D. Foote..

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,288. ELECTRICAL EQUIPMENT.—A firm in Japan writes that it desires to receive catalogs and cash quotations from American manufacturers of electrical equipment and supplies.

NO. 20,302. ELECTRICAL SUPPLIES.—An American consular officer in Italy reports that a man in his district desires to represent American manufacturers and exporters of electrical supplies. Correspondence should be in Italian.

An inquiry has been received by Pass & Seymour, Syracuse, N. Y., from P. H. Nugent, Bridge Street, Bantry, Ireland, which states that he wishes to be placed in communication with manufacturers of a general line of accessories such as switches, ceiling rosettes, cutouts, metallic filament lamps and small house-service meters.

Electrical Patents Issued March 7, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,174,044. **X-Ray Apparatus.** E. Benson, Newton Highlands, Mass. Structure of cathode.

1,174,053. **Inductance Regulator for Alternating-Current Circuits.** M. Burns, Evansville, Ind., assignor of three-tenths to Smith Wiltshire, three-tenths to C. T. Curry, and one-tenth to F. Elmendorf, Evansville, Ind. Mechanism for adjusting core sections.

1,174,072. **Gear Case.** G. H. Hurteau, assignor to Electric Service Supplies Co., Philadelphia, Pa. For motor gears and the like; plates spot welded and riveted together.

1,174,078. **Cable Terminal Box.** J. A. McCoy, Somerville, Mass. Cable entry into box having outer casing and inner distributing casings.

1,174,104. **Dynamo Machine and Apparatus.** W. A. Turbayne, Lancaster, N. Y., assignor to Gould Storage Battery Co. Reversible booster.

1,174,105. **Electropneumatic Brake.** W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Has electrically controlled valve for venting fluid from brake pipe.

1,174,125. **Electrical Burglar-Alarm.** F. E. Crawford, assignor to Bankers Electric Protective Association, Boston, Mass. Time-controlled door-alarm circuit.

1,174,129. **Annunciator.** F. J. Dougherty, Camden, N. J. Details of electromagnet and drop.

1,174,142. **Door-Controlled Circuit-Breaker.** H. Harris, Buffalo, N. Y. Details of door-operated contact device.

1,174,145. **Igniter.** A. B. Herrick, assignor to M. C. Messler, Pawtucket, R. I. Combined spark plug and induction coil.

1,174,146. **Electric Miner's Lamp.** W. Hickman, assignor to Chemische Fabrik Griesheim Electron, Frankfort-on-the-Main, Germany. Relates to battery-cell selection and arrangement for operating.

1,174,157. **Electric Spark Device.** J. A. Jeffery and B. A. Jeffery, Newark, N. J. Details of spark plug.

1,174,158. **Electric Ignition Device.** J. A. Jeffery and B. A. Jeffery. Spark-plug structure.

1,174,162. **Electrical Switch.** M. H. Johnson, Utica, N. Y. Details of pivoted contact device.

1,174,179. **Water Bottle, Stopper and Heating Attachment.** C. A. Rickards, assignor to A. Schrader's Son, New York, N. Y. Electric heater for hot-water bottle inserted through stopper.

1,174,181. **Electric Telegraph Messenger Call Recorder.** J. M. Roberts, Norfolk, Va. Makes signal marks in dust which is brushed away to erase.

1,174,187. **Loading Coil.** T. Shaw, assignor to American Telephone & Telegraph Co., New York, N. Y. For telephone lines.

1,174,188. **Hygroscopic-Actuated Circuit-Closer.** C. H. Smith, Jr., Atlanta, Ga. Contact member swings under varying humidifying atmospheric conditions.

1,174,200. **Inspecting Instrument.** O. F. Tallman, assignor to W. N. Mathews & Brother, St. Louis, Mo. For testing for faults in cables, etc.

1,174,201. **Advertising Device.** G. L. Thom, assignor to George Madison Co., New York, N. Y. In form of lamp shade.

1,174,202. **Display Stand.** G. L. Thom, assignor to George Madison Co. Sectional advertisement bearing members arranged about a lamp.

1,174,223. **Electric Channeling Machine.** A. Ball, assignor to Sullivan Machinery Co., Boston, Mass. For quarrying.

1,174,225. **Spark-Coil.** D. M. Bliss, assignor to Thomas A. Edison, West Orange, N. J. Assembly of core, coil and casing.

1,174,229. **Railway Signaling System.** C. W. Coleman, assignor to Hall Switch & Signal Co., New York, N. Y. Employs pulsating current and selects by frequency.

1,174,230. **Relay.** C. W. Coleman, assignor to Hall Switch & Signal Co. Polarized armatures vibratory in synchronism with current-control switch.

1,174,233. **Locking-Socket for Electric-Lamps.** T. Deaderick, Nashville, Tenn. Key-controlled cam locks base in shell.

1,174,236. **Controlling System.** A. F. Dixon, assignor to Western Electric Co., New York, N. Y. System for controlling perforated transmitter tape.

1,174,240. **Lighting System.** C. F. Dussaud, assignor to Societe Internationale, de Lumiere Froide, Paris, France. Series of movable lights flashed at given point give appearance of fixed lamp and each lamp can cool betwen lightings.

1,174,246. **Support for Electrical Distribution Devices.** J. L. Fay, assignor to W. N. Mathews & Brother, St. Louis, Mo. Pole mounting of cross-arm and fuse boxes.

1,174,252. **Electric Heating Element.** A. H. Happe and W. J. Keep, assignors to the Michigan Stove Co., Detroit, Mich. Mounting in flat case of resistance ribbon on core.

1,174,262. **Telephone System.** E. H. Martin, Webster City, Iowa, and T. H. Ferguson, Oak Park, Ill. Relates to operator's signal control.

1,174,281. **Telegraph System.** P. M. Rainey, assignor to Western Electric Co., New York, N. Y. Central system with automatic operator selection.

1,174,287. **Insulator-Support.** M. C. Rosenfield, Cleveland, O. Structure and securing of hollow post or pin.

1,174,288. **Clamping Device.** M. C. Rosenfield. For securing conductors.

1,174,293. **Controller.** J. E. Seely, assignor to Vulcan Coil Co., Los Angeles, Cal. Rotary drum resistance controller.

1,174,337. **Integrating Mechanism.** E. H. Messiter, assignor to Electric Weighing Co., New York, N. Y. Continuous weighing mechanism: has meter in circuit controlled by load and speed of load conveyer.

1,174,338. **Regulation of Dynamo-Electric Machines.** A. H. Midgley, and C. A. Vandervell, Action Vale, England. Direct-current machine has field regulator controlled by pulsating current from armature.

1,174,352. **Combined Starting and Safety Device.** G. C. Richards, Berkeley, Cal., assignor of one-half to H. C. Austin, Oakland, Cal. Starting motor switch interlocked with clutch to engine.

1,174,367. **Ship's Electric Range.** F. M. Vogel, assignor to General Electric Co., Schenectady, N. Y. Hinged heater units connected to buses beneath by flexible connections.

1,174,373. **Motor Regulation.** E. A. Wright, Norwood, O., assignor to Allis-Chalmers Mfg. Co. Variable speed induction motor with variable load has speed maintained constant below synchronism by secondary regulation and direct-coupled direct-current machine.

1,174,377. **Combination Lamp Protector and Color Cap.** E. G. Appleton, Burlington, Iowa. Of transparent, springy material for snapping over bulb.

1,174,378. **Detachable Plug.** W. S. Bacon, San Diego, Cal., assignor of one-half to O. Kessler. Has push-button-operated collapsible shell.

1,174,379. **Swivel Connection for Electric Conductors.** W. S. Bacon, assignor of one-half to O. Kessler. Has ball bearings.

1,174,383. **Crossing Signal.** L. S. Brach, New York, N. Y. Means for simulating movement of manually swung lantern.

1,174,421. **Light Socket.** W. J. Howe and J. M. Pearring, San Diego, Cal. Locked lamp base requires breaking of fragile, transparent member to unlock.

1,174,427. **Apparatus for Forming Telegraph Tape.** C. L. Krum and H. L. Krum, assignors to Morkrum Co., Chicago, Ill. Key-controlled, magnet-operated.

1,174,434. **Telephone Pay-Station.** G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Coin-controlled, semi-automatic.

1,174,435. **Automatic Locomotive-Controlling Mechanism.** O. H. Naville, La Fayette, Ind. Electromagnetically operated throttle and brake valves.

1,174,443. **Electric Water Heater or Geyser.** J. R. Quain, London, Eng. Electric flash heater for attachment to pipe.

1,174,444. **Heater for Mining and for Other Purposes.** J. R. Quain. Cylindrical heating tool having resistor in casing with shoe at one end.

1,174,446. **Electric Metal-Working Apparatus.** A. F. Reitzel, assignor to Thomson Electric Welding Co., Lynn, Mass. Manner of applying upsetting pressure to the work.

1,174,450. **Track Relay for Block-Signal Systems.** J. J. Ruddick, assignor to United States Electric Signal Co., Boston, Mass. Interlocked magnetically operated switches.

1,174,451. **Automatic Train-Stop.** H. G. Sedgwick, assignor to The National Safety Appliance Co., Mill Valley, Cal. Comprises normally open and normally closed circuits so arranged that if one is ruptured the other will be.

1,174,466. **Process for Electrodeposition of Copper.** S. C. Babcock, Hamburg, and E. W. Hagmaier, Lackawanna, N. Y. Phenol sulphuric acid is added to copper sulphate bath.

1,174,470 and 1,174,471. **Illuminating Appliance.** A. W. Beuttell, Streatham, London, Eng. First patent: Special reflector and plate screen between which is straight filament lamp. Second patent: Special reflector combined with straight filament lamp.

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1,174,478. Insulated Rail-Joint. F. E. Corey, Edgewood Park, Pa. Structure of insulation.

1,174,479. Light Projector for Motion-Picture Machines. J. Darby, assignor to F. B. Griffin and E. C. Wallace, New York, N. Y. Lamp adjustment.

1,174,484. Clamping Device for Electromagnets. L. Ericson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Simple, compact structure for telephone switchboard use.

1,174,491. Automobile Signal. J. M. Glassmeyer, St. Louis, Mo. Electrically lighted direction-indicator.

1,174,492. Bell and Switch-Operating Means. J. G. Glover, Lachine, Can. Push button operates plunger, actuating pivoted switch, which is independently operated by two other push buttons.

1,174,493. Insulated Rail-Joint. L. Griffin, Yonkers, N. Y. Special arrangement of insulation and fish plates.

1,174,503. Automatic Fire-Alarm System. J. M. Johnson, Kansas City, Kan., assignor to The United States Automatic Fire Alarm Co. Controlled by thermostat.

1,174,504. Time-Controller for Electric Currents. J. Jones, assignor to Electric Pest Exterminator Co., St. Joseph, Mo. Variable frequency circuit closer associated with clock dial and operated by minute hand.

1,174,521. Electric Lantern. N. S. Richmond, assignor to Metal Specialties Mfg. Co., Chicago, Ill. For attachment to dry battery.

1,174,548. Electrical Element. F. J. Cook, assignor of one-half to J. E. Doyle and one-half to C. S. Britton, Cleveland, O. Resistor for rheostat or heater.

1,174,554. Thermic Telephone. O. Fischer, assignor to Nammlooze Vennootschap De Nederlandsche Thermo-Telephoon Maatschappij, Utrecht, Netherlands. Structure of heat-conductor carrier. (See cut.)

1,174,563. Dynamoelectric Machine. A. E. Glass and J. M. Downer, assignors to General Electric Co., Schenectady, N. Y. Structure of short circuiting end rings.

1,174,570. Resistance Device. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Tubular resistance unit.

1,174,571. Battery and Switch Casing. E. A. Hawthorne, Bridgeport, Conn. Manner of securing sectional casing.

1,174,573. Automatic Signaling Device. W. F. Hoefs, Milwaukee, Wis., assignor of one-half to A. Grosswitz, Milwaukee, Wis. Direction-indicator displayed by lamp lighting and motor-operated door opened; also audible signal.

1,174,599. Telephone Pay-Station. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Coin-controlled automatic-dial calling device.

1,174,600. Condenser. W. J. Murdock, Everett, Mass. Structure of dielectric in plate condenser.

1,174,607. Insulator Supporting-Pin. C. L. Pierce, Jr., Pittsburgh, Pa. Is integrally forged.

1,174,613. Contrivance for Transmitting Sound to Solid Sound Conductors. E. Ruhmer, Berlin, Germany. Telephone diaphragm connected with solid conductor through vibratory elastic member.

1,174,618. Spark-Plug and Method of Forming the Same. A. Schmidt, assignor to Champion Ignition Co., Flint, Mich. Manner of securing specially formed insulator to nipple.

1,174,654. Alternating-Current Motor. S. R. Bergmand, assignor to General Electric Co., Schenectady, N. Y. Inductance of secondary winding varied in response to speed variation.

1,174,655. Support for Indirect or Semi-Indirect Lighting Fixtures. H. A. Bauer, Lansdowne, Pa. Bowl support.

1,174,658. Shade-Supporting Device. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Manner of securing shade to tubular socket enclosing support attached to ceiling.

1,174,667 and 1,174,668. Process of Fixing Nitrogen and Electric Furnace for Effecting the Same. J. E. Bucher, assignor to Nitrogen Products Co., Providence, R. I. First patent: Treatment in electric furnace having a resistor including a catalyzer of low resistivity. Second patent: Modification.

1,174,676. Vacuum Valve-Tube. E. W. Caldwell, New York, N. Y. Self-regulating.

1,174,678. Brake Mechanism. H. A. Carpenter and A. W. Warner, assignor to Riter-Conley Mfg. Co., Pittsburgh, Pa. Solenoid-operated disk brake for electric motors.

1,174,686. Refillable Fuse-Plug. J. G. Clemens, Buffalo, N. Y. Structural details.

1,174,691. Signaling Device. A. R. Calgin, New York, N. Y. Direction-indicator for automobiles.

1,174,694. Detachable Coupling for Electric Fixtures. J. M. Crucet and M. H. Goldsmith, New York, N. Y. Contacts engage when parts secured by bayonet joint.

1,174,708. Fastener for Telephone Transmitters. A. J. Gattermeier, California, Mo. Details of means for mounting.

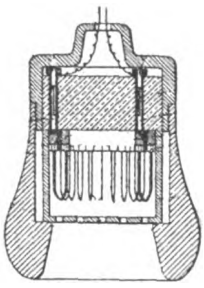
1,174,714. Heating System. G. E. Harrison and J. Templeton, Toronto, Can. Thermoelectric control of admission of steam to radiator.

1,174,715. Electrolytic Electricity Meter. H. S. Hatfield, assignor to General Electric Co., Schenectady, N. Y. Mercury device has provision for caring for air in dome of anode vessel when instrument tilted to restore mercury.

1,174,723. Submarine Torpedo-Discharging Device. H. W. Hills, assignor to L. Lavadan, New Orleans, La. For manipulating electrically controlled magnetic bomb.

1,174,726. Radiotelegraphy. C. Horton, New York, N. Y., assignor of one-tenth to A. M. Henry, Larchmont, N. Y. Sectional primary and secondary coils are relatively adjustable.

1,174,742. Ignition and Charging System. S. L. Lebby, Charleston, S. C. Control of



No. 1,174,554.—Thermic Telephone.

battery-charging and discharging and engine-ignition circuits.

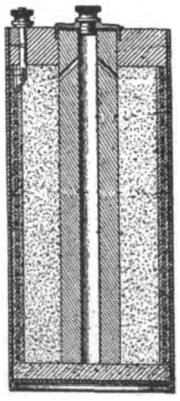
1,174,760. Controlling System for Conveying Means. A. C. Philpott, Bucyrus, Ohio. Main track and turn out for electrically operated carrier system.

1,174,772. System of Motor Control. M. Steiner, assignor to General Electric Co., Schenectady, N. Y. For reversible motors; comprises regulation by variation of generator voltage and field control.

1,174,793. Method of Frequency Transformation. E. F. W. Alexanderson, assignor to General Electric Co. Method of obtaining frequency harmonic to frequency of fundamental current by use of electric valve.

1,174,798. Galvanic Cell. V. G. Apple, Dayton, Ohio. Dry cell has granular material becoming depolarizer on adding liquid. (See cut.)

1,174,805. Train-Stopping Apparatus. J. H. Bennett, Boise, Idaho. Motor-operated



No. 1,174,793.—Galvanic Cell.

mechanism for operating motor switches and controller and engineer's brake valve.

1,174,809. Electric-Conduit Fitting. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. Structure of junction box.

1,174,810. Signaling Device. J. H. D. Blake, Le Mars, Iowa. Centrifugally controlled contact device.

1,174,812. Electromagnetic Piano. G. Breed, assignor to Lyrachord Co., New York, N. Y. Has auxiliary electromagnetic string vibrator.

1,174,813. Electromagnetic Musical Instrument. G. Breed, assignor to Lyrachord Co. Electromagnetically operated pulsator for vibrating strings, controlled at will of operator.

1,174,827. Circuit-Closer for Rain Signals. W. G. Conway, Hartford, Conn. Controlled by disruptible strip.

1,174,854. Railway Safety Device. W. F. Gray, Meridan, Miss. Mounting of dynamo on car truck.

1,174,881. Telephone Bracket. J. B. Ludlum, assignor to J. S. Ludlum, Marion, Ind. Extensible arm.

1,174,887. Magnetic Nail-Holding Device. G. L. Meriwether, Island Grove, Fla., assignor of one-half to V. R. Brice, Island Grove, Fla. Magnetic plates adapted to be secured to hand.

1,174,903. Process of the Treatment of Materials for Impregnating Them Electrosmotically. B. Schwerin, assignor to Elektro-Osmose, Aktiengesellschaft, Frankfort-on-the-Main, Germany. Process of purification of tanning extract and the dressing of hides.

1,174,911. Relay. N. H. Suren, Needham, Mass. Circuit closer having time control.

1,174,935. Railway Signal-Lamp Controller. W. K. Howe, assignor to General Railway Co., Gates, N. Y. For block-signal systems.

1,174,939. Absolute Permissive Automatic Block-Signal System. W. W. Salmon and E. L. Dodgson, assignors to General Railway Signal Co. Signal-circuit controlled by two closed track-circuits.

1,174,944. Molten Bath Process for Fixing Nitrogen and Means for Effecting the Same. J. E. Bucher, assignor to Nitrogen Products Co., Providence, R. I. Process of operating electric furnace to fix nitrogen.

1,174,946. Apparatus for Electro-Osmosis. H. Illig, assignor to Gesellschaft fur Elektro Osmos, M. B. H., Frankfort-on-the-Main, Germany. Structural details of anode, cathode, etc.

Reissue. 14,080. Trap. G. W. K. Fisher, Vancouver, Wash., assignor to Repeater Trap Co. Original No. 1,067,909, dated July 22, 1913. Electrically operated animal trap.

PATENTS EXPIRED.

The following United States electrical patents expired March 14, 1916:

620,900. Means for Lighting Fountains, etc. A. Englesmann, Stuttgart, Germany.

620,907. Trolley Ear. H. Geisenhoner, Schenectady, N. Y.

620,930. Circuit Breaker. T. J. Johnston, Schenectady, N. Y.

620,695. Alternating-Current Motor. E. W. Rice, Jr., Swampscott, and C. P. Steinmetz, Lynn, Mass.

620,966. Induction Motor. E. W. Rice, Jr., and C. P. Steinmentz, Schenectady, N. Y.

620,986. Freqency Changer. C. P. Steinmetz, Schenectady, N. Y.

620,987. Frequency Changer. C. P. Steinmetz, Schenectady, N. Y.

620,988. Self-Starting Alternating-Current Motor. C. P. Steinmetz and E. J. Berg, Schenectady, N. Y.

620,989. Starting Device for Electric Motors. C. P. Steinmetz and E. J. Berg, Schenectady, N. Y.

620,990. Frequency Changer. C. P. Steinmetz, Schenectady, N. Y.

620,996. Electric Arc-Lamp. J. T. Tsachieret, Leballois-Perrett, France.

620,998. Self-Setting Annunciator-Indicator. F. C. Van Dyck, Jr., New Brunswick, N. J.

621,001. Electrical Device Involving Hermetically Incased Conductors. N. G. Warth, Indianapolis, Ind.

621,005. Electric Meter. W. S. Weston, Chicago, Ill.

621,028. Electric Storage Cell. C. P. Elieson, London, England.

621,080. Underground Electric-Railway System and Travelling Collector Therefor. N. Henquin, Schenectady, N. Y.

621,084. Method of Applying Preservative Coatings to Objects or Structures of Iron or Steel. H. L. Hollis, Chicago, Ill.

621,093. Fire-Alarm Box. J. W. Johnson, Chicago, Ill.

621,104. Electric and Combined Electric and Gas Chandelier or Bracket. W. H. Lau, Chicago, Ill.

621,126. Electrical Switchboard Signal. W. E. McCormick, Chicago, Ill.

621,150. Process of Manufacturing Active Compositions for Secondary and Primary Battery Elements. A. Schanschieff, London, England.

622,205. Automatic System for Preventing Collisions on Electric Railways. C. F. Bancroft, Lowell, Mass.

621,210. Apparatus for Supporting Electric Wires and Automatically Cutting Off Current on Breakage of Same. R. Bostock, and F. A. Cheetham, Brighouse, England.

621,241. Electrical Controller. N. K. Garhart, Indianapolis, Ind.

621,263. Electric Switch. A. E. Maccoun, Braddock, Pa.

621,267. Magnetic Lifting Device. A. Monell, Homestead, Pa.

621,291. Electric Incandescent Lamp. F. M. F. Cazin, Hoboken, N. J.

621,292. Electric Incandescent Vacuum Lamp. F. M. F. Cazin, Hoboken, N. J.

Reissue 11,724. Electric Vehicle. K. Knudsen, Chicago, Ill.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, MARCH 25, 1916. No. 13.

EDITORIALS

A YOUNG INDUSTRY.

Fortunate indeed is the industry whose pioneers come into their own as have many of the leaders of electrical development in the past two score of years! The name of Alexander Graham Bell has been inseparably coupled with his great invention for more than a generation, and it was peculiarly fitting that Dr. Bell should have journeyed to Boston a few days ago to unveil in person two bronze tablets marking the birthplace and first complete application of the telephone. Provided by the Bostonian Society and the New England Telephone & Telegraph Company, these memorials add to the already rich historic interest of the Hub, and brief as the exercises were, they were profoundly satisfactory. From a total of two telephones in the world in 1876 to over 15 million today is indeed a development of immense scope, and in view of the achievements of radiotelephony lately accomplished and in prospect, it would be rash indeed to attempt to set a limit to the possibilities of electrical communication. That the electrical industry is still young is wonderfully evidenced by the continued active work of so many of its famous pioneers, sometimes, it is true, in scientific or other lines of their own choosing, but none the less valuable to the world at large.

LIGHTING AND ACCIDENTS.

It has come to be generally appreciated that accidents are more likely to occur in places which are not sufficiently illuminated, and that the cost of adequate illumination is justified upon this score alone. Actual demonstrations of this dependence of safety upon seeing usually result from improving inadequate artificial lighting, whereupon a decreased frequency of accidents is found to follow.

The ban upon generous artificial lighting in the streets of English cities, which has been brought about by the war and the fear of Zeppelin raids, has produced additional evidence upon this subject, but by a reversal of the usual sequence. The darkened condition of the streets at night and in the late afternoons has brought a large increase in the number of accidents in the populous districts, and especially in that class of accidents where automobiles are involved.

The question has been seriously raised as to whether this traffic danger is not more serious than the Zeppelin danger, the endeavor to avoid which has been the means of bringing it into being. This may well be a subject of dispute and differing opinion, but the relation of safety to adequate lighting has received another confirmation.

ARE POWER CONTRACTS PRIVATE?

The constitution of the United States bars out legislation impairing the obligation of contracts and the constitutions of many of the states contain similar provisions. The courts have not given these provisions literal and universal application, since under the common law certain contracts are not enforceable, such as contracts for immoral or illegal purposes, and such as are deemed contrary to public policy. The ordinary police powers of a state are not interpreted to be invalidated by such general provisions of the constitution and when legislation of this type comes in conflict with private contracts, the latter are no longer enforceable, and, moreover, the performance of their provisions may be enjoined, should they conflict with public interest.

The power of the state to regulate the rates and service of public service corporations has been firmly established, subject to the condition that private property shall not be taken for public use without just compensation. The establishment of rates by act of legislature or by a commission created by the legislature for the purpose frequently conflicts with contracts previously made between a company and a customer. Nearly every state commission and every electric power company has experienced instances of this kind. In most instances it is recognized by both parties to such a contract that the contract must thereupon terminate, and the legal rates thereafter be applied. Strength is given to this position by the provision usually found in utility laws which stipulates that there shall be no discrimination shown in the rates to different customers receiving similar service, and the special rates established by private contract would constitute discrimination if they were either higher or lower than those paid by others in the same class.

The courts have generally supported the impairment of contract obligations in cases of this kind, and the Supreme Court of the United States has affirmed this attitude in a number of cases, notably those involving railroad rebates. It is with surprise, therefore, that we note a recent decision of the Supreme Court of the State of Washington, where the right of the Public Service Commission of that state to interfere with a private contract for power between the Washington Water Power Company

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and the Spokane and Inland Empire Railroad Company seems to be involved. This question did not directly come up, however, the ruling being upon the right of the Commission to have the terms of the contract disclosed. A mandamus for this purpose was denied by the court.

Obviously a commission is not in a very good position to determine whether rates are reasonable until it knows what the rates are, nor can it very well carry out the dicta of the Supreme Court in fixing rates without access to the records of the operating company.

ELECTRIC-UTILITY BONDS AS INVESTMENTS.

The financial writer of a daily newspaper is quoted in another column as stating that utility bonds have come into high favor as investments by banks and insurance companies, a great contrast as compared with their attitude some twenty years ago. The innate reliability of the securities of the electric utilities has long been known to the well-informed, but large financial institutions have been slow in coming to a realization of the fact and then in acting upon it. The securities of steam railroads still continue to be received with greater favor than those of electric companies. This is evidenced by market prices for bonds such that the net interest is lower on the average for the bonds of steam railroads than for those of electric utilities. This is contrary to what might be expected from the financial records of the two classes of securities.

About three years ago we published two articles giving specific information on this subject. Statistics compiled for a long term of years showed that the chances of receivership or insolvency proceedings for gas and electric utilities were far less than for steam railroads, which indeed were not much better than the average listed industrial corporation in this respect. The gas and electric average was close to that of the national banks. On the other hand, the net earnings of the electric and gas corporations have not only greatly exceeded those of the steam railroads, but have even exceeded the average of the prominent industrial corporations, in ratio to capitalization. Not only has the risk of receivership been only about one-fifth as great as for steam railroads, and net earnings nearly twice as great, but the earning power is much better sustained. This was beautifully demonstrated a year ago. When business generally was highly disorganized after the outbreak of the European war, the electric power companies not only maintained earnings, but generally took on new business, thus repeating the experience of the panic of 1907.

In spite of all this evidence of the intrinsic superiority of the securities of electric utility corporations, they must continue to pay higher rates for new capital than the steam railroads. This of course is determined by the attitude of the average investor. Why does he continue to give preference to the steam railroad over the electric utility? Ignorance, habit and prejudice are no doubt all involved in the answer to this question. It is often stated that man differs from the lower animals in being a reasoning being. True, he is reasoning, but not reasonable. Confronted with incontrovertible facts, he continues to act from habit and prejudice. He is essentially and inherently conservative. The statesman or politician who avoids subjecting issues to popular vote for fear of radical action displays his ignorance of human nature. You may convince the average man that things should be changed, but he continues to do them in the old way. The carrying out of a reform usually awaits the next generation.

So even the recognition by banks and other financial institutions of the value of electric securities has not sufficed to put them upon a level with railroad securities. Well secured first-mortgage bonds of electric power companies are today being marketed at prices which net the investor as high as 6.5 per cent. At the same time these very securities are acceptable collateral for bank loans at a rate of, say, 4.5 per cent, while money goes begging for loans on commercial paper at as low as 3 per cent, with call money at 2 per cent. These conditions are of course abnormal, and probably will not continue after the end of the war. With money more freely invested, the net rate on electric bonds is likely to come down, which means that market prices on old issues will advance. All of which goes to point out the desirability of present investments in such securities for those who prefer safety with good return to the uncertain allurements of the "war brides."

MAKING THE MOST OF APPLIANCE DELIVERIES.

A recent study of appliance deliveries by a large central-station sales organization disclosed the importance of utilizing every possible occasion to help the customer toward the most satisfactory use of his installation. It seems that in many cases where appliances were delivered by parcel post of by parcel express, the mere cost of placing them in the customer's house or store ran below the expense of distributing such equipment by a special wagon or truck owned by the central station itself. Thus, the average package cost for a year for both parcel post and parcel delivery service was about 13 cents, whereas in a previous year when the company endeavored mainly to handle the deliveries itself, this unit cost was from 75 to 100 per cent greater.

Offhand one might conclude that reliance upon outside organizations specializing in the delivery of apparatus and material of relatively small bulk would therefore be most advantageous; but a deeper study of the situation indicates the contrary. In the first place, the frequent appearance on the streets of a well appointed motor-vehicle bearing the company's name and such effective advertisng of central-station service as occasion requires, is a benefit to the business which cannot easily be overestimated. Here is an opportunity for the central station to secure some highly distinctive publicity, especially in the way of electric sign and flasher effects

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for evening service; and the whole tendency of modern merchandising is toward the maintenance of evening delivery service in large cities and their suburbs. Dwellers in suburban streets are seldom overburdened with outside lighting displays, and a little peripatetic work of this kind will surely attract attention that very properly may be diverted into profitable channels. Why should not the central station's delivery vehicle come to be recognized as a genuine "Chariot of Light," with its appearance varied according to the season of the year and its passage through the regrettable Stygian darkness of many a suburban thoroughfare utilized for all it is worth as a moving example of what can be done with modern lamps?

Even more important is the value both to the central station and to the consumer of giving the latter skilled attention at the time when his appliance goes into service. Electrical conveniences are wonderfully simple, it is true; but a few words of counsel in placing them on the local circuits are very much appreciated. We have known of cases where the failure to replace six-ampere fuses by ten-ampere fuses when a substantial appliance was added to a house-wiring circuit left the family in darkness until the next morning—a not easily excused condition, of course, but one which should be avoided on all counts. If the fuse had been changed at the time of appliance delivery, the customer would have had no difficulty. Again, if the delivery man takes a moment to explain again to the purchaser just how the appliance is to be disconnected, troubles sometimes arising from improper handling of cords, buttons, etc., will be avoided. Many a customer listens to an explanation of the working of an appliance in the company's office downtown, and then forgets just how to secure the best results when he arrives at home, simple though the operation of most appliances is.

When a new appliance goes into use in a home or store, the immediate successful service of it cuts a large figure in the future attitude of the customer toward other electrical conveniences. One would not expect the delivery man to cook a meal for the benefit of the customer when a range is left at the house, of course, but as the customer is often in a very receptive mood at such a time, it seems a pity to let slip the opportunity then afforded to apply the electric service gospel in a practical way. Often the most trifling adjustment is all that is required to secure immediate satisfaction in the use of an appliance, and "every little helps" indeed in increasing the load on the commercial circuits. The advantages of such contact with the customer are too great to be thrown away, even at a moderate increase in the delivery expense of electrical conveniences. We can see no reason why in some cases it would not pay to equip the delivery wagon with a goodly number of light appliances for immediate delivery, supplementing the work of the driver with the services of one of the company's trained salesmen. Electrical development cannot be confined to banking hours if a company is going to fulfill its true mission in its territory and meet all the needs of its customers.

RESIDENCE HEATING.

The convenience and adequacy of the electric heating of residences is brought out in an article in this issue describing an installation in Ottawa, Canada. Uniformity in the supply of power results in uniformity of temperature, and the latter can be easily adjusted by means of the control provided. While the electric current may be used indirectly, hot water or hot air carrying the heat to the rooms where it is desired, it is simpler and, probably more satisfactory in most cases to use direct radiation, or air heaters in each room.

The cost of any electric service is not the only criterion of whether it will be used in competition with other means of satisfying an existing need, and yet it is always a consideration. In most localities, with the prevailing prices for fuel and electric energy, this will be the determining factor, as the prices for electric energy can not usually be reduced to the point where it is financially possible to the average householder to utilize it exclusively for residence heating. For emergency use, however, either in mild or in extremely severe weather, the possibilities are large.

A commission which was appointed in Stockholm, Sweden, to investigate this question from the standpoint of its economic possibilities, made a report in 1914. Experiments were carried out with special reference to the heating of the City Hall, and a comparison made with hot-water heating, using coke for fuel. It was found that 198 kilowatt-hours were equivalent to one hectoliter of coke, provided current were used continuously. Since the conversion of electric energy into heat is complete, this indicates a utilization of 60 per cent of the total heat in the fuel. By intermittent use of electric energy, 120 kilowatt-hours answered as well as the above amount of coke. This is 40 per cent less than the above. For equal cost, with coke at 40 cents a hectoliter, it would be necessary to secure electric energy at one-quarter cent per kilowatt-hour, or if used intermittently at 0.4 cent. Even with hydroelectric plants, such a price can seldom be made to small consumers, if it is to supply the main revenue.

Where energy may be supplied during the winter season as a by-product the conditions are of course altered. The Washington Water Power Company has made experiments in electrically heating its office building in Spokane with surplus power, and finds it feasible both technically and financially. In this case the old steam radiators are retained, and the steam boilers are electrically heated. This equipment has been used for three years, and is soon to be duplicated in a large substation building.

Whether a rate can be made at Ottawa which will permit taking on a commercial load of this kind remains to be seen. The Ottawa Electric Company operates a hydroelectric plant supplying energy at low unit cost, but there have been periods in some winters when the water has failed and the steam reserve station has been called upon to carry the load. This considerably increases generating costs, and makes the problem much more difficult. Its solution will depend largely upon the data supplied by Mr. Ahearn's installation.

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Happenings in the Industry

Securities as Safe Investments—Telegraphic Report of Minnesota Electrical Convention—Trade Press Association Reorganized—Indiana Commercial Men to Meet—Report of Wisconsin Electrical Association Meeting at Milwaukee—Gas-Filled Lamps Discussed at Chicago—Ohio New-Business Convention Report—Annual Meeting of Electrical Manufacturers

Securities of Public Utilities Sought by Banks—Financial Authority Explains Change of Attitude Regarding Safety of Issues.

Had anyone predicted, say two decades ago, that old and first rank bond houses and the bond departments of banks would in time advise the purchase of public utilities securities, he had been put down as a dangerous dreamer; one who should be relegated to the position of messenger or doorman. This is the statement of Boersianer, financial editor of the Chicago *Examiner*, in a recent issue of that publication.

In those days there were only three classes of bonds, with a "safe" label—government, state, municipal and steam railways, particularly the last named.

It mattered not that several states had repudiated their obligations, that there had been hard luck municipalities innumerable, that the panic of 1893 had finally forced one-third of the total railway mileage into bankruptcy, and that rate-cutting and rebating threatened the solvency of the other two-thirds.

Europe could teach the American bond sellers nothing. For decades, the values of approved European industrial companies—specifically public utilities—had taken a place beside older—longer seasoned—issues; were bought liberally by all fiduciary institutions, including, note it well, insurance companies.

The American bond salesman was of the same timidity toward public utilities as had been a little while before the governors of the American stock exchanges who were reluctant to almost downright refusal to admit these securities to the "regular" trading list, though, again, the European bourses had admitted them long ago.

Today, the contrast is startling—save in one highly important quarter. Stock exchanges eagerly invite such listings. Financiers compete keenly for the underwriting of public utilities. Investment houses outbid each other for the bonds. The public—the average investor—buys them readily.

There are reasons. When banks take on increasingly for permanent investment a certain line of securities, such securities inevitably grow in general favor. The record shows that from December 31, 1914, to December 31, 1915, the banks bought $125,000,000 more public utilities bonds than in the previous twelve months.

The banks bought increasingly because the mortality among public utilities is decreasing year by year; for the further reason that net earnings are rising and from the best of all reasons, that the margin of safety is constantly widening.

It may sound like a paradox to say that the safer width comes from closer public supervision of these companies. Officials of public utilities companies have not always a high opinion of state or municipal officiality. There are constant covert charges of ignorance, incompetence, of venality. But after all, state and municipal surveillance—with the enlarged powers conferred on the commissions—has made the operations of these enterprises an open book more or less and has thereby the more guarded the investor.

ELECTRIC COOKING DISCUSSED AT MINNEAPOLIS.

Possibilities of Range Business Pointed Out at Convention of Minnesota Electrical Association.

The practicability of the electric range was the keynote of the discussion on the first day's session of the ninth annual convention of the Minnesota Electrical Association, which was held at Minneapolis, Minn., March 21 and 22. The central-station owner's and manufacturer's viewpoints, as well as customers, together with various problems for introduction of ranges in homes, initial installation costs and rates for energy formed the basis for lively and educational discussion, participated in by large number of members. The discussion resulted in a thorough review of conditions met with by central stations in seeking this business.

The convention began Tuesday morning with a registration of 125, the largest in the history of the Association.

At the opening session, President T. D. Crocker spoke of the prosperity of the section represented by Association members, saying it was unaffected by outside business depression, and that central-station owners in the Northwest can look forward to even greater prosperity with assurance. He stated central stations should fix rate schedules so that the load-factor can be increased, and best efforts should be made to secure large power consumers at high load-factors. He laid stress on need of an efficient legislation committee in the association.

The report of the secretary-treasurer, F. A. Otto, showed the finances of the association to be in a very creditable condition. The membership committee reported the addition of seven new members during the year.

The afternoon session began with a paper by J. D. A. Cross, of Chicago, on "Possibilities and Practicability of the Electric Range." The presentation of this paper was interrupted by the arrival of Mayor Nye, who expressed his cordial greetings to the association in his welcoming address. As a member of an electrical organization himself, he stated his appreciation of the progress of the industry. He cited it as typical of the trend of the world toward better service and conditions. Mr. Cross then continued with his paper. He outlined the distinctive advantages of electric ranges for cooking, such as convenience, cleanliness, uniformity of results obtained and ease of operation. He stated that the heating efficiency of electrical ranges is 75 per cent; that of gas ranges, 25 per cent. He then gave a table of comparative costs on that basis, gas at $1 being equal to energy at 1.75 cents per kilowatt-hour. He gave methods of demonstrating ranges in homes of prospective customers, and stated that the first ranges installed in a city should be closely watched to avoid unfair criticism. Mr. Cross pointed out the desirability of ranges as a central-station load, the average yearly income in a number of states being given at $66. He concluded by saying that electric cooking has too many advantages to be compared with gas or coal.

In the discussion following, R. F. Pack, of Minneapolis, stated that the electric range was too much a piece of electrical apparatus and too costly, but this would be over-

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come in the same manner as with the gas ranges. He emphasized the high diversity-factor, and explained the rates recently put in effect in Minneapolis.

J. C. Bang, of Madison, brought up the question of rearrangement of lines and the problems of metering for range loads. He was answered by quotations from several members giving line changes necessary for about 25 per cent of new customers and averaging $30 per customer.

Ludwig Kemper, of Albert Lea, said the electric range movement was premature, but his remarks met with general opposition. All present favored the movement but seemed to wish better means of introduction of ranges.

George Fiske, of the General Electric Company, next gave a brief summary of progress in flood lighting. His talk was illustrated by a number of excellent slides.

The last paper of the session was that of W. C. Beckjord, of the St. Paul Gas Light Company, on "Rates for Electric Service," which took up the problems involved in a very comprehensive manner. The history of rate-making was reviewed. Data on a hypothetical case of a typical installation were given, showing methods of arriving at correct rate for different classes of consumers. Simplicity of rates for small users was advocated, a block rate being suggested as most satisfactory, with a minimum rate to cover fixed charges. Curves were shown of transformers on typical lighting loads.

The discussion was short, emphasizing in detail points brought out in the paper.

The Association was the guest of the Minneapolis Jovian League at luncheon on Tuesday noon. In the evening a rejuvenation was held at which 80 candidates were taken into the Order.

On Wednesday papers were presented on "Boiler Efficiency," "Rural Extensions" and "Attitude of the Central Station Towards the Consumer." A discussion on concentric wiring was also held. A more detailed report of Wednesday's sessions will be given in our next issue.

Federation of Trade Press Associations Reorganized.

The Federation of Trade Press Associations, composed of trade, technical and class papers representing every phase of industrial and professional occupation in the United States, held a constitutional convention at the Fort Pitt Hotel, Pittsburgh, Pa., on Saturday, March 18, at which resolutions were adopted making effective the immediate reorganization of the association. Heretofore the Federation has been made up of memberships of local associations representing territorial divisions of publishing, including trade press associations with headquarters in Chicago, New York, St. Louis, Philadelphia and Boston, with a number also of affiliated publications not resident in these centers.

Under the new plan of organization membership is by individual publications upon a democratic and national basis, the new organization to be called "The Associated Business Papers." William H. Ukers, publisher of *The Tea and Coffee Trade Journal*, chairman of the Committee on Reorganization, drafted the new constitution and by-laws, which were unanimously adopted.

Committees will be appointed to co-operate with the Federal Trade Commission to secure data relating to the industrial resources of the nation, and with the Bureau of Foreign and Domestic Commerce to carry forward plans for studying and making available to American manufacturers information regarding opportunities for both domestic and foreign trade.

Membership in "The Associated Business Papers" will be based upon rigid adherence to the "Standards of Practice for Business Papers" adopted by the Associated Advertising Clubs of the World, and embodying audited and verified proofs of circulation.

The president was authorized by the executive committee to proceed immediately to carry out the plans contemplated under the reorganization, including the engaging of a permanent secretary and business headquarters, participation in the convention of the Associated Advertising Clubs of the World and preparation of a directory listing the member publications, with stated circulation and proof of audit and information.

The officers were continued until the annual meeting, September 21, 1916, as follows:

President, A. A. Gray, ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago.

Vice-president, W. H. Ukers, *Tea and Coffee Trade Journal*, New York.

Secretary-treasurer, Charles-Allen Clark, *American Paint and Oil Dealer*, St. Louis.

Indiana New-Business Men to Hold Convention.

A convention of the New-Business Committee of the Indiana Electric Light Association will be held at the Elks Club, Kokomo, Ind., on Wedensday, April 19. O. M. Booher, of the Indiana Railways & Light Company, Kokomo, is chairman of the committee and has arranged for a very interesting program which includes a paper entitled "Electric Cooking" by Pierre L. Miles of the Globe Stove & Range Company, a paper by P. H. Palmer of the Indiana Railways & Light Company entitled, "Facts and Figures on Rural Extensions," and a paper entitled "Forecast and Co-operation" by R. A. McGregor and A. C. Riggs, both of the Merchants' Heat & Light Company, of Indianapolis.

These papers are being prepared in advance and submitted to prominent new-business managers of Indiana companies so that a comprehensive discussion of each subject is assured. There will be a luncheon at noon at the Cortland Hotel at which Elwood Haynes will deliver an address on "Tungsten and Its Application to the Electrical Industry."

Electrical contractors and others interested in the commercial development of the electrical industry are invited to attend the convention.

Vermont Hydroelectric Company Expands Activities.

Rapid developments are taking place in the hydroelectric industry in Vermont, where the Hortonia Power Company, of Rutland, is now engaged in tunneling a mountain near Lake Dunmore to tap Silver Lake, where a storage reservoir up in the hills will provide a reserve supply of about 400 million cubic feet of water. A generating plant to be built near the shore of Lake Dunmore will have an ultimate capacity of 7,000 horsepower.

At Hortonia will be a development of about 1,000 horsepower, at Bethel, 1,000 and at Gaysville, 500 horsepower. It is proposed to extend transmission lines south to Brandon, Proctor and Tinmouth, covering an area of rich marble and slate deposits; to Middlebury and Bristol on the north, and from Bethel northeast to the granite region of the central part of the state.

The company owns and operates the Lake Dunmore Power & Traction Company, Neshobe Electric Company, Gaysville Electric Light & Power Company, Bethel Electric Light & Power Company, and White River Electric Company. In addition to the five hydraulic and three steam stations, the company owns undeveloped water powers estimated at 11,750 horsepower.

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IMPORTANT UTILITY PROBLEMS DISCUSSED IN MILWAUKEE.

Wisconsin Electrical Association Considers Regulation, Rates and Street Lighting at Annual Convention.

Regulation of utilities by public service commissions, discussed from both the utility and commission standpoint, was accorded considerable attention at the eighth annual convention of the Wisconsin Electrical Association at Milwaukee, Wis., March 16 and 17. President M. C. Ewing, in the presidential address at the opening session, which was held jointly with the Wisconsin Gas Association, stated that the problems of regulated monopoly are being decided on their merits, but few of the really important principles of regulated monopoly have yet been thoroughly tried out or determined. The continued acquisition of private plants through condemnation in Wisconsin by various municipalities is, he thought, one evidence that regulation is not in all cases proving satisfactory. One of the dangers of regulation is that a considerable percentage of the people have established regulation for the continual enforcements of greater service and the continual reduction in rates. Local politicians, Mr. Ewing said, who have instigated unfair demands, in their disappointment, immediately condemned the commission and direct their efforts to municipal ownership, and condemnation elections are being carried upon prejudice rather than upon sound business principles.

He said the smaller electric street railways have had anything but a bright history and are facing a still darker future.

In regard to legislation affecting public utility companies, Mr. Ewing thought that the only effective method of avoiding unjust legislation is to furnish at public hearings, reliable, truthful and conservative information, opposed to glittering generality, prejudice and misrepresentation. When a proposed measure is unjust, discriminatory and confiscatory, intelligent effort ought to demonstrate that fact and once demonstrated and properly presented to the legislature there is as a rule little danger of bad legislation. The danger lies when utility interests fail to properly present their cases and let them go by default.

"The Attitude of the Wisconsin Railroad Commission on Security Issues" was the subject of an address of Harold L. Giesse, secretary of the Railroad Commission of Wisconsin, in which the question of regulation was discussed from the Commission standpoint. Mr. Geisse referred to criticisms that are frequently made to the effect that commission regulation has curtailed the development of public utilities. He thought that with statistics showing continual development and with recognized improvement of service there is no proof that this criticism is justified. He explained that the Railroad Commission of Wisconsin, as in other states, has no right to refuse an authorization of securities that are within the law.

One of the advantages of requiring authorization from the Commission before issuance of securities is that the priority of liens is definitely ascertained by the Commission. Reference was made to several litigations in which this point was disputed with the result that much difficulty was encountered in effecting reorganization and in some cases investors suffered losses. Mr. Geisse thought that one advantage of regulation was that there is a tendency to stabilize the industry and discourage exploitation of unsuccessful ventures. He pointed out that a promoter must, in order to secure a certificate of convenience and necessity, show ability to raise funds.

F. W. Walker of the Milwaukee Northern Electric Railway, in discussing Mr. Geisse's address, thought the valuation of a utility as made by the Commission for the purpose of authorizing issuance of securities should be the same as a valuation for rate-making. He thought that stockholders are not being protected because the Commission reserves the right to discount the value on which stock is issued for rate-making. He thought further, that the public does not always suffer from unsuccessful ventures and believed that exploitations should be possible. In this connection, mention was made of several interurban railway projects which from a stockholders' standpoint were unsuccessful, but which he thought certainly benefited the communities in which the lines were built. In answer to Mr. Walker, Mr. Geisse called attention to the fact that the laws of the state clearly defined different values for different purposes and it would be unfair to both public and utility to use the same valuation for determining rates as for authorizing security issues.

Utility Legislation in Wisconsin.

An address by John B. Sanborn of Madison, Wis., dealing with a review of state legislation during the past year was presented at the morning session, following the reports of committees. Mr. Sanborn pointed out that although many bills relating to public service companies were introduced in the last legislature, few amendments were made with the exception of the act to regulate jitneys. None of the legislation was enacted in a spirit hostile to public service corporations. He said both the companies and the public have accepted the principle of commission regulation. Modern legislative tendencies in Wisconsin have been to leave to the commission the working out of the detailed utility problems.

In an address by T. E. Lyons of the Wisconsin Tax Commission on "Methods of Taxation of Public Service Companies in Wisconsin," mention was made of the continually increasing taxes. During the year 1915 the increase alone totaled approximately $1,000,000. He said, however, that the tax burden in Wisconsin is comparatively low per capita as compared with other middle western states. Mr. Lyons mentioned some of the difficulties in determining the taxing value of public utilities, the three important considerations being investment, replacement value and earnings.

Rates for Residence Service.

The question of rates for residence electric service was discussed in a paper by A. C. Babson, manager of the Wisconsin Gas & Electric Company, of Watertown, presented at the session on Friday morning. This paper pointed out that the fixed elements in the cost of residence service are the controlling factors in the cost of serving this class of customers. Proper development of the residence business requires the encouragement of the long-hour user which can be done only if the costs are properly divided so that the short-hour user pays the share of fixed expense which he occasions. Mr. Babson said that local conditions must in every case determine the schedule of rates to be employed.

The ordinary residential rate schedules in general use were discussed, particular emphasis being placed on the schedule based on active or counted rooms. The chief disadvantage of the latter is the somewhat complex nature of the rate, although there are many advantages to counteract this feature. Of particular importance is the fact that such a rate does not penalize the use of appliances, nor does it necessitate frequent inspections of the installation, as is true of the rate based on connected load. In advocating this rate Mr. Babson held that the maximum demand of a customer's installation is a function of active rooms rather than number of outlets. With an active room rate, the complete wiring of houses for the many electrical conveniences is encouraged and expensive meter-

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ing devices are unnecessary. The primary rate remains constant and this encourages better illumination and higher intensities, as economy in the use of energy will not lower the high-rate portion of the bill. The experiences of Minneapolis and Milwaukee were cited as examples of successful operation under the active-room rate schedule. In Minneapolis the number of residence customers increased 116 per cent since 1912 when the new rate was inaugurated. During the same time the connected decreased 47 per cent, the annual consumption per customer decreased 9 per cent, the annual use of the connected load increased 71 per cent and the average consumption per kilowatt connected increased 39 per cent. Similar results were obtained in Milwaukee. The number of residential customers increased from 5,908 in 1910 to 22,132 in 1915.

The general effect of such a rate, Mr. Babson thought, was to increase the number of residence customers and at the same time decrease the number of complaints. In regard to this item it was shown that, in Milwaukee, with 11,403 customers in 1912 there were 4,245 complaints; in 1913 there were 14,322 customers and 3,764 complaints; in 1914 there were 17,603 customers and 3,411 complaints, while in 1915 there were 22,132 customers and the number of complaints had decreased to 3,021. Some mention was made of electric cooking and the desirability of offering a low rate for this class of business which, however, should be based on off-peak use.

S. B. Way, of Milwaukee, in discussing this paper referred to the experience of the Milwaukee Electric Railway & Light Company and called attention to the high diversity-factor in residence business. With electric cooking in the western states, the diversity is 6 to 1. A rate based on active rooms, he said, eliminates the need for separate meters for cooking, and also the expense of separate billing, collecting, etc. The rate in Milwaukee for cooking is approximately two cents per kilowatt-hour, which makes electricity competitive with gas, although it is not recommended for heating water. He further thought that with the active-room rate, customers' bills would become stabilized and complaints minimized, particularly in cases where hours of use are long. The 50-cent minimum in effect in Milwaukee has helped to stimulate residential business which has been found profitable by the Milwaukee company.

Mr. Douglas, of Milwaukee, believed that the psychological effect of reducing rates is of as much value in stimulating new business as the actual reduction. He thought it more desirable to reduce the maximum rate from time to time rather than give customers the benefit of the reduction in a schedule such as the active room. In regard to electric cooking, he thought that the peak would occur during the winter peak of the station and this fact must be considered in making rates.

C. H. Shaw, of Sheboygan, and F. A. Pamperin, of Oconto, also discussed the paper. Mr. Pamperin explained that with a two-cent rate no difficulty has been found in securing electric-cooking business and considerable progress has also been made in installing electric radiators and electric water heaters.

Street-Lighting Rates and Contracts.

At the afternoon session the paper entitled "Street Lighting Rates and Contracts" was presented by G. W. Van Derzee, of the Milwaukee Electric Railway & Light Company.

The paper deals quite fully with street-lighting costs considered on a cost of service basis, and the advantages of such form of contract to the municipality are discussed. The condition of termination where service is rendered on a cost basis must necessarily be that the municipality guarantee the integrity of the utility's investment in special street-lighting equipment devoted exclusively to street-lighting purposes.

This paper was discussed briefly by Louis Friedman, of Chicago, Ward Harrison, of Cleveland, and S. B. Way, of Milwaukee. Mr. Friedman thought that central-station companies are inclined to take what they can get for street lighting, rather than make a rate based on the cost of service. Mr. Harrison thought that a depreciation of five per cent on street-lighting equipment should be divided and a higher depreciation rate for lamps and other equipment that is liable to become obsolete in much shorter period, included. Mr. Way thought that because of the low cost of lamps in comparison with other equipment necessary for street lighting it hardly seems necessary to estimate the depreciation separately for lamps and other equipment.

The report of the Committee on Rural Service was presented by W. E. Haseltine, of the Ripon Light & Water Company. This report embodies statistics compiled from a canvass made among central stations of the state. A total of 16 companies replied to questions submitted by this committee. These companies supply a total of 323 customers, having an average connected load of 32.2 kilowatts. The conclusions drawn by the committee are that rural service has not yet reached a point where it can be considered profitable. It is, however, rapidly reaching this point, especially in the more closely settled communities. It was recommended that careful development along sane lines of finance and adequate minimum payments be made; that the farmer be educated in the diversified uses of energy; and that every effort be made to extend high-tension networks, bringing the source of supply closer to the rural communities.

Election of Officers.

At the morning session on Friday a paper by H. W. Young, president of the Delta-Star Electric Company, of Chicago, entitled, "Outdoor Substations," was presented. This was illustrated with stereopticon views showing latest practices in outdoor substation work. At the afternoon session papers were presented by R. M. Howard, of Winona, on "Two Years' Experience in One-Man Car Operation" and by H. O. Seymour, of Milwaukee, on "The Telephone and the Electric Utility." Following these papers there was an informal discussion of the National Electrical Safety Code by S. B. Way of Milwaukee and an informal question box discussion.

The election of officers resulted as follows:

President, W. E. Haseltine, Ripon.
First vice-president, B. F. Lyons, Beloit.
Second vice-president, A. E. Pierce, Eau Claire.
Third vice-president, John St. John, Madison.
Secretary-treasurer, George Allison, Milwaukee.

Proposed Lighting Code Discussed at Joint Meeting of New York Sections.

The proposed Lighting Code was brought forward again on the evening of March 14, at the Engineering Societies Building, New York, at a joint meeting of the Sections of the American Society of Mechanical Engineers and the Illuminating Engineering Society.

The subject was introduced by C. E. Clewell in the form of a paper entitled "Modern Aspects of Factory Lighting and the New Code."

A discussion rather than a criticism was the answer of L. P. Alford, editor of the *American Machinist*, which completed the formal program. A general discussion then followed which was entered into by Messrs. Stickney, Burroughs, Law, Newlin, Bond and Bullard. Written discussion was also read from H. S. Wynkoop.

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Characteristics of Gas-Filled Tungsten Lamps.

A meeting was held in Chicago on the evening of March 16 by the Chicago Section of the Illuminating Engineering Society, at which G. S. Merrill, assistant chief engineer, National Lamp Works, Cleveland, O., presented a paper entitled "Latest Developments in Incandescent Lamps." This was devoted almost entirely to the gas-filled or type C tungsten lamp. Mr. Merrill stated that the manufacturers are continuing lamp research and development, aiming steadily to improve the lamps. He described the general method of manufacturing and the characteristics of gas-filled lamps and pointed out that the degree to which the efficiency can be carried depends on an adjustment between the cost of energy and the cost of lamp renewal. As a rule, the cost of energy supplied to a lamp throughout its life is from 5 to 10 times the cost of the lamp; therefore, even a slight improvement in efficiency is of great value. Mr. Merrill touched on the photometry of these lamps and on their rating.

Lamps for stereopticon use have intensely concentrated filaments and operate at a higher temperature, giving a life from 150 to 200 hours with all-around satisfaction. The quality of the light emitted by the type C lamps accounts largely for their extended use for some special purposes. A close approximation to daylight quality is obtained by operating at high temperatures and by use of a special bulb rich in blue. Mr. Merrill pointed out that the average performance of a lamp is of much greater value than its initial results. He also referred to the need for educating the public in order to get the best service out of these lamps.

The discussion was opened by Preston F. Millar, of the Electrical Testing Laboratories, New York City, who called attention to the fact that while the work on type C lamps has been attracting most attention, the manufacturers have also been improving the vacuum lamps. He also called attention to the inaccuracy resulting from the old horizontal candlepower rating of lamps and strongly advocated the lumen rating; the latter, however, can not be brought about except by a gradual process of education. In lamp tests it is very important to have a large number of samples in order to get truly representative results. An interesting feature developed on testing has been that the small lamps on direct-current circuit lasted longer than similar lamps on alternating-current circuits, although the lamps that were survivors had a higher average candlepower. In general, the average life performance of lamps is fairly good and quite close to the rating. Mr. Millar called attention to the danger resulting from indiscriminate and unscrupulous sale of incandescent lamps improperly labeled, chiefly in the cheaper department and 5 and 10-cent stores.

S. E. Doane, of Cleveland, O., said it was extremely difficult to get proper lamp knowledge to the public. The result is a truly deplorable situation. Much difficulty has been met in making the public understand the value of the lumen rating. It is not generally known that manufacturers have many troubles; for instance, that filaments of seemingly identical purity have strikingly different properties. Filaments are now made to an accuracy within a few hundred-thousandths of an inch. In some special cases the less efficient lamps are needed; for example the concentrated-filament vacuum lamp is particularly serviceable where greater downward illumination is required with certain reflector equipment. Mr. Doane also touched on the value of daylight lamps in stores and stated that lamp salesmen are now in position to sell almost any quality of light desired.

Among others who discussed the subject were Chairman E. W. Lloyd, Morgan Brooks, H. E. Clifford, P. Junkersfeld, G. H. Lukes, P. S. Millar, J. R. Cravath, S. E. Doane and G. S. Merrill. Among the points brought out in the discussion were that American manufacturers have consistently advocated more light for the same money rather than the same light for less money, that the inferior lamps on the market are chiefly the imported types, that the efficiency of the type C lamp is so good that effective screening thereof is not only practical, but highly desirable. Respecting the gas filling, it was shown that argon is particularly advantageous in the smaller lamps only and that the higher lamps employ nitrogen to better advantage.

Residential Service Questions Discussed by Ohio Commercial Men.

The fourth convention of the present New Business Co-operation Committee of the Ohio Electric Light Association was held at the Arcade Hotel, Springfield, O., on Wednesday, March 15, and was no doubt the most enthusiastic meeting that has been held this year.

There were approximately 60 central-station salesmen in attendance connected with the different electric light and power companies in Ohio.

The meeting opened with a few remarks by the energetic chairman of the Committee, J. E. North, the commercial manager of the Springfield Light, Heat & Power Company, of Springfield, O., who introduced Weare Parsons, general manager of the same company, to deliver the address of welcome. Mr. Parsons extended a very hearty welcome to the delegates and told them how thoroughly the Springfield people appreciated the meeting being held in that city and in closing Mr. Parsons outlined briefly something about Springfield's world-known industries.

The first paper on the regular program was presented by E. Burt Fenton, the publicity manager of W. S. Barstow & Company, New York City, entitled "The Golden Rule in the Utility Business." There was a very interesting discussion on this paper, which was entered into by Chairman North, J. C. Matthieu, of the Dayton Power & Light Company; E. A. Beckstein, of the Sandusky Gas & Electric Company, Sandusky; W. A. Wolls, of the Columbus Railway, Power & Light Company, Columbus; W. Parsons of the Springfield Light, Heat & Power Company, Springfield; C. E. Yacoll, of the Mahoning & Shenango Railway & Light Company, Youngstown; and L. C. Spake, of the *Electrical World*, Chicago. Mr. Matthieu stated that it was his idea that the claim, adjustment or complaint department of any electric light company should be under the head of the new-business department, and this idea seemed to meet the approval of the other gentlemen who discussed the proposition. As an outcome of this paper and the discussion thereon, Chairman North reported that the Committee would have someone present a paper on the subject of handling complaints at the next convention of this Committee, which will be held in Newark, O., on Friday, May 12.

The next paper presented was entitled "The Value of Residential Business to the Central-Station Company," by G. A. Lowther, of the Sandusky Gas & Electric Company.

H. S. Gilhams, Jr., of the Westinghouse Electric & Manufacturing Company, Cincinnati, led in this discussion and he was followed by Thomas F. Kelly, of the Dayton Power & Light Company, Chairman North, E. A. Beckstein, of the Sandusky Gas & Electric Company, G. Marmon, of the Columbus Railway, Power & Light Company, and K. Fitzpatrick, Jr., of the Dayton Power & Light Company.

Mr. Gilhams in his discussion of the paper explained the present activities of the Union Gas & Electric Company, of Cincinnati, and told what was being done in connection with the national house-wiring campaign, which is being conducted by the Society for Electrical Development. Mr. Lowther in the discussion stated that an electric iron was given free to the owner of every old house that is wired in Sandusky by the electrical contractor who secured the contract. Chairman North explained the house-wiring proposition that is being conducted at the present time in

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Springfield. Mr. Beckstein explained the campaign that was being started in Sandusky with "Wire Your Home Month," and told that the company is offering to give $1.00 or a carton of Mazda lamps to any of its present customers who turn in the names of house-wiring prospects from whom contracts are secured. Mr. Beckstein advocates the "going after" business in outlying districts on the theory that the gas mains are not extended as far as electric service lines, and by extending into these districts without gas service, as a rule 100 per cent of the business can be secured.

Mr. Marmon stated it was his belief that possibly about 30 per cent of the electrical appliances that are sold in this country are not in actual use, explaining that a great number of them are given as wedding gifts, etc., and if the receivers of these gifts are not living in a wired house, naturally the appliance is nothing more than an ornament. He, therefore, explained how by having more of these unwired houses equipped for electric service, that this number of electrical appliances would be greatly decreased. Mr. Marmon explained the present house-wiring proposition of the Columbus Railway, Power & Light Company, and told of the special offer of wiring a five-room house complete with fixtures for $24.71, and allowing the customer to pay in 10 monthly installments. Mr. Fitzpatrick stated it was his belief that the revenue of the central station could be greatly increased by the education of the electrical contractor to install suitable electrical appliance outlets when wiring houses.

The next paper presented was by Thomas F. Kelly, commercial manager of The Dayton Power & Light Company, entitled "Results Obtained from Kitchen-Service Installations." This paper is abstracted quite fully elsewhere in this issue.

This paper was discussed by Chairman North, F. C. Morrison, of the Ohio Light & Power Company, Newark; W. A. Wolls, of the Columbus Railway, Power & Light Company; E. A. Beckstein, of the Sandusky Gas & Electric Company; and K. Fitzpatrick, Jr., of the Dayton Power & Light Company.

Mr. Morrison stated that his experience with this kitchen service proposition was very similar to that in Dayton and that the revenue being received from electric kitchen service customers was more than anticipated.

Following luncheon, C. E. Ogden, of the Walker Vehicle Company, Cincinnati, presented a paper entitled "Electric Industrial Trucks."

Following the discussion on this paper, A. C. Shepherd, of the Cleveland Electric Illuminating Company, presented a paper entitled "Solving the Heating Problem and Securing the Power Business." This paper was illustrated with many very interesting curves containing information of great value on this subject.

This paper was discussed by J. R. McCoy, of the Columbus Railway, Power & Light Company; B. G. Tarkington, of Hodenpyl-Hardy & Company, Jackson, Mich.; Roscoe Oltz, of the Springfield Gas & Electric Company, Springfield, Ill.; T. D. Buckwell, of the Central Illinois Light Company, of Peoria, Ill.; and F. B. Steele, of the Dayton Power & Light Company.

Messrs. Tarkington, Oltz and Buckwell were in Springfield for this meeting and also to attend a conference of a number of the commercial managers of the Hodenpyl-Hardy syndicate of Michigan, Illinois and Ohio, on March 16, 1916.

After the adjournment the delegates in a body went to the plant of the Robbins & Myers Company, in Springfield, where they were first addressed by Mr. McGilvray, president, and after being given souvenirs, were taken through the plant in small groups under the leadership of very excellent guides.

Annual Meeting of the Associated Manufacturers of Electrical Supplies.

The first annual meeting of the Associated Manufacturers of Electrical Supplies was held on Thursday afternoon, March 16, at the Hotel Biltmore, New York City, about 150 representative manufacturers of the United States being present.

President R. K. Sheppard called the meeting to order and after roll call delivered an interesting and comprehensive address covering the work of the first year of the association, highly complimenting his associates and the committees for the work that had been carried out so thoroughly and capably.

Abstract of Mr. Sheppard's Address.

Happily in the winter of 1914-1915 we American manufacturers of electrical supplies and materials entering into electrical construction found our need of one another. It was a discovery which marks the close of one epoch and the beginning of another in the history of our industry.

Suddenly we discovered that most of the modern world and certainly every other division of the electrical fraternity in this country had far outstripped us in that they had discerned and partially used the power of industrial solidarity. They too had prospered by individualism but in that prosperity had found their common needs and the wisdom and economy of unitedly analyzing their common problems for their common good. They had built powerful organizations which co-ordinated their activities and compelled respectful consideration of their standards by all who dealt with them.

This Association is the result of our awakening. Unique among such organizations it provides for every member one or more jobs in which he may coin his own abundant compensation for effort expended. With an unprecedented variety of detail interests represented by our members, every manufacturer of electrical supplies may fraternize here with his own particular group in an autonomous section.

This entire fabric of co-operation in standardization of products for the benefit of the art and in analagous activities is built to endure only so long as it renders beneficent service both to each member directly and to all collectively. Let none of us selfishly seek here for individual benefits that will not help also our comrades in this movement.

Vital to the life and welfare of this organization was the selection of a general secretary. He must be energetic, experienced in the electrical industry, he must be constructive with the ability to select fundamentals from the heterogeneous multitude of possible activities, he must have a capacity for great visions and the power to transmute those dreams into realities, he must be tactful, discreet, and on confided themes he must be silent as the grave.

The search, begun in March, was ended successfully in June, when your Board of Governors persuaded Charles E. Dustin to throw in his lot with us. With him on duty as our general secretary we stand today on a pinnacle of hope. I now bear grateful testimony to his devotion and efficiency.

I point with unalloyed joy to the activities of ten important sections, with 40 or more division committees in which more than 200 executive and associate representatives of our member companies are genuinely busy solving very many common problems which they could not, would not, or certainly did not discuss together in past years.

Without distinction, without qualification, let me thank you one and all for the part each of you has played already in the rapid development of that comraderie which dominates our section meetings and our meetings of the Board

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of Governors. I know that all of you will gladly endorse the thanks which I extend especially to our lovable and brilliant counsellor and legal adviser, Thomas M. Debevoise, who has given unstintedly his time and his strong intellect to the upbuilding of our organization.

At first your Board of Governors supposed that bimonthly meetings would suffice but after the Association got into full swing last fall the mass of work accumulated for them in two months proved that monthly meetings of the Board must occur regularly except during mid-summer. So fifteen of you, active responsible officers and owners of large business enterprises, are regularly setting aside other important duties to foster and strengthen this co-operative movement. As officers and chairmen of your ten sections and your forty odd committees others of you, men of big affairs, are devoting your time and strength to the specific problems of your divisions of the electrical industry. Are not those facts prima facie evidence of the serious purpose and the dignity of this Association?

Your organization committee tried to provide a plan, at trivial cost to each member company, which in emergencies would enable us easily to consult one another and to act in unison. Those committee members guessed that the dues named in our By-laws would cover the expenses of such a defensive movement. But we found this Association far too valuable to let it hibernate until some great common problem confronted our industry. What would have been the use of putting $8,000 or $10,000 annually into a quiescent, non-remunerative organization when, by expending a few thousand dollars more we can have an enterprise that gives us continually returns for our expenditure, enlarges our activities, contributes to the betterment of standards, reduces friction and abolishes misunderstandings between us and our competitors? While we formed this Association in March, 1915, our general secretary was not discovered and installed until July. None of us was willing to devote time and attention to our secretary's pleadings until we finished our summer outings, and so the formation of new sections began actively only in the fall and present winter months. Ten sections now organized represent tremendous labor expended, how great none but our secretary and counsel know.

The profits on our investment must come from the work those sections are yet to accomplish. Many more sections are waiting and until practically all sections are in running order we must consider that we still are in the organization period. Your Board of Governors forecasts the completion of this organization period in about another year.

Your general secretary in his report will tell you of some important connections already established between this Association and other bodies such as (1) the Federal Trade Commission, (2) the Bureau of Standards of our Federal Government, (3) the Underwriters' Laboratories, Incorporated.

You will remember that at our gathering on March 9, 1915, before this Association organized, and subsequently at the Bi-Annual Open Meeting of the Electrical Committee of the National Fire Protection Association a large and representative body of men was asked to study the question of grounded versus all insulated electrical circuits in American building construction, first as to safety to life, secondly as to safety from fire, and third as to possible methods of interior wiring of existing buildings which will be safe, inexpensive, and not unsightly.

Later I shall call upon Mr. LeRoy Clark to tell you of the work done and to be done by that large committee, whose members represent about one dozen manufacturing concerns and the following associations and institutions: American Institute of Electrical Engineers, Associated Factory Mutual Fire Insurance Companies, National Electrical Supply Jobbers' Association, International Association of Municipal Electricians, Massachusetts Institute of Technology, National Electrical Contractors' Association, National Electric Light Association, Bureau of Standards of our Federal Government, Western Association of Electrical Inspectors, Underwriters' Laboratories, Inc., and Associated Manufacturers of Electrical Supplies.

Some of our sections and their committees have met from time to time during this past year with representatives of the National Electric Light Association with subcommittees of the Standardization Committee of the American Institute of Electrical Engineers, and with other authoritative bodies for the discussion of subjects of mutual interest. In the coming year similar conferences will occur frequently and the decisions obtained will be of increasing importance and interest to the electrical industry.

Today the popular cry is for preparedness and synchronizing with the martial note in that call is the vibration of the industrial chord which interests you and me. Perhaps you observed in the public press a few weeks ago an article purporting to tell of an interview with a prominent engineer, who, if I remember rightly, was said to be an official of the American Institute of Mining Engineers. In that article was described a plan which provides that our various American engineering societies shall obtain from all manufacturers complete statistics as to their factory equipments, capacities for production, classes of goods now made and which possibly can be made with the machinery therein, and voluminous similar data.

To the Chief of Staff of the Army, the Secretary of War on February first last referred a letter in which your president with the approval of the Board of Governors told the Federal Government at Washington that our Association, by reason of its unique organization, is particularly well equipped to assemble from its members all such data as may be needed from the manufacturers of electrical supplies. Whether or not those statistics are ever demanded of us by our government, I submit for your consideration the thought that every member of this Association needs that kind of properly assembled data relative to his particular line of manufacture, summarized in such manner and under such assured privacy as will prevent improper disclosures about the equipments of individual or specific factories or plants. When pressure of much business tempts you to increase your facilities your judgment will err less often if you have that information. When scarcity of orders and extremely low prices distract you your business sense, which tells you to curtail production, will secure the poise which accompanies accurate knowledge of possible total production versus actual demand.

In public speeches in recent months members of the Federal Trade Commission, and notably Edward N. Hurley, vice-chairman of the Commission, have laid great emphasis upon the importance of common and united action by the members of such trade associations as ours "looking toward improving their processes of manufacture, standardizing their products, improving their systems of ascertaining costs, obtaining credit information," and the like. I commend all such activities to the thoughtful consideraion of our section members.

You are aware that the electrical manufacturers of this country are quite naturally divided into two great classes: (1) The manufacturers of electrical apparatus including generating machinery, transformers, motors, etc. (2) The manufacturers of electrical supplies and of materials entering into electrical construction. To the former the doors of the Electric Power Club are open. Our Association opens its doors to all of the latter class.

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A third organization, the Electrical Manufacturers' Club, has gathered into intimate association with one another a large number of men who hold official positions of more or less importance in many of the manufacturing companies who are members, or are eligible to be members, of the Electric Power Club, or of the Associated Manufacturers of Electrical Supplies.

Manifestly co-ordination of the activities of the two standardizing associations, and non-duplication by one of the work accomplished in the other, are exceedingly important matters for both organizations.

All three of the organizations just mentioned ought to foster a lively, sympathetic and co-operative interest in the activities of each.

To provide a simple and useful medium of intercommunication those three organizations have appointed four representatives each, making twelve men in all, who now have organized the Electrical Manufacturers' Council.

Miscellaneous Business.

The reports of the treasurer, J. W. Perry, and of the general secretary, Charles E. Dustin, were read and accepted. From the secretary's report it was shown that the present number of member companies is 143, while executive and associate representatives number 215. There are now ten Sections in active operation: Fuse Section, Interior-Conduit Section, Knife-Switch Section, Lamp Receptacle and Socket Section, Molded or Formed-Insulation Section, Outlet-Box Section, Panelboard and Switchboard Section, Porcelain Section, Snap-Switch Section, Wire and Cable Section. Several new Sections are in process of formation, embracing Heating and Current-Consuming Devices, Electrical Fixtures, Fan Motors and other lines.

The chairmen of the various committees presented valuable reports of progress. Chairman LeRoy Clark, of the Committee on Concentric Wiring, stated that this form of wiring had met with only slight favor in limited fields. All the committee reports and those of officers, including the president's address in full, are to be printed and a copy sent to each member of the Association. It was announced that during the coming year it is planned to enlarge greatly the work of the Association, and permanent headquarters will be established in New York, with commodious conference and committee rooms.

The following-named gentlemen were elected Governors: For three years—LeRoy Clark, New York; J. W. Perry, New York; W. C. Robinson, Pittsburgh; J. J. Gibson, Pittsburgh, and Warren Ripple, South Bend, Ind.; for two years E. B. Hatch, Hartford, and L. W. Downs, Providence.

After adjournment of the general meeting the Governors met and elected the following officers for the ensuing year:

President, R. K. Sheppard.

Vice-president, H. B. Crouse.

Treasurer, J. W. Perry.

General secretary, Charles E. Dustin.

In the evening a banquet was held at Delmonico's, with a full attendance, and interesting addresses were delivered by Dr. Talcott Williams, of Columbia University, and J. A. Emery, of the National Association of Manufacturers.

The Associated Manufacturers of Electrical Supplies was organized a year ago, and numbers the following list of member companies, as of March 16, 1916:

List of Members.

A. A. Wire Company, Newark, N. J.; Adapti Manufacturing Company, Cleveland, Ohio; Alphaduct Company, Jersey City, N. J.; American Circular Loom Company, New York, N. Y.; The American Conduit Manufacturing Company, Pittsburgh, Pa.; Frank Adam Electric Company, St. Louis, Mo.; American Electric Works, Providence, R. I.; American Enameled Magnet Wire Company, Muskegon, Mich.; American Vulcanized Fibre Company, Wilmington, Del.; Appleton Electric Company, Chicago, Ill.; Ansonia Electrical Company, Ansonia, Conn.; The Arrow Electric Company, Hartford, Conn.; Atlantic Insulated Wire & Cable Company, New York, N. Y.; Belden Manufacturing Company, Chicago, Ill.; Benjamin Electric Manufacturing Company, Chicago, Ill.; Best Electric Company, Pittsburgh, Pa.; Bishop Gutta Percha Company, New York, N. Y.; Black & Boyd Manufacturing Company, New York, N. Y.; The W. A. Bonnell Company, New York, N. Y.; Boston Insulated Wire & Cable Company, Dorchester District, Boston, Mass.; Boonton Rubber Manufacturing Company, Boonton, N. J.; Bourn Rubber Company, Providence, R. I.; James F. Burns, Philadelphia, Pa.; The Bryant Electric Company, Bridgeport, Conn.; Cassidy & Son Manufacturing Company, New York; Edward T. Caldwell & Company, New York; Central Tube Company, Pittsburgh, Pa.; Chase-Shawmut Company, Newburyport, Mass.; Chicago Fuse Manufacturing Company, Chicago, Ill.; Chicago Insulated Wire & Manufacturing Company, Chicago, Ill.; The Colonial Sign & Insulator Company, Akron, Ohio; Collyer Insulated Wire Company, Pawtucket, R. I.; Condit Electric Manufacturing Company, Boston, Mass.; The Connecticut Electric Manufacturing Company, Bridgeport, Conn.; Crescent Insulated Wire & Cable Company, Trenton, N. J.; Crouse-Hinds Company, Syracuse, N. Y.; Cuthbert Electric Manufacturing Company, Chicago, Ill.; The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; George Cutter Company, South Bend, Ind.; Cook Pottery Company, Trenton, N. J.; D & W Fuse Company, Providence, R. I.; Detroit Fuse & Manufacturing Co., Detroit, Mich.; Detroit Insulated Wire Company, Detroit, Mich.; Dickinson Manufacturing Company, Springfield, Mass.; Duranoid Manufacturing Company, Newark, N. J.; Eastern Flexible Conduit Company, Brooklyn, N. Y.; The Electric Cable Company, New York, N. Y.; The Electric Storage Battery Company, Philadelphia, Pa.; Electrose Manufacturing Company, Brooklyn, N. Y.; Enameled Metals Company, Pittsburgh, Pa.; Empire China Works, Brooklyn, N. Y.; I. P. Frink, New York; Freeman Electric Company, Trenton, N. J.; General Bakelite Company, New York; General Electric Company, Schenectady, N. Y.; General Insulate Company, Brooklyn, N. Y.; B. F. Goodrich Company, Akron, Ohio; Habirshaw Wire Company, Yonkers, N. Y.; Hart & Hegeman Manufacturing Company, Hartford, Conn.; Hart Manufacturing Company, Hartford, Conn.; Harter Manufacturing Company, Chicago, Ill.; Hartford Faience Company, Hartford, Conn.; Hazard Manufacturing Company, Wilkes-Barre, Pa.; Hemming Manufacturing Company, Garfield, N. J.; Hotpoint Electric Heating Company, Ontario, Cal.; Harvey Hubbell, Inc., Bridgeport, Conn.; Illinois Electric Porcelain Company, Macomb, Ill.; Imperial Porcelain Works, Trenton, N. J.; Indiana Rubber & Insulated Wire Company, Jonesboro, Ind.; Industrial Controller Company, Milwaukee, Wis.; H. W. Johns-Manville Company, New York, N. Y.; Johns-Pratt Company, Hartford, Conn.; Keasbey & Mattison, Ambler, Pa.; Kerite Insulated Wire & Cable Company, New York, N. Y.; Killark Electric Manufacturing Company, St. Louis, Mo.; The Krantz Manufacturing Company, Brooklyn, N. Y.; Locke Insulator Manufacturing Company, Victor, N. Y.; J. B. McCoy & Son, New York; The Macallan Company, Boston, Mass.; Manhattan Electrical Supply Company, New York, N. Y.; Marconi Wireless Telegraph Company, New York, N. Y.; Mark Manufacturing Company, Evanston, Ill.; Marion Insulated Wire & Rubber Company, Marion, Ind.; Metropolitan Electric Manufacturing Company, Long Island City, N. Y.; Metropolitan Engineering Company, New York, N. Y.; Alfred F. Moore, Philadelphia, Pa.; Mutual Electric & Machine Company, Detroit, Mich.; National India Rubber Company, Bristol, R. I.; National Carbon Company, Cleveland, Ohio; National Metal Molding Company, Pittsburgh, Pa.; Newton Manufacturing Company, Lynbrook, L. I.; New York Insulated Wire Company, New York, N. Y.; Northern Electric Company, Ltd.; Montreal, P. Q., Can.; Nungesser Carbon & Battery Company, Cleveland, O.; Nyelec Switchboard Company, New York, N. Y.; Ohio Brass Company, Mansfield, O.; Otis Elevator Company, New York, N. Y.; The Okonite Company, New York, N. Y.; W. R. Ostrander & Company, New York, N. Y.; Overbagh & Ayers Manufacturing Company, Chicago, Ill.; The H. T. Paiste Company, Philadelphia, Pa.; Palmers & DeMooy Foundry Company, Cleveland, O.; Pass & Seymour, Inc., Solvay, N. Y.; Perkins Electric Switch & Manufacturing Company, Bridgeport, Conn.; Phillips Insulated Wire Company, Pawtucket, R. I.; Pittsburgh High Voltage Insulator Company, Derry, Pa.; Pittsburgh Lamp, Brass & Glass Company, Pittsburgh, Pa.; Plume & Atwood Manufacturing Company, Waterbury, Conn.; Portland Monson Slate Company, Portland, Me.; Pratt-Chuck Company, Frankfort, N. Y.; Pringle Electrical Manufacturing Company, Philadelphia, Pa.; L. Plaut & Company, New York; J. A. Roeblings Sons Company, Trenton, N. J.; Rome Wire Company, Rome, N. Y.; Safety Armorite Conduit Company, Pittsburgh, Pa.; Safety Insulated Wire & Cable Company, New York, N. Y.; Saylor Electric & Manufacturing Company, Pittsburgh, Pa.; Siemon Hard Rubber Corporation, Bridgeport, Conn.; Simplex Wire & Cable Company; Boston, Mass.; Standard Underground Cable Company, Pittsburgh, Pa.; Star Porcelain Company, Trenton, N. J.; Steel City Electric Company, Pittsburgh, Pa.; Sterling Bronze Company, New York; Tabulating Machine Company, Washington, D. C.; Thomas & Betts Company, New York, N. Y.; R. Thomas & Sons Company, East Liverpool, Ohio; Thompson Electric Company, Cleveland, Ohio; Trenton Electric & Conduit Company, Trenton, N. J.; E. T. Trotter & Company, Brooklyn, N. Y.; Trumbull Electric Manufacturing Company, Plainville, Conn.; Tubular Woven Fabric Company, Pawtucket, R. I.; Union Electric Company, Trenton, N. J.; V. V. Fittings Company, Philadelphia, Pa.; Waterbury Button Company, Waterbury, Conn.; Weber Electric Company, Schenectady, N. Y.; Western Electric Company, New York, N. Y.; Wakefield Brass Company, Vermilion, Ohio; Western Conduit Company, Youngstown, Ohio; The Wirt Company, Philadelphia, Pa.; Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; Wm. Wurdack Electric Manufacturing Company, St. Louis, Mo.; Waclark Wire Company, New York; Yost Electric Manufacturing Company, Toledo, Ohio.

The Board of Governors now consists of the following gentlemen, representing the companies named:

A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; Charles Blizard, Electric Storage Battery Company, Philadelphia, Pa.; LeRoy Clark, Safety Insulated Wire & Cable Company, New York; H. B. Crouse, Crouse-Hinds Company, Syracuse, N. Y.; D. C. Durland, Sprague Electric Works, General Electric Company, New York; J. J. Gibson, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; H. Holmes, R. Thomas & Sons Company, East Liverpool, Ohio; J. F. Kerlin, National Carbon Company, Cleveland, Ohio; J. W. Perry, H. W. Johns-Manville Company, New York; W. C. Robinson, National Metal Molding Company, Pittsburgh, Pa.; B. E. Salisbury, Pass & Seymour, Inc., Solvay, New York; R. K. Sheppard, Simplex Wire & Cable Company, Boston, Mass.; E. B. Hatch, Johns-Pratt Company, Hartford, Conn.; L. W. Downes, D. & W. Fuse Company, Providence, R. I.; Warren Ripple, George Cutler Company, South Bend, Ind. Thomas M. Debevoise is general counsel.

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Miscellaneous NEWS NOTES

Directory of Electricians in Massachusetts.—A 220-page booklet, giving the names and addresses of licensed electricians of both the Masters' (Class A) and the Journeymen's (Class B) grades has been issued by the State Board of Electrical Examiners of Massachusetts. The list is arranged by cities and towns, and is a convenient handbook for use in checking up authorized electricians in the state. The laws relating to the licensing of electrical workers are also presented.

Frank J. Sprague Addresses New York Electrical Society.—At the meeting of the New York Electrical Society held the evening of March 24, Frank J. Sprague, who is an ex-officer of the United States Navy, delivered an address entitled "A Month With the Atlantic Fleet During Battle Maneuvers, Drills and Target Practice." The information upon which this address was based was obtained on a trip undertaken by Mr. Sprague in his official capacity as a member of the recently organized Naval Consulting Board.

New Orleans Jovians to Hold Electric Show.—Plans are being rapidly completed for a comprehensive electrical show to be given by the New Orleans Jovian League on April 10 to 15. W. E. Clement is chairman of the committee on arrangements and states that much enthusiasm has already been aroused and that New Orleans manufacturers and dealers of electrical supplies and appliances have all pledged their support and many out-of-town dealers have indicated a desire to maintain extensive exhibits.

City Purchases Light Plant.—An agreement has been reached between the City Commission of Pratt, Kans., and the representatives of the Pratt Light Company, providing for the taking over of the latter's electrical distribution system, together with all poles, switchboards, engines, generators and other electrical appratus. The city will pay $23,000 to the old-plant stockholders for the electrical properties and in addition the franchise under which the company now operates will be canceled. An approval of this action will be sought at the regular spring election, at which time, the city will be asked to vote on the proposed bonds.

American Institute Nominees.—The Board of Directors of the American Institute of Electrical Engineers has selected the following names as "directors nominees" for election of officers for the next fiscal year beginning August 1, 1916: President, H. W. Buck, New York City; vice-presidents (three to be elected), L. T. Robinson, Schenectady, N. Y., Peter Junkersfeld, Chicago, Ill., B. A. Behrend, Boston, Mass., Henry A. Lardner, New York City; managers (four to be elected), John B. Fisken, Spokane, Wash., Charles Robbins, Pittsburgh, Pa., N. A. Carle, Newark, N. J., Charles S. Ruffner, St. Louis, Mo.; treasurer, George A. Hamilton, Elizabeth, N. J.

Tablets Commemorating Telephone Inception Dedicated at Boston.—Two bronze tablets marking the site of the buildings in which the telephone was developed, at Boston, Mass., were dedicated March 13 by Alexander Graham Bell. One tablet is located on the front of a theater at 109 Court Street, where stood the building in which the early experiments of Dr. Bell and his associates were carried on; and the other tablet is on the building at 5 Exeter Place, where the first words were transmitted over a telephone wire. The tablets were erected by the Bostonian Society and the New England Telephone & Telegraph Company. In the evening of March 13 Dr. Bell addressed a large audience at the City Club, recounting the early struggles and the wonderful development of the telephone industry.

Detroit Edison Company Publishes House Organ.—The Detroit Edison Company has inaugurated the publication of a monthly house organ which is termed the "Synchroscope" and which, it is stated, will deal with all inter-departmental activities of the company. The March issue contains an interesting article on "Load-Water-Rate Curves Applied to Plant Operation," by W. A. Hirt, and an article on electric steel furnaces by E. L. Crosby. The company's pulmotor service and the testing and research laboratories are also described.

Generation of Energy by Steam Twice as Costly as by Water Power.—The city of Seattle's municipal lighting plant paid $56,160.16 for the generation of energy at the hydroelectric power plant at Cedar Falls, and $112,466.26 for the generation of energy at the Lake Union steam auxiliary plant in Seattle. According to a report of the Bureau of Inspection and Supervision of Public Offices at Olympia, the cost of generating by steam in the case of the city of Seattle was twice as expensive as generating by water during the year 1915.

Street Railway Commissioner Advocated for Minneapolis.—Creation of the office of Street Railway Commissioner, to which only a technically educated man would be eligible, to look after the city's interest under the proposed new street-railway franchise of Minneapolis, Minn., was advocated by Charles L. Pillsbury, consulting engineer, in an address to the Central Franchise Committee at the Dyckman Hotel, Minneapolis, on March 14. Mr. Pillsbury, whose company is working on the valuation of the utilities of Washton, D. C., in the course of his address presented to the committee the main factors that he believed should enter into the franchise provisions in regard to service, rates and values.

New Electrolytic Plant at Boston.—The Boston Electrolytic Oxygen Company, a new enterprise organized by Tenney interests, has been incorporated with a capital stock of $150,000 and has begun the manufacture of compressed oxygen and hydrogen gases at works in Everett, Mass.

The process, which is covered by patents giving the company rights for the United States and its possessions, consists of electrolysis of distilled water which produces oxygen guaranteed 99.3 per cent pure and hydrogen 99.9 per cent pure. The oxygen gas is compressed in metal cylinder tanks and distributed by auto trucks in the Boston territory.

Rejuvenation in Louisville.—A Jovian rejuvenation was held at Louisville, Ky., on March 17, at the Seelbach Hotel, at which the 42 candidates were initiated. The ceremonies followed the annual banquet of the organization, at which the candidates were guests. Robert Montgomery, First Tribune, presided as toastmaster, and introduced Donald McDonald, vice-president and general manager of the Louisville Gas & Electric Company; Frank H. Miller, president of the Jovian League; Judge Matt O'Doherty, counsel for the Gas & Electric Company, and James Clark, Jr., one of the first of the Kentucky Jovians, who all made talks.

Arrangements for Ohio State Electrical Show.—The Ohio State Electrical Show will be held April 27, 28, 29, 1916, at Columbus, O. The best engineering companies of the country will be represented and their exhibits will give the public the opportunity of comparing advantages and disadvantage, developments and improvements of everything electrical. Lectures will be given on high-frequency work, modern inventions, X-Ray and other subjects which every one desires to know more about. This show which is given only once every two years is held under the auspices of the Ohio State University, Columbus, O.

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Electric Heating of a Canadian Residence

President of the Ottawa Electric Company, a Pioneer in Electric Heating, Has Equipped His Residence With Exclusively Electric Heating System—Complete Satisfaction and Uniform Temperature Result—Description of Equipment Used

The electrical heating of residences has received little attention in the eastern portion of the United States and Canada, as the general availability of cheap fuel in these districts has made electric heating seem too expensive a proposition for consideration. This feature has not, however, prevented experimentation along this line and one of the pioneers in this field, Thomas Ahearn, of Ottawa, Canada, has completely equipped his home with electric heating apparatus.

Mr. Ahearn is a pioneer inventor of electric heating devices. Some of his early work along this line was described in the WESTERN ELECTRICIAN for July 23 and October 22, 1892. At that time Mr. Ahearn equipped the electric street cars of Ottawa first with electric heaters using a hot-water distributing system, and later with electric air heaters. Electric heating equipment for supplying hot water for the use of barbers, druggists and even for household purposes was installed at that time, the equipment being manufactured by the firm of Ahearn & Soper, Limited. Mr. Ahearn also installed some heating equipment in his residence about the same time, reference to which will be made later.

Not finding very great commercial possibilities for electric heating at that time, this branch of the firm's business was not given very much attention, although electric cooking apparatus was designed and an exhibit of such apparatus was awarded a gold medal in 1892 by the Exhibition Association of Central Canada. The front of this medal is shown in Fig. 6. Upon the other side of the medal appears the following inscription: "Awarded to T. Ahearn for exhibit of electric cooking and heating devices." This exhibit was a working demonstration and specimens of the products of the electric oven were distributed to visitors. About the same time, namely, on August 29, 1892, an electric dinner was served at the Hotel Windsor, Ottawa, every item of which was cooked by the heating appliances of Mr. Ahearn. The bread and meats were cooked in an electric oven and the liquids in other electric heaters. The apparatus was installed at this time in the building of the Ottawa Traction Company, in which also Messrs. Ahearn and Soper were interested. They also introduced electric street cars into Ottawa. Mr. Ahearn was at that time and still continues to be president of the Traction Company. He has also been largely interested in the development of Ottawa's other utilities and is president of the Ottawa Electric Company, the Ottawa Gas Company, the Ottawa Light, Heat & Power Company, the Ottawa Car Manufacturing Company, and has a number of other business connections.

Mr. Ahearn decided to heat his home entirely by electricity during the present winter and for that purpose installed in his residence a number of air heaters of the type manufactured by the Consolidated Car Heating Company. This residence, which is a large detached house shown in Fig. 3, was formerly heated by steam. The house steam plant was shut down and has not been in use during the present winter.

The electric heating system employed involves three different elements. In the first place, there are a number of the old electric heaters made in the early days by Ahearn & Soper. These are cylindrical in shape with the axis vertical, and are designed to induce a current of air through

Fig. 1.—Library With Electric Heater Under Window and Control Switch to Left.

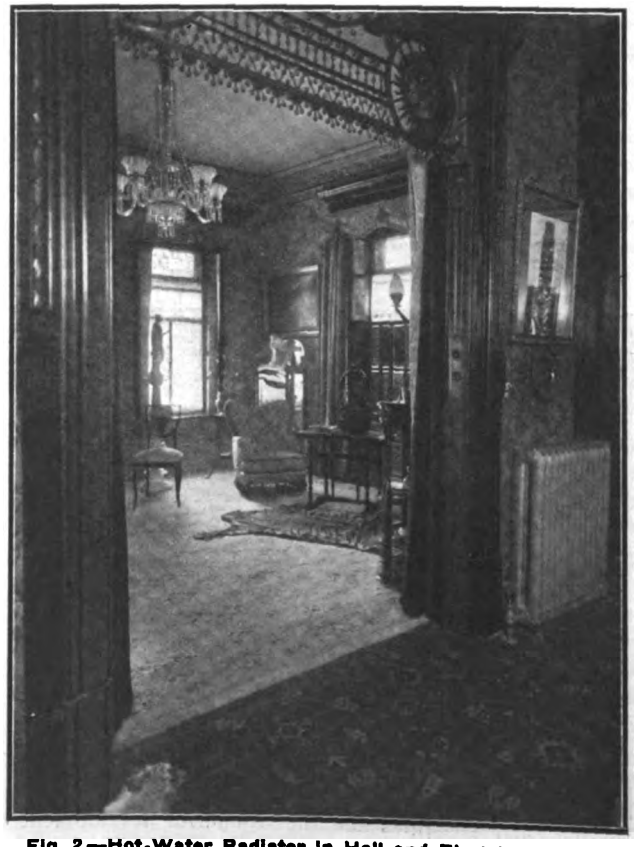

Fig. 2.—Hot-Water Radiator in Hall and Electric Heater in Drawing-Room.

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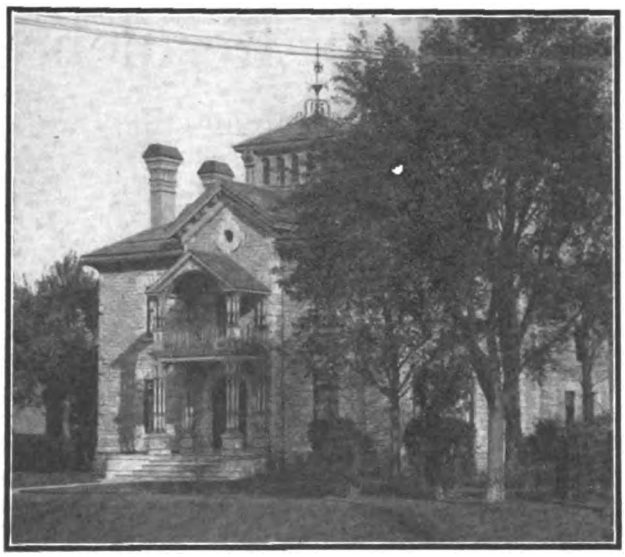

Fig. 3.—Exterior of Mr. Ahearn's Residence.

an opening through the bottom of the heater, the air becoming heated during its passage. There are eight of these small heaters now in service, each taking about 6.5 amperes from the 107-volt lighting circuit.

The new air heaters which were installed last fall are 17 in number and are connected to a special circuit supplied by an individual transformer, which is mounted upon a pole outside of the building, service being brought into the basement through an underground cable. This cable terminates at the panelboard shown in Fig. 5. This panelboard provides for 20 local circuits, each supplied with a switch and fuses. These circuits are wired in conduit which can be seen just above the cabinet, and a blueprint on the cabinet door indicates the location of the heater attached to each one of the outgoing circuits. Each of these heaters has four elements in parallel, each element taking approximately five amperes. A gang switch permits any desired number of these elements to be utilized at any time. One of these heaters is installed under the front window of the library on the first floor, shown in Fig. 1. The flush switch, just referred to, may be seen to the left of the window. In a number of the rooms, the heaters are placed in a similar manner, under the windows, but in certain of the rooms they are mounted in the room away from the wall. In every case the heater is supplied with a deflector which throws the hot air forward. For the heaters mounted in the wall as shown in the library, a double deflector is provided, with an air space between the two sheets of metal.

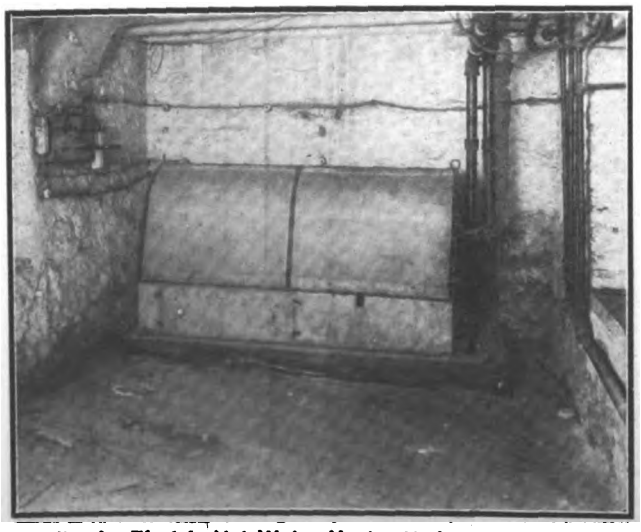

Fig. 4.—Electric Hot-Water Heater Under Front Hall, Installed in 1895.

This is intended to prevent a loss of hot air which might find its way into the wall between the stonework and interior finish.

The third element in the heating system consists of the hot-water radiators in the front hall, supplied with hot water from an electric heater in the basement. The basement heater is shown in Fig. 4 and was installed in 1895. It is supplied from a 550-volt street-railway circuit through the switch shown in the left of this illustration. There are two elements in this heater, each taking approximately six amperes. One of the radiators is shown in Fig. 2. The doorway shown in this figure leads from the hall into the drawing room. Under the window of the drawing room is an air heater similar to that installed in the library. The other window seen to the left is still equipped with an unused steam radiator.

This electric heating system has given excellent satisfaction, the house being kept at a comfortable temperature in all kinds of weather. The only attention required is the occasional changing of a switch by simply pushing the button, in case it is found the amount of energy being used is not suited to the prevailing weather. Ottawa experiences severe winter weather at times, but it has not been found necessary to use the entire capacity of the heating system at any time. Most of the switches are set during midwinter with three elements of the heater in use, although some are utilized at one-half capacity. A very uniform temperature is maintained in the house night and day, as is evidenced by the records of a recording thermometer which is kept in operation in the library. Each record covers operation for one week and one of these records is shown in Fig. 8. The record runs from February 17 to February 24, 1916, with an overlap of a few hours. The outdoor temperature during one night of this week (Sunday, February 20) reached 20 degrees Fahrenheit below zero. Nevertheless, the temperature varied only between the limtis of 68 and 75 degrees, with the exception of one day when a gas log in the room was ignited. Upon this occasion the temperature rose in one hour from 70 to 77 degrees. It soon

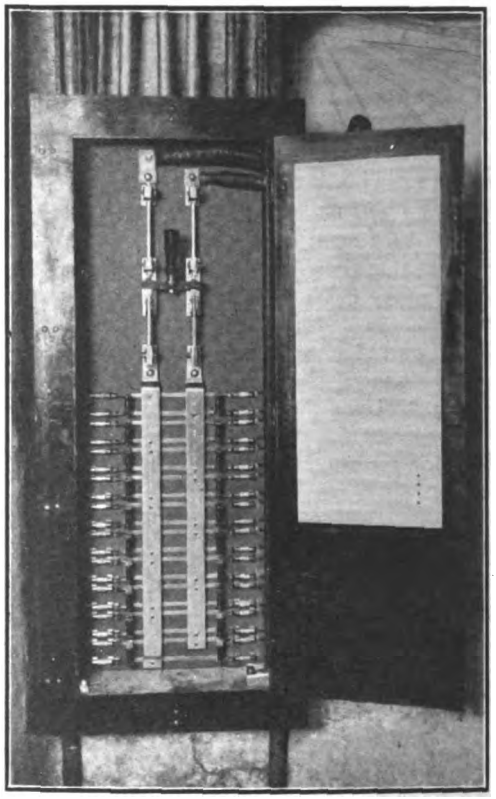

Fig. 5.—Panelboard for Heating Circuits.

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returned to 71 degrees when the gas grate was shut off.

It is Mr. Ahearn's idea that electric heating should be supplemented by some other form of heating such as that supplied by gas logs. This supplementary heating would come into use during the extreme peaks of cold weather. The capacity of the electric equipment need not consequently be sufficient to take care of these peaks, but could be designed for average winter weather. This would not only reduce the first cost of the equipment but would reduce the maximum demand of the system. Since the latter element has come to be an important item in most systems of charging for electric energy, this is a very practical consideration and would, no doubt, greatly influence the cost of electric heating. The installation of Mr. Ahearn is of a trial nature and is paid for by a special flat rate. The Ottawa Electric Company has not yet decided upon a schedule of charges for this service and although very low rates are offered by the company for both domestic service and power, the cost for electric heating on the same basis would be generally found prohibitive. The Ottawa Electric Company generates power in a hydroelectric plant located upon the Ottawa River within the city. It is also equipped with a steam reserve station, which is only called into service during periods of low water or other interruptions of operation in the hydroelectric station. The special flat rate which has been given Mr. Ahearn is conditioned upon the use of auxiliary heating (such as gas logs) during periods when the steam reserve station may be called into operation, as only a minimum consumption of electric energy will be permitted to him at such times.

Fig. 6.—Medal for Electric Heating Apparatus.

As stated above, the maximum capacity of Mr. Ahearn's installation has never been required. A measurement made at the panelboard showed a total consumption when all switches were closed of 394 amperes at starting and 350 amperes after operation for 20 minutes. Using the latter figure, and noting that the pressure upon this special circuit is 112 volts, we find the total capacity of this set of heaters to be 39,200 watts. The eight smaller heaters previously referred to take 6.5 amperes at 107 volts or 5,560 watts. The water heater which supplies the hot-water radiators consumes 6,600 watts. The total capacity for the entire house is consequently slightly over 51 kilowatts. The third floor, which is occupied by a billiard room, is not separately heated. It is found that sufficient warm air circulates up here from the lower floors to make separate heating unnecessary. The cubical content of the first two floors of the house amounts to 53,000 cubic feet. The installed capacity is thus slightly less than one watt per cubic foot, and as noted above, the entire capacity has not been required, even in the most severe weather. In this connection it should be remembered that this building is unusually well constructed, with outer walls of stone, giving good heat insulation. Moreover, a house of this size has less surface exposed per unit of volume than would be the case for a smaller residence, and the latter would consequently require greater capacity in the heaters per unit volume.

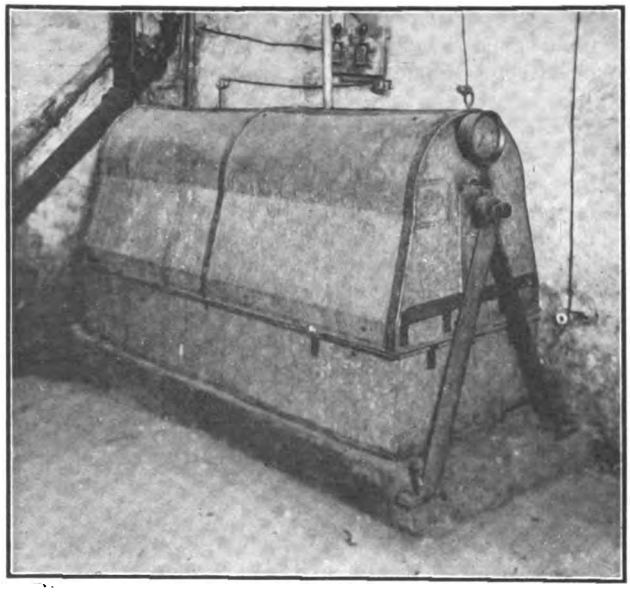
Fig. 7.—Electric Heater for Household Water Supply.

Measurement of the energy consumption for the months of March and April is being made by watt-hour meter, and this will give data as to the requirements during the more moderate weather of the spring months. Combined with the data above it will give a knowledge of the entire winter's requirements, and the result will be of great interest as affecting the commercial practicability of house heating in this territory. No doubt can exist as to its feasibility when the satisfactory results in Mr. Ahearn's residence are considered.

Hot water for household purposes is also supplied in Mr. Ahearn's residence through the medium of electric heating. An ordinary kitchen boiler is mounted horizontally in the basement and two electric heaters have been placed underneath it. Each of these heaters uses six amperes from the electric railway circuit above mentioned. The entire outfit is inclosed in a double case of sheet metal and is shown in Fig. 7. This equipment was installed in the basement in 1894 and has been in continual use since then, giving entire satisfaction and plenty of hot water. A thermometer mounted upon the end of the inclosure indicates the temperature of the air surrounding the boiler as 240 degrees Fahrenheit. This temperature is considerably above the boiling point of water.

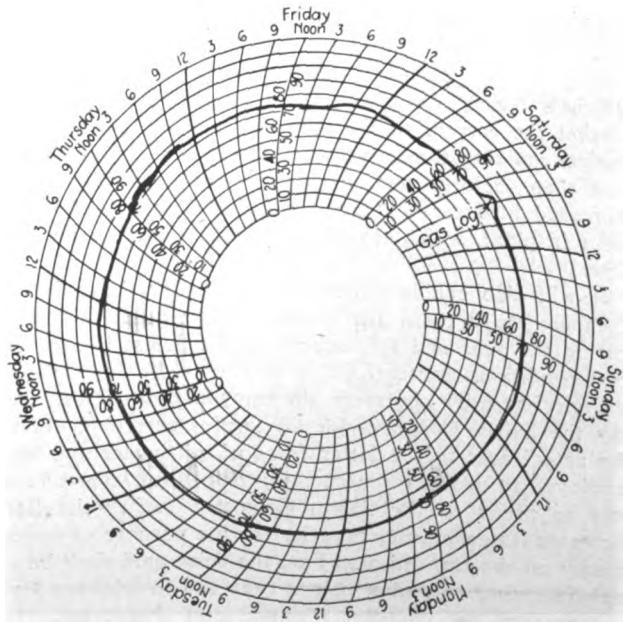

Fig. 8.—Temperature Record From February 17 to 24.

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The electric bell circuits in the house are supplied from a storage battery which is mounted in the basement and equipped with a lamp bank for charging purposes. As Mr. Ahearn was at one time a telegraph operator, he has retained his interest in this use of the electric current and keeps a set of instruments within easy reach upon his library table, connected by line with the residences of Warren Y. Soper and James D. Fraser, two of his business associates who were also old-time telegraphers. Mr. Fraser is secretary-treasurer of several of the Ahearn-Soper corporations. The line also gives connection with the offices of the various companies in which Messrs. Ahearn and Soper are interested. They find this method of communication more attractive than the telephone, although the latter stands ready at hand and of course must be used for communicating with persons unfamiliar with the Morse code. By having this telegraph circuit looped in with the Associated Press line during the evening hours, these gentlemen get the benefit of this news service many hours before it appears in the morning newspapers and through a medium which to them is more agreeable than reading.

TRANSMISSION LINE TO CONNECT MASSACHUSETTS CENTRAL STATIONS.

Important Development in New England Providing for Centralization of Supply.

The proposal of the Eastern Massachusetts Electric Company, a newly organized corporation allied with Charles H. Tenney & Company, Boston, to construct a high-tension transmission line in Massachusetts, to connect the Salem Electric Lighting Company's plant with that of the Malden Electric Company, Malden, and the Suburban Gas & Electric Company, Revere, Mass., contemplates the building of a steel tower line about nine miles in length through Salem, Peabody, Lynn, Lynnfield, Wakefield, Saugus and Melrose, and the installation of cables in underground conduits of the Suburban and Malden companies, thus providing a physical connection of the three plants, for operation at 22,000 volts.

The three companies mentioned are under the engineering management of the Tenney Company and the Eastern Massachusetts Electric Company is identified with that concern, its officers being members of the Tenney organization. The capital stock is $250,000.

Owing to the very favorable location of the Salem Company's plant at tide water and its capacity, due to the large power load it has under contract, it is proposed to sell energy to the Eastern Massachusetts Electric Company, which is purely a transmission company. The latter will market the current to the Suburban and the Malden companies, enabling them to purchase it at a considerably less cost than their present production costs, and to take on increased business without making further capital investment in plant, which would become necessary at an early date.

It will also enable either the Malden or the Suburban Company to operate the present plants at certain times during the year and sell current to the Salem Company if load conditions warrant.

Under tentative contracts, the transmission company will pay the Salem Company for all surplus current generated the actual cost to the latter for coal, oil, water and labor employed to produce the current, plus 10 per cent of such cost as profit to the Salem Company. After the latter increases its generating capacity for the purpose of putting energy on the transmission line, the price paid shall be the manufacturing cost plus 10 per cent and in addition 7 per cent interest on the part of plant and equipment maintained for producing the current sold to the transmission company, and all maintenance, depreciation and incidental charges on that account. The cost of current generated by the Salem plant is now as follows, per kilowatt-hour:

Fuel, $0.005; handling, $0.00095; water, $0.00024; lubricants, $0.0001; total, $0.005435. Adding 10 per cent gives a total cost of $0.005978.

A contract with the Malden Electric Company calls for the use of about 10,800,000 kilowatt-hours, the price paid the transmission company to be $0.009 per kilowatt-hour. The Suburban Gas & Electric Company would buy about 3,850,000 kilowatt-hours, at the price of $0.0115 per kilowatt-hour. On this basis the Salem Company would receive $87,900 per year, representing a profit of about $8,277.

It is planned to keep the Malden and Suburban plants in repair as auxiliaries and for use in emergencies.

The present cost of energy generated at the Malden station is 1.05 cents a kilowatt hour. At the price paid the transmission company it would be $0.00985, representing a saving of $0.00065 per kilowatt-hour or about $7,200 per year. The following would be the added items of production cost of energy furnished the Malden Company:

Station superintendence and care	$2,000
Three switchboard men at $20 each per week	3,120
Two extra men at $15 each per week	1,560
Fuel	500
Light and miscellaneous expenses	500
Repairs	1,500
	$9,180
Divided by 10,800,000 kilowatt-hours	.00085
Cost of energy purchased	.00900
Total	$0.00985

The maximum load conditions at the Malden plant are about 3,500 kilowatts, and the normal rating about 3,300 kilowatts. The company has signed a contract for nearly 1,000 kilowatts additional load, which necessitates either increased generating facilities or procuring energy from another source.

The estimated cost of the purchased energy supplied the Suburban Company is $0.01383, representing a saving of $0.00077 over present cost, or about $2,695 per year. The only added items of cost would be about $250 for station fuel and $750 for repairs. The load is about 1,900 kilowatts at this plant, and the normal rating 1,440 kilowatts. Energy is now purchased of the Malden Company to care for overload conditions during the summer, when the beach business taxes the plant.

Income and investment of the Eastern Massachusetts Electric Company would be as follows:

Total investment for right of way, engineering expenses and construction	$250,000
Estimated net income from Malden Electric Company	90,000
Estimated net income from Suburban Company	40,250
Total	$130,250

Operating Expense.

Current purchased, 14,650,000 kilowatt-hours at $0.006	$87,900
Labor	8,000
Repairs	1,000
Taxes, 2 per cent on $200,000	5,000
Insurance, fire, employee and public	1,000
Depreciation on $200,000 at 5 per cent	10,000
Interest on $250,000 at 6 per cent	15,000
Total	$127,900
Net income	2,350

The transmission line will consist of 140 double-circuit steel towers carrying six No. 00 stranded copper wires, with five-sixteenth-inch steel stranded ground cables. The average spacing of towers will be 450 feet. Structural line materials are estimated to cost $18,250, foundations $3,300, labor of erection $8,800, conductors and transmission material $29,000, overhead fixtures $3,300, underground transmission line $61,771, cable between the Salem plant and terminal house, $25,049, cable between Malden plant and Revere plant, $53,196. Total, $202,666. Incidentals and contingencies at 5 per cent and engineering at 5 per cent bring the total to $223,439.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Results Obtained from Kitchen Service Installations in Dayton.

The progressive manager or head of the commercial department of an electric light company in any community is not satisfied in having meters installed in all the new buildings erected in his territory, but is conducting campaigns for the wiring of already-built houses and making sure that unwired buildings are decreasing rapidly in his town. The "panel board" as an entering wedge for wiring business has proved very popular and many companies have adopted some form service of this character. As explained by Thomas F. Kelly, commercial manager of the Dayton (O.) Power & Light Company, before the Ohio New-Business convention the Kitchen Service campaign inaugurated April 19, 1916, has been very successful. The Dayton "Electric Kitchen Service" consists of one key-socket drop cord with a 40-watt Mazda lamp and one side-wall outlet, and a six-pound electric iron, all complete and ready for use for $10.98 cash. The wires enter the premises in metal conduit. The wiring is all concealed. The meter and fuse box are set according to standard practice in the cellar and the box has sufficient capacity to accommodate the future permanent wiring.

The proposition was introduced through advertising in the newspapers and a two-color four-page folder, which was distributed through personal visits of residence salesmen on prospects. The order for an "Electric Kitchen Service" is secured by the salesmen and is turned over to the contractor, who satisfies himself regarding the credit and collects from the customer when the work is completed. While the campaign was given special attention for a short time after its introduction—no long drawn-out campaign with special effort has been inforce and therefore the proposition has simply been a wedge to get electric service introduced into a home when other efforts failed.

As to the results obtained from the kitchen-service installations, the contracts closed for this business are a small portion of the business obtained through this proposition. Since the "Electric Kitchen Service" proposition was placed on the market, that is during the past ten months, 1,276 old houses have been wired in Dayton for electric service but the records do not show how many owners became interested first in the Kitchen Service proposition, and then through salesmanship and the opportunity thus afforded, were convinced that the proper thing to do would be to wire their house for complete electric service.

The possibility of securing that household necessity—an electric iron, all wired up complete for $10.98, interested tenants and owners alike and many a tenant "got after" the owner of his property and had it made modern.

From the books of the electrical contractor who is cooperating with the Dayton Power & Light Company on this proposition, it is found that approximately 25 per cent of the "Electric Kitchen Service" customers have spent amounts from 75 cents to $26.47 with the contractor in addition to the $10.98. People, who after they had signed the kitchen-service contract, decided at the solicitation of the representative of the electrical contractor to wire their entire house, are not considered electrical-kitchen-service customers.

Unfortunately, the proposition has not been in existence one year and therefore it is impossible to give the annual revenue from any of these customers, although the average monthly revenue taking about 20 per cent of the total customers as an average has been during the past nine months $1.08 per customer.

There is no record of any kitchen-service customers having completed the wiring of their home since the meter was installed although it is possible that some have.

New England Companies Inaugurate House-wiring Campaigns.

The Manchester (N. H.) Traction, Light & Power Company took cognizance of house-wiring month by inserting in local newspapers a whole-page advertisement setting forth its special wiring offer to owners of houses on the company's lines.

The company offered to connect the residence with service, set the meter and install entrance switch, wire and install a front porch or front hall light with push-button switch and 40-watt Mazda lamp, a cellar light controlled by a snap switch and provided with a 60-watt Gem lamp; to wire and install a flatiron outlet in the kitchen or laundry and supply a Perfection electric iron, all for $15, $5 to be paid on signing the contract and the balance "as suits your convenience." The work is sublet by the company to any local contractor in good standing whom the customer may designate.

The Narragansett Electric Light Company, Providence, R. I., inaugurated a new plan for house-wiring. An eight-light installation, complete with fixtures, shades, Mazda lamps and a six-pound Hotpoint electric flatiron, is provided for $49.94, only $4.99 being required as first payment and $3.75 per month for 12 months.

With the use of other styles of fixtures and added lights, contracts up to $75 are payable in 12 months, from $75 to $150 in 18 months, and over $150 in 24 months. The first payment in each case is 10 per cent of the whole. Wiring is all concealed work.

Electric Range Campaign by the Boston Edison Company.

Although the Boston Edison Company has sold some 400 electric ranges since late fall, the real electric range campaign will be begun April 1 and continue until July 1, the summer being the favorable season for electric cooking. A continuous range demonstration will be conducted at the Boylston Street salesrooms, with three expert demonstrators in charge, and a two or three weeks' demonstration will be carried on at each of the company's 16 other stores.

The advertising department is sending to a select list of about 1,500 prospects an announcement of these demonstrations, followed weekly for six weeks by special booklets and letters on electric ranges. Placards will be posted in 4,500 street cars, calling attention to the fact that "The electric range is now standard equipment for all up-to-date apartment buildings."

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Newspaper Advertising for Central Stations

By Charles H. Seaver

How to make advertising copy attractive and productive is a question that is too frequently neglected by the central station. In this article, which is the second of a series on central-station advertising, some valuable suggestions are offered and general principles of good copy writing discussed. Another article by Mr. Seaver will appear in an early issue.

The life of a newspaper advertisement is short at best. Few people keep a daily newspaper more than a day or two, and fewer still refer to it after the day of its publication is past. Most readers have formed the habit of getting news from a paper quickly and answering advertisements promptly, when the advertisement appeals and the way to a response has been made easy. Attention must be caught and action secured at once, or the copy is valueless as a means of securing direct replies.

This rapidly passing value, which is common to all daily newspapers, makes it necessary to take advantage of news items promptly if any advertising value is to be gained from them. The installation of motors of unusual size or character; some quick resumption of service after a storm, or the rapid placing of a motor to do the work of a disabled engine, can all be worked into advertising that has distinct good will and educational value. How well this can be done may be seen from the advertisement shown in Fig. 1. Here a good deal of interest is attached to a construction detail of a large company. It is told in words that do not need to be explained to any one. The picture has an unquestionable educational value. Such an advertisement takes the public into the company's confidence, and does much to combat the old idea that a public utility moves in dark and mysterious ways.

Changes in rates are always interesting, as is anything that directly affects the user's pocketbook. Still the presentation of even such a prosaic thing as rates can be made in such a way that it will seem even more vital to him. One company has done this with a diagram in which the point is made, not that the same light may be had for less money, but that a steadily increasing amount of light may be bought for the same expenditure as in former years. The same company also explained reasonable variation in its customers' light bills with the chart, Fig. 2. One of the best testimonials of the merit of this advertisement is the fact that it has been used by many companies other than the one which originated it.

Copy Supplied by Manufacturers Useful.

Manufacturers' advertisements are, on the whole, excellent, and it is to be regretted that they are not even more generally used. The copy is written by men skilled in that line, the arrangement is attractive and the illustrations are of such a character that they could be duplicated only by the largest companies. In spite of some arguments against these stock advertisements, it is very generally agreed that arguments which gain customers in New York state will get business as well in Oklahoma. Human nature is very much the same, and people in the same walks of life want the same things for the same reasons.

For the companies making use of the manufacturers' advertising service the problem reduces itself merely to selecting those advertisements which most nearly fit conditions. These can be alternated with advertisements of a purely local nature. In a monthly sample sheet published by the General Electric Company, not only sample advertisements are reproduced, but valuable advice is given. Brief directions are included as to the steps necessary to push most effectively the particular article or appliance covered.

The company that uses these prepared advertisements not only saves a good deal of time, but the man responsible for its publicity has also at his command the product of experienced copy writers. He thus obtains at once and with very little trouble the result which he himself could produce only after considerable experience.

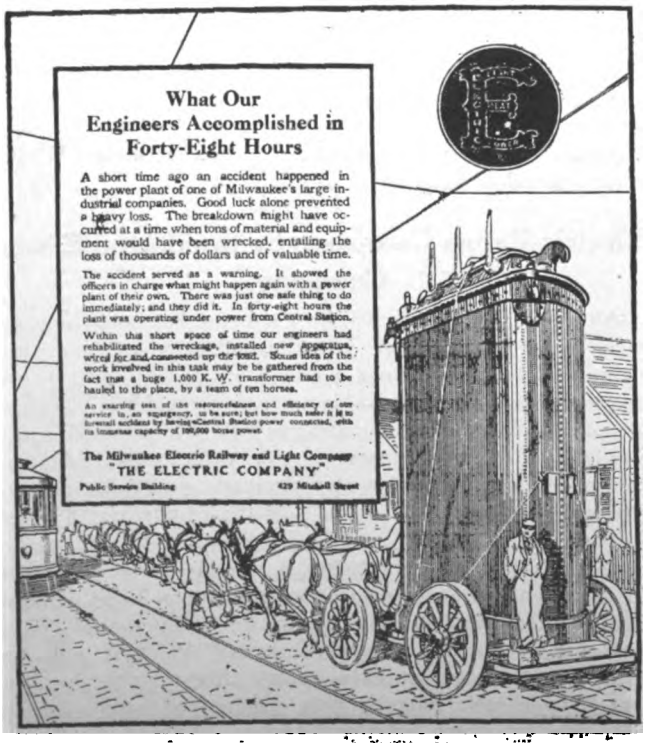

Fig. 1.—An Advertisement With News Value.

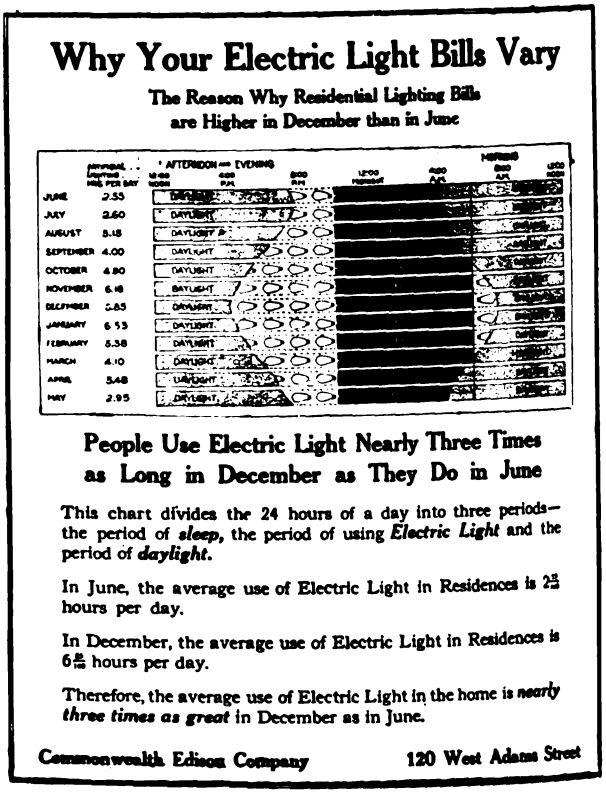

Fig. 2.—Advertisement Showing Why Bills Vary.

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Physical Appearance of Copy Important.

To the man who writes his own advertising—if he lacks experience in printing—it is a source of constant wonder that his apparently plain directions can be misunderstood in so many different ways. Often the copy set up bears so little resemblance to the mental image the writer had, as to be hardly recognizable. The remedy is simple. It lies in giving the printer a definite layout. By this countless difficulties and disappointments may be avoided. Plan the advertisement as you would a drawing. Don't forget that white space is often as valuable as type matter. Make the directions as specific as you know how.

The point of proper white space is illustrated by the advertisement and revised arrangement, Figs. 3 and 4. The copy used in that space is good. The prices quoted ought to attract trade. In many ways it is a good advertisement, but it would have been a better one if a little more white space, and some such an arrangement as the revised one had been used.

It is an advantage if all the advertisements used by any concern have the same general appearance. This does not mean that the series should be monotonous. On the contrary, each piece of copy should possess enough points of interest to insure at least a hurried reading from all who see it. The similarity of style will attract attention rather than the reverse, if the copy is, as a general rule, interesting. The advertisement that is immediately recognized as being one of an interesting series is most apt to be read through.

Whether such things attract attention or not, there is nothing more harmful to any advertisement than an unpleasant reference or disagreeable comparison. While it may seem foreign to the subject of central-station advertising, here is a valuable example offered by a series of advertisements on beer run several months ago. This series featured a disagreeable taste in connection with other manufacturers' product. The bad feature was that the idea of an unpleasant taste associated itself with the product advertised and the firm using this copy harmed itself more than it did its competitors. The average central station is in a good deal the same position as that brewer. In no case should unpleasant associations be suggested by the advertising matter. Sometimes the temptations to refer to the expensive, dangerous, unhealthful gas light is strong, but it should be remembered that this light also has its merits. Electric light and electric power have enough advantages of their own to warrant a very general use without calling the attention of the public to the deficiencies of any other system of lighting or power. The best advertising is constructive. The same thing might apply to the exploitation of the Mazda lamp as against the older carbon incandescent. It leaves a great deal better impression if the great merits of the tungsten are exploited rather than the deficiencies of the carbon lamp.

Use Care in Selecting Illustrations.

So-called humorous illustrations—especially the cheaper sort—are without excuse in any advertising and they are particularly objectionable in any copy relating to a public service company. In some cases there may be more or less reason for using pictures of this kind, but stock illustrations of the variety so common a few years ago are without any justifying merit. The man who is tricked into reading an advertisement by an irrevelant headline or an illustration which would apply as well to a clothing store as it does to a central station loses confidence in the good intentions of the advertiser at the very start. The advertisement, Fig. 5, showing a colored gentleman apparently holding an electric motor out on a tray would certainly not have any influence in converting a manufacturer to the use of electric drive, or even in interesting him in the advantages of electric power. This advertisement is taken from a series—not all humorous—prepared by a western company unusually aggressive in the matter of newspaper advertising.

The question of how much copy to use is as difficult to answer as would be the question of what to run.

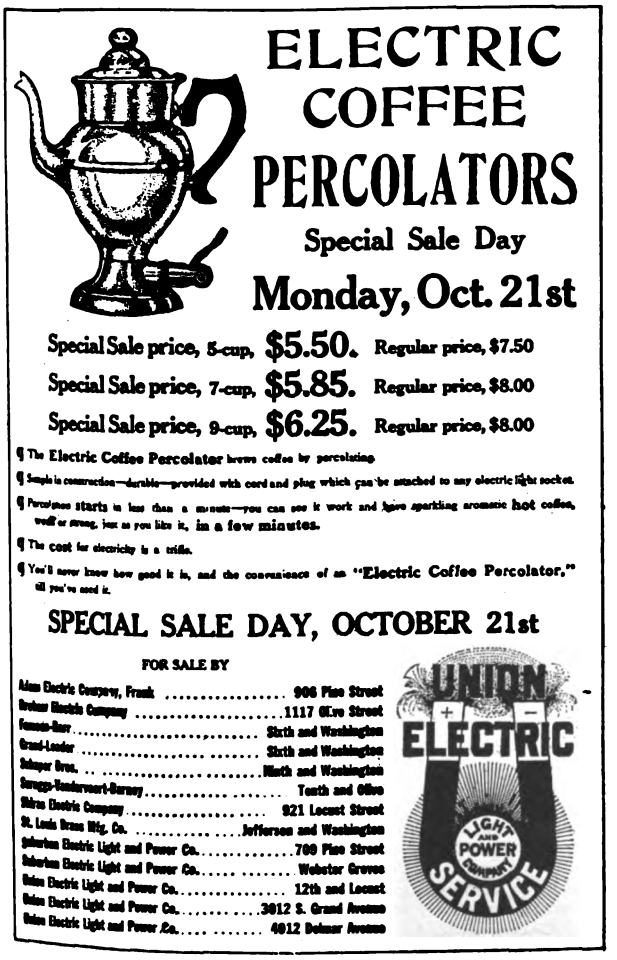

Fig. 3.—Bargain Advertisement, Copy Good, But Too Crowded.

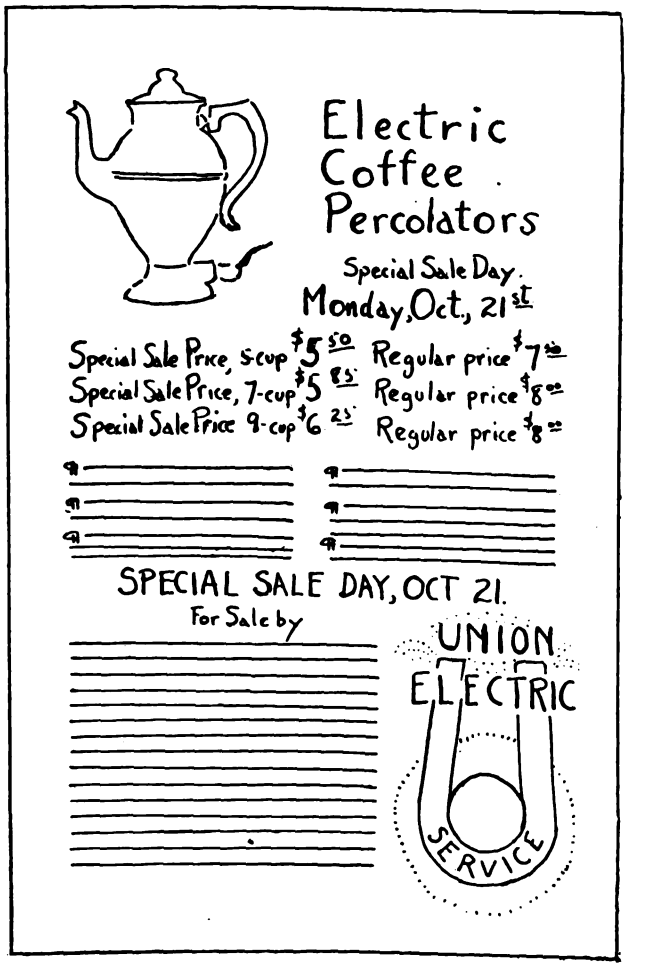

Fig. 4.—Suggested Layout for Same Advertisement.

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One large advertiser likens the advertising appropriation to a pole needed for reaching a desired object. "If," says he, "an 11-foot pole is needed for the work, a 10-foot pole is exactly as good as none at all. The last foot is the necessary one." There is a great difference of opinion as to how much an advertiser should spend, and probably always will be. If the space used is accomplishing all the results that you feel are possible—if you have used greater space with no more replies there is surely no ground for increasing your expenditure. If

Fig. 5.—Advertisement With a Meaningless Illustration.

it is found that an increase more than pays for itself, it is reasonable to believe that your space is well within the profitable limit.

It is almost universally agreed, however, that the advertising appropriation should be fixed and not subject to enlargement toward the end of the year. Whether it be one per cent of the total income or a half of one per cent it should be used consistently. The small advertisement, getting attention every day, taking the reader into confidence or offering inducements to become a user of electricity, is vastly better than an occasional large space. An advertisement need not be large to be conspicuous. The three-times-a-week advertisement taking up one argument after another, running the year round, and arranged to catch the eye, logically, not through freak pictures, is the one that will win, and bring returns on the money invested.

Power Rates in Kansas City to Be Reduced.

Revision of rates for power by the Kansas City Light & Power Company probably will occur shortly, the company having filed new schedules following its organization, as successor to the Kansas City Electric Light Company. All the power contracts were annulled by the reorganization and the entrance of the new company, according to the orders of Judge Hook. Some of the contracts annulled are said to have been at very low rates, and the abrogation of the contracts simplifies the establishment of new ones at, in the cases mentioned at least, a higher level. The domestic rates are not affected.

WHAT ENTHUSIASM CAN DO FOR A SIGN CAMPAIGN.

Toledo Company Sells Over 350 Electric Flag Signs in Three Months.

A few weeks ago George Williams, head of the new-business department of the Doherty companies, conceived the idea of the electric flag sign as a central-station opportunity. Today, thousands of these signs have been installed and sign manufacturers are finding the continual demand a tax on their manufacturing facilities, although by expending extra effort deliveries are being made without delay.

The Toledo (O.) Railways & Light Company was the first to grasp the importance of the Old Glory campaign and despite the fact that Toledo is, perhaps nearer the saturation point in electric signs than any other city in the country, up to date over 350 electric flag signs have been sold. Of course enthusiasm is largely responsible for this remarkable record. A. K. Young, new-business manager of the Toledo company, when the idea of the flag sign was suggested to him became enthusiastic over the idea and succeeded in installing this spirit in his department. Toledo merchants responded in a highly gratifying manner. It was of course to be expected that some of the prominent stores with patriotic managers would become interested, but the significant feature of the campaign was that the small establishments responded just as readily. Factories, warehouses, etc., ordinarily not considered live sign prospects also installed signs and in several instances electric flags were purchased for installations in interiors of shops, hotels, etc. The accompanying illustrations shows some of the noteworthy installations that have been made. In one view there is shown an automobile, decorated with an illuminated sign, that was used by salesmen in the campaign. Another view shows a flag sign in the shop of the Mather Spring Company.

Over 120 central stations are now pushing the electric flag sign and the aid of the National Lamp Works, of the General Electric Company, has been enlisted to further popularize the movement.

Large Power Contract for Pennsylvania Company.

The Penn Central Light & Power Company, of Altoona, Pa., has just signed up the largest power contract in the history of the corporation, it having secured the contract for furnishing electric power for the great Standard Steel Works at Burnham, near Lewistown, Pa. With the growth of the work at the Burnham plant, which is a part of the Baldwin Locomotive Works, the Standard company has decided to purchase electric power, instead of using its own electric power, as before. In preparation, it has spent large sums of money installing substations and transformers and has now contracted with the Penn Central company for a load of 4,100 horsepower.

Residence Section of Oklahoma City to Have "White Way" Lighting.

Contract has been secured by the sales department of the Oklahoma Gas & Electric Company for a "White Way" system in "Harndale," a residence addition of Oklahoma City covering about 40 acres. The first part of the installation, consisting of 22 cast-iron standards painted white, will be installed immediately. Each standard will be surmounted by an acorn-shaped globe containing one 250-watt lamp. This installation is believed to be the forerunner of a number which will be placed in other residence sections of the city.

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Patriotism in Toledo.

A Few of the Many Notable Electric Flag Installations Made in Toledo, O. There Are Now Over 350 of Such Installations.

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POWER ENGINEERING

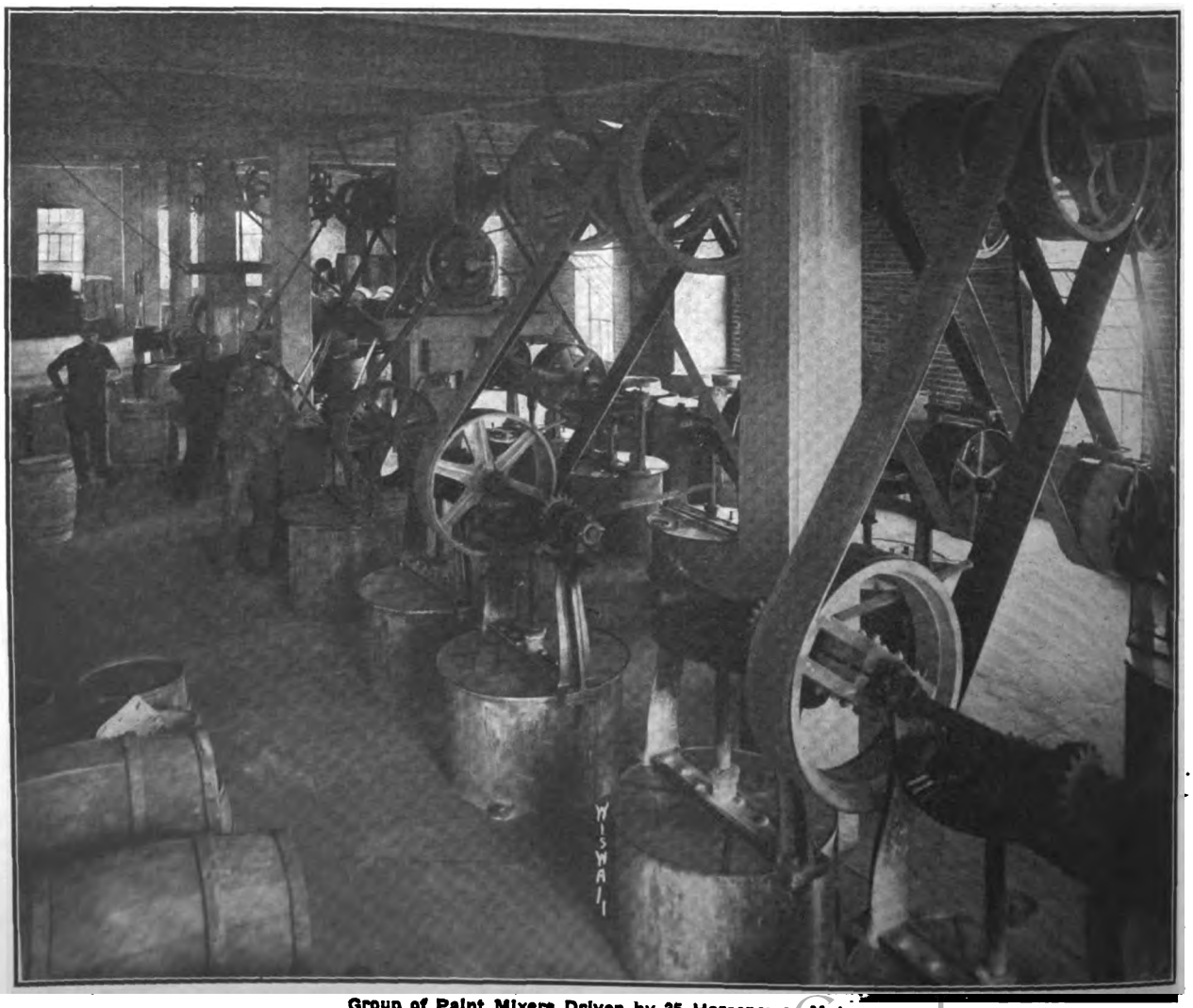
Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

ELECTRICITY IN THE MANUFACTURE OF PAINT AND VARNISH.

By Frank D. Burr.

The manufacture of mixed paint has been successfully carried on for the past 25 years by the McMurty Manufacturing Company, in Denver, Colo. It has been the object of the management to study and experiment, in order to obtain a formula which will produce a paint which wears as well in a dry climate as in a damp one. This is necessary in order to withstand the peculiar atmospheric conditions of the Rocky Mountain region.

The linseed oil, white lead and other pigments and color materials are taken to the third floor by means of a 4,000-pound Nock & Garside elevator, operated by a 10-horsepower, 220-volt, three-phase motor, running at 1,730 revolutions per minute. The materials are there mixed by means of a 35-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, driving a group of 13 Ross mixers having a capacity of 35 gallons each, and four pony mixers of 10-gallon capacity. These machines, shown in one of the accompanying views, consist of vertical cylinders, in the center of which is a vertical shaft, on which are mixing blades rotating within the cylinder to thoroughly mix to a paste the materials, and beveled geared to the line shaft, which is belted to the motor. After a mixing has been completed the material is taken to the second floor by means of chutes, where it is finely ground by three groups of burr mills. A 20-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, drives three 26-inch Ross burr mills, and three 30-inch Ross burr mills and four 20-inch Kent burr mills. A 20-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, drives two 30-inch Ross burr mills, two 26-inch and one 26-inch Kent burr mills and two 18-inch Ross iron mills and grindstone for sharpening the chisels, for cutting the grooves in the burr mill. A 10-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, drives three 20-inch Kent burr mills and four 20-inch Ross burr mills. These burr mills consist of a round carborundum burr or stone, which has sharp-edged grooves radiating from the center, and each is driven by a



Group of Paint Mixers Driven by 35-Horsepower Motor.

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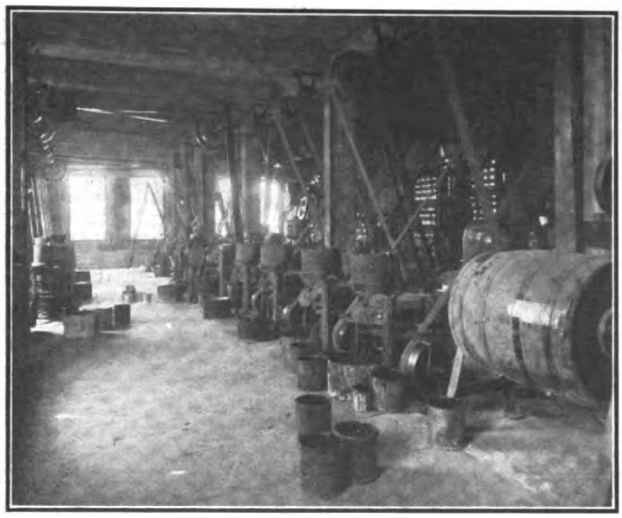
Group of Agitators Driven by 7.5-Horsepower Motor.



Group of Burr Mills Driven by 20-Horsepower Motor.

vertical shaft beveled-geared to a line shaft belted to the motor.

After being properly ground the material is then sent to the first floor by means of chutes, where it is deposited into the agitator and thinned with linseed oil and blended to obtain the various necessary colors.

These machines consist of two groups, one driven by a 7.5-horsepower, 230-volt, three-phase motor, running at 1,200-revolutions per minute, driving eight 135-gallon agitators and three 500-gallon agitators. The 7.5-horsepower motor drives six 135-gallon agitators and three 500-gallon agitators. These machines consist of vertical cylindrical tanks, in the center of which revolves a shaft with blades connected for stirring the mixture, and connected by beveled gear, to the line shaft, which is belted to the motor.

A 10-horsepower, 220-volt, three-phase motor, running at 1,200 revolutions per minute, on the first floor, drives a putty chaser, which mixes together whiting (calcium carbonate) and linseed oil for one-half hour, in order to produce 400 pounds of putty. The putty chaser consists of a six-foot pan, in which the material is placed. A vertical shaft rotates in the center, clamped to which, at right angles, is an axle on each end of which is rotated a cast-iron roller five inches in diameter, which rolls and grinds the whiting and oil together. A plow share is also attached to the vertical shaft, which scrapes the flattened material from the bottom of the pan, standing it on edge, to be mixed and ground.

The varnish is made by depositing gum and rosin into a large two-wheel kettle, which is conveyed over a coke fire or a gas burner, and is there cooked until it reaches the proper consistency. It is then poured from the kettles into tanks. After being cooled it is pumped to the thinning tanks, where it is mixed with linseed oil, which has been further treated in the factory, so as to obtain the best effect for the uses intended.

For this purpose two one-horsepower motors, driving two 0.5-inch Deming rotating pumps, are used. The linseed oil is pumped by means of a two-horsepower motor, driving a Deming rotating pump and a one-horsepower Deming rotating pump.

The varnish is then in some cases thinned with benzine and filtered by means of a three-horsepower, 220-volt, three-phase motor, running at 1,800 revolutions per minute, driving two filter presses. These consist of a centrifugal machine, operating upon the principle of a cream separator, which runs at a speed of 6,000 revolutions per minute. The same motor drives a Gould rotary pump, which forces the liquid to the tanks which feed the filter presses.

The varnish is then kept in vessels and aged. The best varnish requires an age of four years. Energy is supplied by the Denver Gas & Electric Light Company.

Economy Effected by Individual Motor Drive in Machine Shops.

One of the most specialized applications of individual motor drive is exemplified in the installation of the Washington Iron Works, at Sherman, Texas. This shop was established in 1876 and has done a prosperous business ever since.

Although there are a total of 31 motors installed, the average kilowatt-hour consumption varies from 331 to 642 per month. Every machine has an individual motor and when a machine is not in use, no power is being consumed.

The consumption per month by years is as follows:

Year	Total Kilowatt-hours	Average per Month
1913	5,970	497
1914	7,700	642
1915	3,979	331

The monthly consumption during 1914, the banner year of the company, was as shown in the following table:

Month	Kilowatt-hours	Month	Kilowatt-hours
January	750	September	540
February	690	October	670
March	530	November	930
April	550	December	1,030
May	450		
June	600		
July	360		
August	600		

Following are the machines installed with the motors which drive them:

WASHINGTON IRON WORKS, SHERMAN, TEX.

Direct-Connected Motors in Service, March 1, 1916.

No.	Horsepower	Driving
1	10	30-inch Leblond engine lathe.
1	7.5	24-inch Leblond engine lathe.
1	1.5	16-inch L. & S. engine lathe.
1	0.5	11-inch Star Precision engine lathe.
1	3	Shaper.
1	2	Emery wheel.
1	1	Emery wheel.
1	0.25	Emery wheel.
1	0.25	Portable emery grinder.
1	0.25	Portable breast drill.
1	1	Hydraulic press.
1	5	W. S. lathe.
1	0.5	15-inch hack saw.
1	0.25	6-inch hack saw.
1	1	Sensitive drill.
1	5	Drill spindle—radial 5-foot.
1	3	Elevating arm—radial.
1	0.5	Operating large panel street door (open and close).
1	5	Hoist, 5-ton traveling crane.
1	0.5	Carriage of 5-ton traveling crane.
1	0.5	Bridge of 5-ton traveling crane.
1	2	Blacksmith forge with exhaust fan attached.
1	15	Old belted tools.
1	2	Foundry pressure blower.
1	5	Casting cleaner.
1	2	Rip saw.
1	0.5	Jig saw.
1	1	20-inch woodworking lathe.
1	3	Portable lathe for job work.
1	2	Portable extension for job work.
1	0.5	Gas blower.

All motors 220-volt direct current.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

INSTALLATION OF KNOB-AND-TUBE WIRING.

By Terrell Croft.

Knob-and-tube wiring was formerly used in practically all frame buildings and still finds wide application. Its installation is, however, now prohibited in certain cities, Chicago and Denver, for instance, where by municipal ordinance conduit or armored-cable wiring only is permitted for concealed work. Knob-and-tube wiring is the cheapest of all of the methods of concealed wiring and can, obviously, be used only in frame buildings and in brick structures with lath and plaster partitions.

Disadvantageous Features.

The disadvantageous features of knob-and-tube wiring are:

(1) The conductors are unprotected from mechanical injury.

(2) A fire originating in rubber insulation on one of the conductors will readily follow along that conductor and may ignite adjacent timbers.

(3) Even if, when the installation is made, all of the conductors are thoroughly insulated in accordance with prescribed practice, there is no assurance that they will remain so. The warping and shrinkage of timbers, the settling of the building and the breakage of the brittle porcelain knobs and tubes, may permit the conductors to make contact with damp wood or grounded pipes.

(4) The porcelain-tube bushings used for protecting the conductors through joists may, and often do, back out of the timbers and permit the conductor to make contact with them.

(5) Grounded metalwork, such as pipes, steel beams and girders, are liable to be placed in contact with the conductors after they are installed but before the building is finished. Sometimes these interfering members may be placed after the building is finished.

(6) Building tradesmen, other than wiremen, may, after

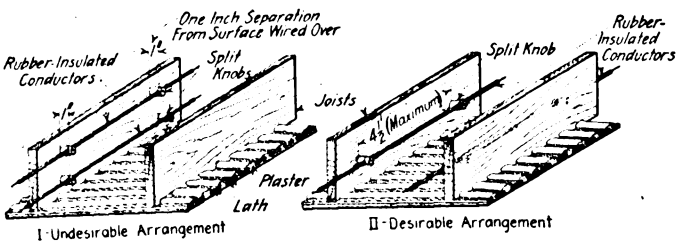

Fig. 1.—Showing How Conductors Should Be Run on Separate Timbers.

the wireman has left the job and prior to plastering, place members in contact with the conductors.

Insulation and Separation.

Knob-and-tube-wiring conductors should have rubber insulation. It is apparent from a consideration of the above outlined disadvantageous features of the method that only the very best insulation should be used, because of the possibility of the conductors touching wood or metal work. Rubber is the best insulation for conductors that is now commercially available.

Knobs giving a one-inch separation from the surface should be used in knob-and-tube work (Fig. 1). Porcelain cleats do not ordinarily provide this separation, hence they should not be applied.

The conductors should always be run on separate tim-

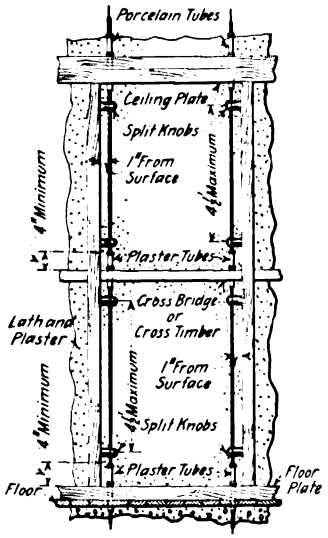

Fig. 2.—Showing Application of "Plaster or Mud Tubes."

bers where possible, as shown in Figs. 1, 2 and 3 *l*, to reduce the liability of their touching one another. Even where the five-inch separation, which is prescribed for knob-and-tube work, can be maintained between the conductors, it is better to support them on separate timbers where feasible. This is in accordance with the suggestion in Rule 26*r* of the National Electrical Code.

Tubes and Protective Bushings.

Where the conductors pass through timbers, the holes must be bushed with porcelain tubes, as shown in Fig. 2. Joists should be similarly bushed. A damp timber may be a reasonably good conductor, hence this provision.

Where the conductors pass through horizontal timbers, an additional porcelain tube, known as a "plaster tube," should be used on top of the bushing tube. These tubes are sometimes also called "mud tubes." Their function is to prevent the plaster droppings from coming in contact with the conductor. Dry plaster is a fairly good insulator, but wet plaster is a good conductor and, furthermore, may have an injurious chemical effect on the wire and its insulation. See Rule 26*r*, paragraph 2.

The minimum permissible distance between supports is 4 feet 6 inches, as indicated in Fig. 2. That is, a knob should be placed at least every 4 feet 6 inches along every conductor, unless tubes, which in themselves constitute supports, are interposed between. Frequently, particularly in unfinished basements and in other places where the wires are liable to mechanical interferences, it is well to

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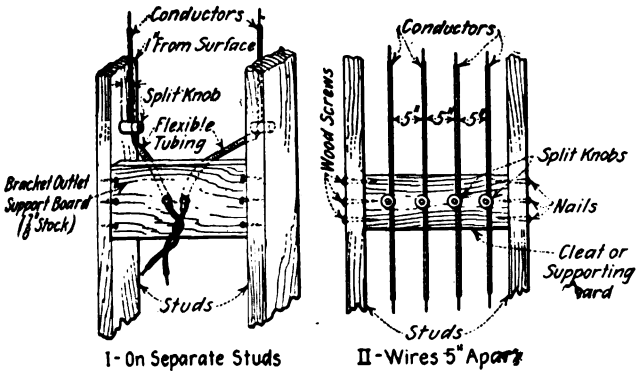

Fig. 3.—Proper Arrangement of Conductors in Knob-and-Tube Installation.

locate the knobs 2 feet 6 inches or 3 feet apart. (See Rule 26r, paragraph 3.)

Flexible Protective Tubing.

Where the wires cannot be separated from each other by at least 5 inches, flexible tubing should be slipped over the conductors for additional protection, as shown in Figs. 4 and 5. The tubing should always extend from the last

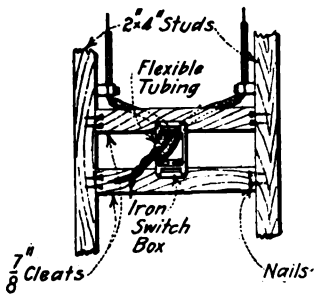

Fig. 5.—Flexible Tubing-Encased Conductors Entering a Metal Outlet Box.

porcelain support to and through the outlet. The conductors should, prior to the completion of the job, be twisted together outside of the outlet, as suggested in the illustrations, to prevent the tubing from slipping off. At a combination fixture outlet, the pieces of tubing may be bound to the gas pipe with an iron or copper tie wire, as

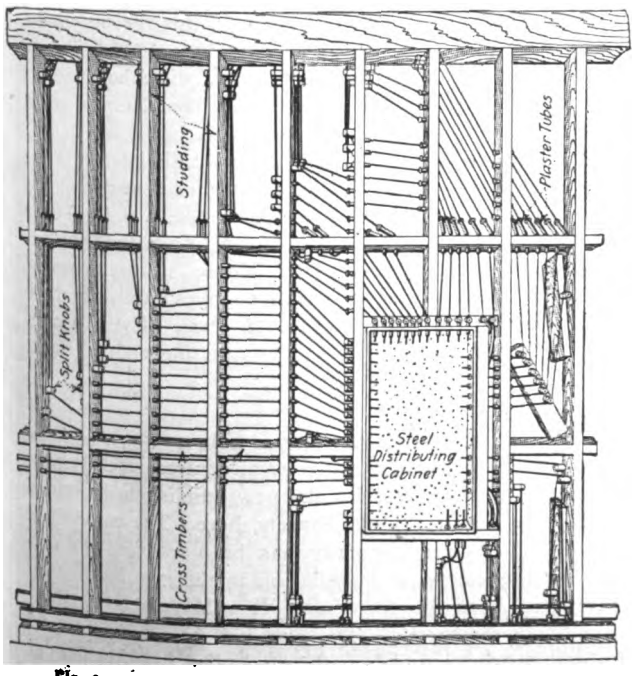

Fig. 6.—An Example of Good Knob-and-Tube Work.

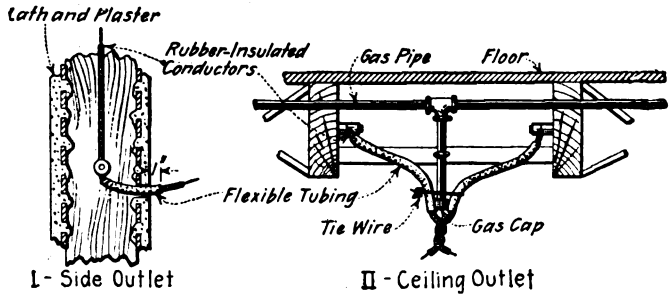

Fig. 4.—Arrangement of Conductors at Side and Ceiling Outlets.

shown in Fig. 4 *II* to hold them close together to insure that the fixture canopy, after it is installed, will cover the wire ends. The tie wire also prevents the tubing from slipping down. In applying the tie wire care should be taken not to draw it so tight as to cut the tubing.

Use plenty of knobs and tubes and flexible tubing to prevent the possibility of any non-insulated member contacting with the conductors. Where there is any doubt as to the possibility of a future accidental contact, place another knob and tube or use more flexible tubing, as the case may require. Fig. 6 shows an example of a good knob-and-tube installation. In such a large installation it is manifestly impossible to run wires singly on separate timbers or studding; therefore extra care should be observed.

Installation On or In Brick Walls.

Where conductors must be installed on or in brick or masonry walls, steel conduit is used as shown in Fig. 7. Such walls, particularly outside walls, may be "damp places." They are so considered, hence flexible-tubing-incased conductors should not be imbedded in them nor should they be placed where they will be imbedded in plaster. The illustration shows how the conduit is applied in combination with knob-and-tube wiring. A conduit run must always terminate in an accessible outlet box or fitting, hence an accessible outlet box must be located where knob-and-tube wiring joins conduit wiring. Usually the outlet box where the junction is made is located at a fixture or bracket outlet as shown in Fig. 7, so that the fixture canopy covers it after the installation has been completed. Either rigid conduit or flexible conduit may be installed in the brick walls, masonry or plaster. The installation must be complete (and in the case of flexible conduit the walls should be dry) before the wire is pulled into the duct. If flexible conduit is used, that of the ordinary type is usually

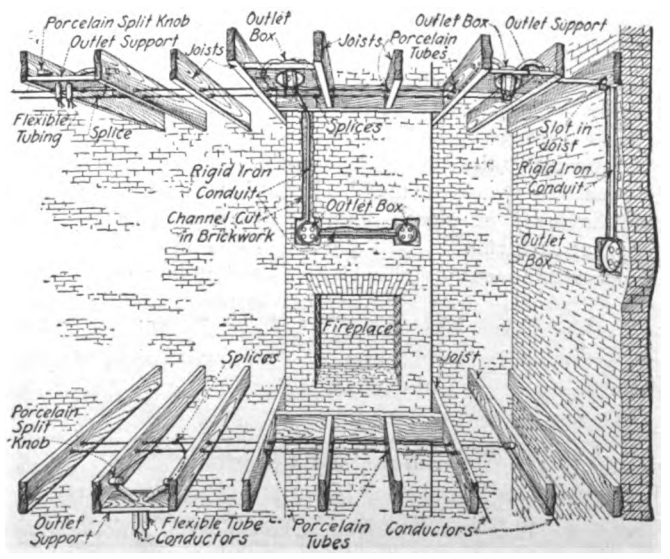

Fig. 7.—Application of Conduit When Knob-and-Tube Work is Impractical.

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accepted by wiring inspectors, but if the walls or location will always be damp, flexible steel-armored, lead-covered cable (BXL) or flexible conduit otherwise manufactured in such a way as to be watertight is ordinarily required.

When installing short conduit runs in combination with a knob-and-tube system the essential rules covering the installation of conduit should be followed, that is, the conduit should be continuous from outlet to outlet and fitted at all outlets with suitable steel outlet boxes, bushings and locknuts. The other rules relating to conduit installations also apply, in general, with the exception that it is not usually considered necessary to ground the short conduit runs.

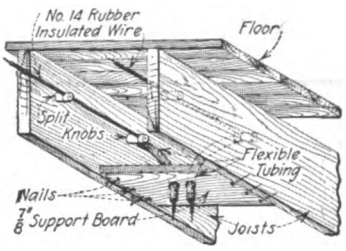

Fig. 8.—Straight-Electric Ceiling Outlet—Knob-and-Tube Work.

The conduits in these cases are frequently considered as coming under the head of protective runs, and, are, therefore, subject to the specification of Rule 26*e*, paragraph 3, wherein it is specified that conduit used for sidewall protection need not be grounded. Some inspectors do not require the grounding of a protective conduit run, unless the run is of excessive length. Ordinarily it is considered unnecessary to ground a run unless it has a length greater than 10 or 12 feet.

Protection at Outlets.

Conductors should be incased in flexible tubing at all outlets, as shown in Fig. 8, and in certain of the preceding illustrations. This is, in a sense, merely a repetition of the requirement (previously cited) that all conductors should be incased in tubing if the distance between them is less than five inches. The tubing should extend past the gas cap on combination gas and electric fixture outlets, to prevent the conductor contacting with the gas pipe that will ultimately be placed at the outlet. It should also extend at least one inch beyond the wall or ceiling surface, as shown in Fig. 3 *I*. Only continuous lengths of tubing should be used for wire protection at these outlets. It is inadvisable and poor practice to slip several short lengths of tubing over the conductor, because they are liable to separate, leaving the conductor unprotected.

Every wire should be fastened by a knob at every outlet. It is not sufficient for it to merely pass through a tube near an outlet. This is particularly true in the case of outlets at the ends of long runs. Unless the knob is so located as to hold the wire at the end of the run the wire is liable to sag back and touch wood or metal. Fig. 6 illustrates this point, knobs having been placed near the distributing cabinet at the end of each run.

Holes around outlets should be closed with plaster, because a draft may draw a flame from burning conductors or some other source into the partition space. This requirement is of particular importance in wiring finished frame buildings.

Copperless Machinery in Germany.

Electrical firms in Germany have been constructing transformers having zinc windings for some time past, and are now engaged in the production of generators and motors with windings made entirely or partly of zinc and commutators of steel.

AMONG THE CONTRACTORS.

The Reynolds Electrical Supply Company, Santa Barbara, Cal., has been awarded the contract for the installation of ornamental lights in the Riviera district.

B. H. Tingley has opened an electrical-supply store in Johnson City, N. Y., and will do electrical contracting. He would like to receive manufacturers' catalogs and circulars.

The Tri-City Electric Company of Davenport, Iowa, has renewed its articles of incorporation for another 20 years. W. T. Ball is president and W. J. Ball is secretary of the company.

A. R. Collins, of Detroit, and H. W. Lobdell, of Grand Rapids, have formed the Electrical Service Company of Muskegon, Mich., and will do electrical contracting and handle supplies.

The Thomas Electric Company, Marion, Ind., Fred H. Thomas, manager, has moved from 114 West Fourth Street to 224 West Third Street, that city. The company is doing a good business in fixtures and supplies and electrical contracting.

The contracts for the electrical work in the new interurban building at Dallas, Tex., have been awarded to the G. D. Cammack Company, of Dallas. The contract will include electrical conduit, lighting, fans, fire-alarm system, wiring for elevators and all minor electrical equipment.

The Bailey Electric Company, Bloomington, Ill., has the contract for the electrical work for the new high school at Bloomington and is progressing nicely with the work. The school is of fireproof construction throughout and the electrical work will be in conduit. The Bailey company will furnish practically all of the fixtures. The contract price for the electrical work is in the neighborhood of $10,000, and the total cost of the building will be about $500,000.

The United Electrical Construction Company, Chicago, Ill., has commenced work on the electrical equipment of the Chicago & Northwestern Railroad office and record building now being erected at Lawrence and Ravenswood Avenues, Chicago. The contract calls for the installation of 210 circuits, 250 horsepower in motors, 1,700 lights and 3,175 outlets, 723 of which will be for dictaphones. Two carloads of conduit will be used for the electrical work.

William H. Knapp, who recently sold his interest in the Jamestown Electric Company has formed a new company to be known as the Knapp Electric Company, and will open a store on Main Street, Jamestown, N. Y., in the Odd Fellows Building about May 1. Mr. Knapp has been engaged in the electrical contracting and supplies furnishing business in Jamestown for the past 13 years. The new company will do general electrical contracting and will make a specialty of lighting equipment.

United Electrical Construction Company, Philadelphia, Pa., has been awarded the electrical contract, including the engines and generators, for the new building to be erected at Nineteenth and Walnut Streets, here. The cost will be $50,000. The same company has been awarded the contract for the electrical installation in the new building being erected here for the Victor Box Manufacturing Company, Quakertown, Pa. The cost will be $10,000. A total of about 500 horsepower will be supplied from the lines of the Lehigh Valley Light & Power Company.

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DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Forcing String Through Conduit by Means of Compressed Air.

In drawing wire through conduit installed in large factories where compressed air is available, considerable saving of time can be effected in the following manner. Take a ball of mason cord and start the end of the string in the pipe, blowing with the compressed air; the ball will unwind and blow the string right through. I have never had this fail in any length of pipe I have had to deal with.

W. D. Wilson.

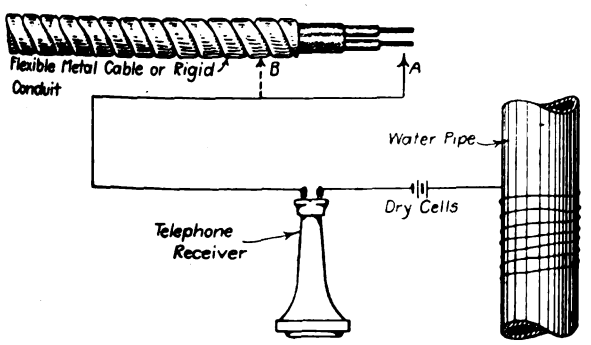
Fishing by Suction.

An easy way to fish wires through a long run of pipe, where you cannot push a steel snake wire through, is to get an ordinary vacuum cleaner, either electric or hand-operated, and put the rubber hose into one end of the pipe. Next take a spool of stiff thread and tie a small ball of cotton wad to it and push this into the other end of the pipe. By starting the vacuum cleaner you will be able to suck the ball right through the pipe, dragging the thread after it. Next tie a piece of string to the end of the thread and pull this through and tie your wires to it. By doing this you will find that you can overcome trouble in a great many places.

Walter Morris.

Ground Test on Conduit or Armored-Cable Installations.

This is a simple and accurate test for grounds on flexible or rigid metal conduit, metal molding or armored cable installations. Each wire is tested out as per terminal *A* in the diagram. If the wire is grounded a clicking sound will be heard in the receiver each time that the test wire is brushed across the grounded cable wire. If the wires are



Ground Test for Armored-Cable Installation.

clear there will be no sound from the receiver when the wires touch each other. To test whether the conduit itself or the metal sheath is properly grounded, apply the test wire, as shown dotted at *B*. In the same way a click in the receiver indicates a grounded condition; the absence of the click indicates absence of a ground, and, therefore, the need for proper grounding of the sheath or conduit.

M. J. Moriarty.

Test of Motor-Field Polarity with a Carbon Lamp.

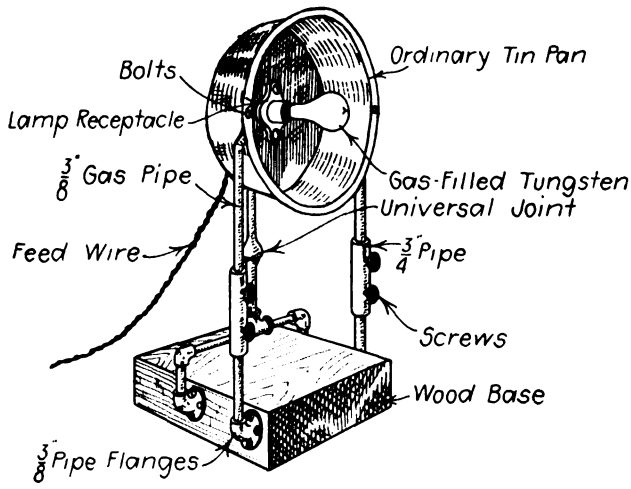
It is very often necessary to test the polarity in the field coils of a motor, to see that adjoining ones do not buck. A very simple way of doing this, other than by using a compass, is as follows:

Pass a current through the fields and then take an ordinary carbon incandescent lamp, preferably one with an unanchored single-loop filament, and bring it near one field at a time, as though testing with a compass. The filament will have a tendency to deflect in opposite directions as the different coils are tested. If the filament does not deflect in opposite directions as the adjoining coils are tested, then one or more of the field coils are reversed.

Charles Stadmuller.

Home-Made Flood-Light Projector for Construction Work.

On a rush installation of electrical work in a theater several home-made flood-light projectors similar to that shown in the accompanying sketch were used, since projectors especially made for the purpose and now on the market could not be obtained in time. The reflecting surface consisted of an ordinary tin pan, which cost only a small amount in a hardware store. The pan was large enough to permit using a 500-candlepower nitrogen-filled lamp. The lamp receptacle was mounted in the center of the pan, as shown.



Home-Made Flood-Light Projector.

The tin pan was supported by means of three-eighth-inch gas pipe in such a way as to permit adjustment of the projectors up and down through various angles. The two pipes in the front of the projector were arranged with a sleeve with two wing screws, which permitted these pipes to be shortened or lengthened for adjustment. The rear pipe was arranged with a universal joint, which acted as a hinge. By using a loose tee at the bottom of the rear pipe, the universal joint probably could be dispensed with, or the lower part of this rear pipe below the universal joint could have been mounted in a flange directly on top of the wood block to which the pipes were secured. For temporary and emergency lighting purposes these projectors gave fairly satisfactory results. For regular use in construction work the commercial forms of projectors will, of course, give much better efficiency.

M. J. Moriarty.

Fishing Through Hollow Cement Blocks.

When fishing through hollow cement blocks for a switch line or side light, it is often difficult to get down through the blocks since the openings in the blocks are not always above one another. A fishing line with a chain or weight on the end of it, when it hits the partition in the blocks cannot be swung from side to side after it has passed several lapping openings. A small rubber ball, large enough so that its diameter is the same as that of two pieces of loom, with a screw or nail driven in it and the fish line tied to this, can be bounced by jerking the fish line and it will fall through a very long row of irregular openings.

Carl V. Hench.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Grounding of Secondaries.

To the Editor:

I have read with great interest Mr. C. H. Hill's letter in the issue of January 15, and the replies thereto in the issue of February 19, and I trust you will find room for these few remarks thereon.

Mr. Croft gave originally four disadvantages of grounding in his paper of January 1, as follows:

(1) A single ground on a grounded system may and probably will interfere with the service.

Quite true, but this is vastly preferable to allowing that ground to set a hidden trap which an unsuspecting consumer will later on unwittingly spring to his own or another's injury.

(2) That it puts full potential between the ungrounded wire and the ground.

Well, it is only required up to a possibility of 150 volts between these two points, and if there is on the market today any wire which will stand safely 75 volts between core and outer surface of braid, but has no factor of safety when that potential difference becomes 150 volts, it is mere junk and it ought to be a criminal offense to make, sell or install it for such work.

(3) Possible difficulty in testing.

This is rather remote and technical. I have not been stumped yet though it might sometimes be necessary to remove the ground connection temporarily, not a difficult thing to do usually.

(4) Increase of expense.

I can not say as to this point as in this neighborhood I have only the statement of the contractors I have inquired of that they wouldn't change their figures merely for leaving off the ground connection except in very rare cases. It wouldn't hit my own town anyway.

Now, as to the fire risk. I have been interested as inspector in Concord for 9 years, since inspection was first begun. I have the town reports for the last eight of those years before me and during those eight years we have had a total fire loss of $117,656. In these eight recorded years (I ordered grounding when I took office and no fires occurred the first year from electricity), we have had one electric fire, due to misuse of a flat iron, with attendant loss of $138. One fire with a loss of $17,000 was at first attributed to "electric wires" but afterward by admission it was shown to be due to hot ashes and similar stuff placed in a wooden receptacle. During this same period lightning set four fires with a total loss of $12,410 in unwired buildings, none in wired buildings.

Thus the total loss attributable to electric installations is 0.012 per cent, considerably below 0.5 per cent and none of it at all traceable to grounding. Our present assumed valuation is $9,318,000 and the population about 7,000.

During all this time our three-wire secondary network has been grounded every 250 feet and every installation fed by an isolated transformer individually grounded. Our grounds are made this way because of certain existing amounts of cement pipe, but the grounds are grounds for the town lies low along a slow flowing river, and permanent moisture is reached anywhere at depths from 10 to 15 feet in a sandy gravel overlaying the hard-pan bottom of the ancient glacial lake. When water or sewer lines are being laid it is not at all easy to keep the trenches dry.

As to transformer insulation, I believe our high grade of today is largely due to manufacturers meeting the conditions of stress due to grounding, and the low percentage of breakdowns to be primarily due to the quality of insulation incident to insisting on grounding; as those of us who remember conditions when grounding was originally broached will recall.

It is pure bosh to attempt any argument based on the money value of human life, per cent of persons killed due to non-grounded secondary in an installation in town with municipal inspection, at least under our laws. If a suit for damages is brought based on a discoverable fault in an approved installation where the inspector has full legal power behind him, and the inspector puts up the argument that he did not compel the grounding because, though he knew it undoubtedly decreased the life hazard, it slightly increased the fire hazard, that municipality will lose the case, for counsel will have no difficulty in proving negligence and the inspector ought to lose his job.

As Mr. Wynkoop says, when you find one bridged wire you most commonly find two, and in my experience trouble due to grounding is the cause of an almost infinitesimal amount of "bridging." It is usually caused by barefaced, deliberate overloading of circuits, wilfully or ignorantly, and if I can trace it to a licensed wireman, under our present law, I shall do my best to have him deprived of his license.

As to the layman, just one thing will cure it—education, and as the use of electricity increases, we must either trust to slow bitter experience with its attendant loss, to high-cost inquisitorial inspection as in some European countries where it reaches the domestic details of life, or somebody has got to do the educating.

I have, in the past two years, given two talks to the high-school pupils, one to a large private school, one to the grammar grades, two to men's and women's clubs and when the two local boy-scout patrols meet with my boys at our house, I frequently talk electricity with them.

In my report to the town, I make it a custom to insert about four pages written as interestingly as I can on domestic uses of electricity, risk of tampering with the wires, overloading, overfusing, etc., and I can positively say that "bridging" is among the least of my worries today with trouble from grounding a close second.

We can all improve what chance we get in the education line, not as the official with the law behind him, or the sometimes unwelcome inspector for the insurance company, but as the neighbor whose experience counts, who has a stock of proved cases of trouble at hand to back up his statements, and my experience has been that a vast amount can be accomplished, and it pays.

William Lincoln Smith,
Municipal Inspector.

Concord, Mass.

Jovian Rejuvenation in Eau Claire.—At a rejuvenation held at Eau Claire, Wis., on March 9, 29 candidates were initiated into the Jovian Order. A degree team from Minneapolis conducted the ceremony.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 333.—Electric Car Heating.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

No. 338.—Grounding of Motors.—What is the best way to ground a group of motors? Can motors of different voltages be connected to the same ground plates, say in the case of 110, 220 or 440-volt alternating-current machines?—R. B., Jackson, Mich.

No. 339.—Telephones on Power Lines.—What precautions should be taken in installing telephones whose line is on the same poles with 11,000-volt power lines? What special precautions should be taken for safety? Would it be practical and would the service be satisfactory if a grounded circuit were used instead of a metallic circuit for the telephone line?—R. F. C., Minersville, Cal.

No. 340.—Three-Phase Versus Single-Phase Transformers.—If the three-phase transformer actually possesses all the advantages that are claimed for it, why is the three-phase distributing transformer not used instead of the single-phase on a larger scale? How do the two compare as regards reliability and cost?—N. T., Chicago, Ill.

Answers.

No. 322.—Jobbers' Trade Names.—Is the common custom of jobbers of putting their own firm name or some special trade name on articles (thus disguising the real manufacturer) regarded as good commercial practice? Does it promote sales? Does it not injure the interests of the manufacturer to have his products sell under several trade names?—W. T. K., St. Louis, Mo.

While it might be through neglect on his part, nevertheless, the writer of the present answer has never noticed it to be a *common* practice for jobbers to obliterate, with their own, the marks of the manufacturer on goods sold by the former. The writer is in possession of a number of catalogs (in both bulletin and bound-volume form) of representative jobbing houses; in none of these publications is any attempt made to represent standard manufactured articles as being of the jobber's own make. Again, though the writer has followed the proceedings of the more important societies (engineering, contracting, etc.) for the past five years, he has never seen the present particular matter brought up; though certain discussions could be extended to bear on this subject.

However, assuming such a custom to be evident, the writer believes that the matter should be weighed—in his opinion, the custom condemned. The attack can be made from several angles, the chief ones taking into consideration (1) ethics, (2) trade-mark law, and (3) co-operation.

That such a custom is *against* good ethical principles, being self-evidently misrepresentative, alone is sufficient to establish the first point's negation.

Considering the second point, it is that the custom conflicts with the rights of holders of specific trade-marks, the definition of the last being "a symbol consisting in general of a picture, a label, or a word or words, applied or attached to the goods of a trader [which term can be extended to include the manufacturer whose organization includes direct sales to the ultimate consumer, in competition with the so-called middleman] for the purpose of *distinguishing* them from the similar goods of other traders, and of *identifying* them as *his* goods, or of those of his successors, in the business in which they are *produced* or *put forward for sale*." And, though the trade-mark's chief purpose is to act as a deterrent against the *substitution* of inferior goods for those (generally of superior quality) indicated by the mark, it would appear to the writer that the owner of the mark should equally demand his *originality* rights. At any rate, Webster's definition of "trade name" does not include in its use the right to obliterate the trade-mark of another than the owner of the trade-mark. There is a wide literature on the interpretation of trade-mark law, but the writer cannot conceive of a technicality tending to weaken his foregoing conclusion based on the general definitions.

In considering the third point, co-operation,—and neglecting to regard possible cases in which the public's confidence in a local jobber overrides that in the manufacturer—the second and third questions in the above query can also receive attention. The question of the proper relations between the contractor and the jobber, on the one hand, and the manufacturer on the other, is one that has occupied a prominent place in the technical journals and in papers and discussions by exponents of these followings. While a large number of different suggestions, codes of ethics, etc., have been put forward for consideration and many adopted it might be said that in general these all pointed to co-operation. The writer can not see that the custom under discussion smacks of *united effort*. As regards the interests, other than those already considered, of the manufacturer, the following comments, which also affect "magnitude of sales," have arisen from the sources just mentioned: The contractor or jobber would be the first to admit that a firm of, say, lamp makers who did not advertise *their goods* to the general public as widely and effectively as possible would soon go out of business. They recognize that the more energetically the manufacturer cries aloud the merits of *his* goods, the more eager the public is to buy those goods bearing his stamp and the more business comes to the contractor and jobber. Attractive posters, show-cards, booklets, and pamphlets—this in addition to sometimes mammoth advertising campaigns in popular and other publications—are put forth by the manufacturer at considerable expense and distributed broadcast, and as a general thing any contractor or jobber whose field lies within the area covered may have an almost unlimited amount of this kind of advertising matter *with his own name and address* printed thereon (but the last not to be the elimination of the maker of the goods being pushed). The distribution of such literature does good to both parties concerned and is one of the most useful forms of co-operation between them.

It would be extremely poor business judgment to refuse the benefits of the above co-operation for the sake of a local term, and rather unfair to overfly the one flag with another in selling articles, possibly of the same manufacture, that have, however, no propaganda of the maker behind them. In conclusion, attention might be called to, say, the local (wholesale or retail) grocer: he does not overstamp "White Building Coffee" and sell it as "*His* coffee," or "50-Odd Varieties" as "His Pickles, etc."—and so on for other articles and other dealers.—P. B. W., Verbena, Ala.

No. 331.—Small Lifting Magnet.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

From tests conducted on a series of open plunger-type magnets it has been found that the pull per ampere-turn per inch per square inch core cross-section is about 0.01 pound between the limits of 800 and 2,800 ampere-turns per inch per square inch of core cross-section. Thus a magnet energized with 10,000 ampere-turns and of a length of five inches will exert

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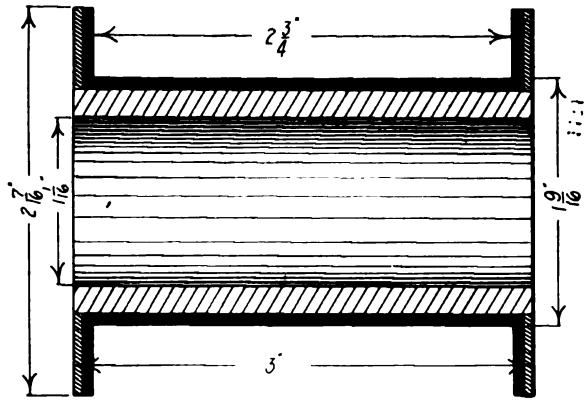


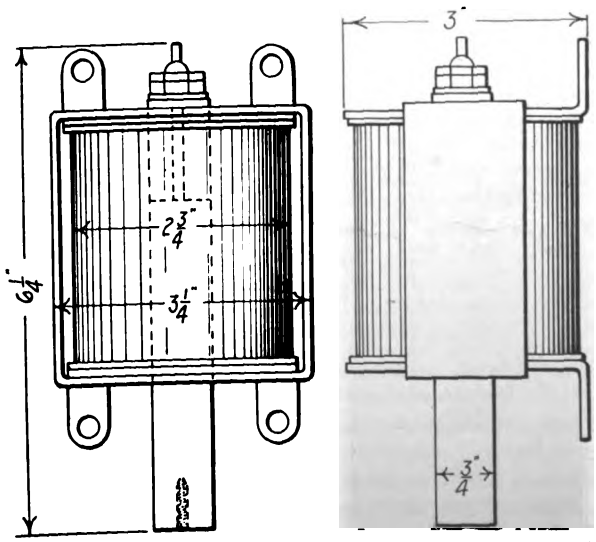
No. 331.—Fig. 1.—Coil for Small Lifting Magnet.

a pull of approximately 20 pounds on a core of one square inch cross-section. The ampere-turns per inch per square inch cross-section=2,000, and 2,000×0.01=20. This is the maximum pull exerted, and will not be exerted over the entire length of the stroke, but at that point where there is a maximum number of lines of force cutting a maximum number of turns. In order, therefore, to give a minimum pull of one pound, this coil is designed for a maximum pull of 2.3 pounds. The dimensions are as shown in the diagram (Fig. 1). The spool should be constructed of brass and insulated effectively to the size shown, then wound with 550 feet No. 23 double-cotton-covered copper wire. The core should be 1 inch in diameter by 3.5 inches long, and should be adjusted to operate with its end entered one inch within the coil. The magnet will take about two amperes at 20 volts.—J. H. M., Sharon, Pa.

The drawing (Fig. 2) shows the principal dimensions for the electromagnet in question. The following data will give all that is necessary to check up on the design, if desirable. The core is wound with No. 22 single-cotton-covered copper, 93.5 turns per layer and a total of 1,770 to 1,780 turns.

Energy required	18 watts
Current (18/20)	0.9 ampere
Resistance of winding (20/0.9)	22.2 ohms
Winding space (area)	2.41 square inches
Winding space (volume)	14.17 cubic inches
Resistance per cubic inch required (22.2/14.17)	1.57 ohms
Nearest to this is	No. 22 B. & S.
Turns per inch of No. 22	34
Turns per layer	93.5
Total turns	1,770 to 1,780
Ampere-turns	1,593
Length of wire	1,375.5 feet
Weight of wire	2.83 pounds

—H. E. W., Chicago, Ill.



No. 31.—Fig. 2.—Front and Side Views of Lifting Magnet.

No. 334.—Locked Cutout Cabinets.—In a large drafting room lighted by adjustable drop lamps over each drawing table considerable trouble has been caused by a rule keeping the cutout cabinet locked with only the electrician in charge of the key. When a fuse blows due to trouble on any drop lamp, the circuit for several tables is dead until the electrician can be found in some remote part of the factory. What is the best solution for the difficulty without violating the rule? —N. L. P., Milwaukee, Wis.

Probably the simplest way to secure relief from the delay incident to a blown fuse being located in a locked cabinet, on account of trouble on a lamp circuit, would be to localize the trouble by installing a fused rosette for each lamp. This would save the electrician time and labor in locating the fault, and allow only the lamp on the drop affected to go out. Adjustable drops usually receive rather severe service, and I have found that the kind of flexible cord and type of adjuster used determines their length of life. We consider that "slicked down" reinforced cord gives the most satisfactory results.—M. K., Passaic, N. J.

The inquirer is in a certain sense asking how he can violate the spirit of the rule without violating its letter. It is obvious that the cutout cabinet is kept locked with the intention that only responsible persons shall be able to replace and be accountable for the fuses therein. I think it is safe to conjecture that a cutout controlling a number of table lamps or drops that often blow the fuses, would very soon be bridged or overfused were the cabinet not kept locked, for if awaiting for the arrival of the plant electrician to make the repair is too great a strain on the patience of N. L. P. and his fellow draftsmen, it is not reasonable to suppose that they are going to wait until they can obtain the proper fuse plugs themselves and even supposing they did the occasion would arise when a fuse plug could not be readily obtained and then—oh! that bridge!

No! The best solution for your difficulty is to leave the cabinet locked and, if permissible in your district, fuse your rosettes. In this way only one lamp will be dead and if you bridge the rosette it will not do any harm, beyond blowing the fuse in the cabinet, putting out the rest of the lights on the circuit.—J. S., Victoria, B. C.

In mostly all places where the locked cabinets are installed there is considerable inconvenience caused by the delay in getting the electrician who has been intrusted with the keys of the cabinets.

Such a rule is a good one, however. For instance, if the cabinets were not locked, as soon as the fuses blow some unauthorized person might insert another fuse or a set of fuses of different amperage to that needed, and may either overfuse or underfuse the circuit, which is very undesirable, and the electrician would not know anything about it until trouble happened again.

If fuses are constantly blowing, the cause should be located and removed; either the circuit is overloaded, that is, the fuse may not be large enough, or there may be excessive heating near the fuse which would tend to blow sooner. If circuits are properly loaded, properly fused and well installed, there is very little danger of the blowing of fuses unless something out of the ordinary happens.

In our mill all such cabinets are kept locked and a key of each cabinet furnished to each of the three men in the electrical department, so that any one of them can be dispatched to the scene of trouble.

If it were merely the blowing of fuses, one of the men in the room could be given a few fuses and instructed how to use them. But where fuses are blown there is usually trouble on the circuit that must be removed before service can be restored and it is necessary that the electrician do this—W. T. E., Ansonia, Conn.

[No. 337.—Master Switch for House Lighting.—Of the numerous answers received to this question, the best ones will be published in an early issue.—Editor.]

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Annunciator System for Placing Orders in Restaurants and Lunch Rooms.

The transmission of guests' orders from the waiters in lunch rooms and restaurants to the kitchen is usually accompanied with considerable confusion and very often with much noise. While this is particularly true in lunch rooms of the quick-lunch type, it also prevails in many of the better restaurants, in hotels and club houses. To overcome this, various systems of signals have been developed with more or less success, because if the waiter must actually go to the kitchen to place his order, considerable time is usually lost.

An electrical system to accomplish this with certainty and dispatch has now been developed. It consists of a number of sending stations similar to that shown in Fig. 1. These are made for mounting upon the wall, directly above the counter or on a post. Any number of these stations may be arranged, usually one for each dining room. All these are connected electrically to a receiving station or a cabinet shown in Fig. 2, which is located at the desk or convenient to the position of the chef or special checker in the kitchen.

Fig. 1.—Sending Station, Hotel and Restaurant Indicator.

On a comparison of the two illustrations shown herewith, it will be noted that both of these stations consist of equal numbers of panels, in this case 36; this number may be made whatever is required, from 16 to 100. On the sending station each panel consists of a name plate into which can be removably inserted the names of the various courses on the menu of the restaurant; the corresponding panels in the kitchen are similarly labeled. Each of the sending panels also includes a push button which is connected to the receiving panels so as to cause a small red lamp to be illuminated in the lower left corner of the panel, the latter feature being for the purpose of attracting the attention of the chef.

It will be observed in Fig. 2 that various numbers appear upon the little dials in the centers of the panels. These correspond to the number of orders that are "live." The arrangement is such that each time that a waiter presses the button on any particular panel at any sending station, the number in the corresponding receiving panel is successively increased for each depression of the sending button; thus the number shown indicates how many orders are to be filled. As soon as any of these orders have been filled and made ready for the waiters, they are passed by the chef who checks them off by pushing a button in the lower right portion of the panel and this causes the numbers to be successively reduced one at a time for each pressing of the button. In the meantime, however, the small red lamps remain lighted as long as any orders must be filled for any particular course.

This system works with precision and shows at a glance just what orders are to be taken care of immediately by the chef's staff; therefore, he can arrange the work among his assistants so as to have the orders filled in the most prompt manner. He also has a check on all of the orders being filled.

The electrical system by which this is accomplished is through a development of the annunciator principle and is covered by patents. All of the wiring from the various sending stations to the receiving cabinet in the kitchen is put in steel conduit so as to make it entirely waterproof and well protected. Any number of sending stations can be connected in parallel to one receiving cabinet. The names of the various courses and orders are easily changed and are protected by white celluloid. The system is easily installed because the actual wiring can be readily put in by practically any local contractor or electrician. All parts of the sending and receiving stations are well made and neatly finished. Metal parts are heavily nickel-plated. The plate box is made of cast aluminum. A number of these indicators have been in use with complete success for some time. The current required for their operation is small.

Fig. 2.—Receiving Station, Hotel and Restaurant Indicator.

These hotel and restaurant indicators are manufactured by the Hamilton Manufacturing Company, Two Rivers, Wis. They are sold and distributed by Schaeffer & Weber, 1051 Marquette Building, Chicago, Ill.

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BALL BEARINGS ON ELECTRIC MOTORS.

By F. E. Rogers, Jr.

Ball bearings are usually applied to machinery because of the power saving which they make possible. Machine builders early recognized the value of ball bearings as power savers, and their adoption as standard equipment has been consequently rapid and extensive. Although ball bearings have been applied to electric motors at a rate which compares favorably with other types of machinery, power saving has not been the principal reason. The question then arises: Why are ball bearings used on electric motors? There are several important reasons which it is the object of this article to discuss.

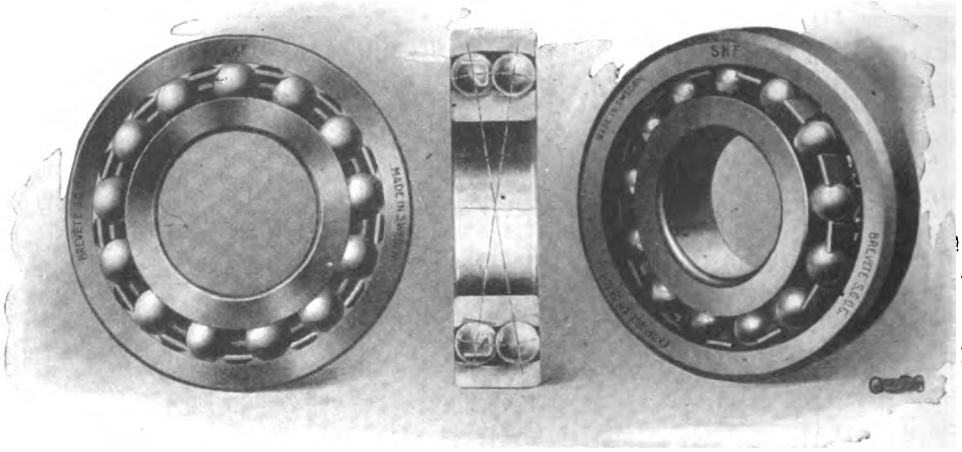

Fig. 1.—Typical Self-Alining Ball Bearing, Shown in Normal Position, in Section, and in Deflected Position.

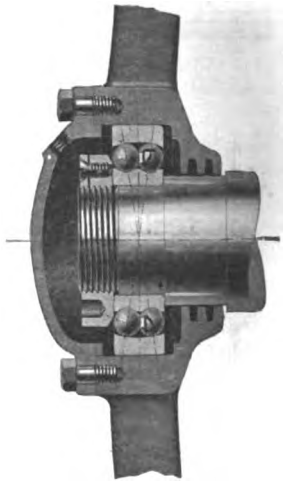

Fig. 2.—Sectional View of Bearing Housing, Showing Mounting of Bearing.

Construction of the Bearing.

In order that the reader may more readily appreciate the advantages to be derived from their use on electric motors, it would appear desirable to examine the mechanical construction of ball bearings. The radial bearing used on electric motors consists essentially of four parts; an outer race, an inner race, two rows of balls, and a ball retainer or cage. Referring to the sectional view of the bearing, it will be seen that the inner race contains two grooves, each ground to a radius slightly larger than the radius of the balls. The inner surface of the outer race is ground as part of a hollow sphere, the center of which lies on the axis of the shaft. The balls and inner race are thus free to rotate at any angle within this spherical outer race, without increasing the strain on the bearing. Thus the shaft may deflect, but it cannot bind the bearing. This "ball and socket" principle is invaluable in the electric motor, "because a bearing which cannot adjust itself to suit the shaft, requires extreme accuracy in fitting up, and the least inaccuracy in alinement and housings results in wedged and broken balls and abnormal wear."[1]

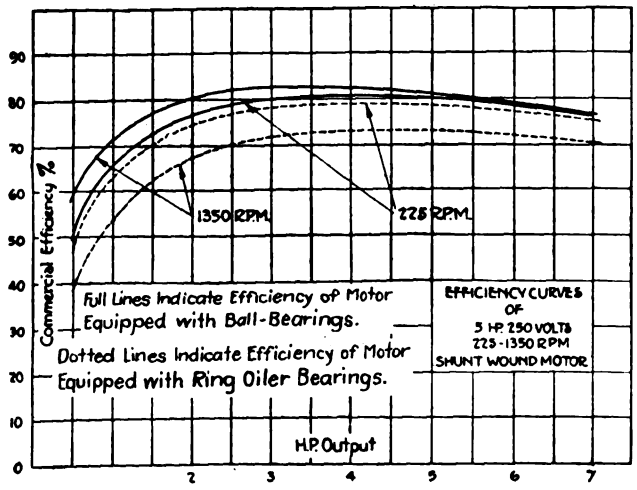

Fig. 3.—Efficiency Curves of Motor with Ball Bearings and Plain Bearings.

Regarding the strength of the material from which ball bearings are made, it should be realized that the crushing load of a one-inch Swedish crucible-steel ball is 97,000 pounds. Add to this the fact that sliding action is replaced by rolling action, and the reason why ball bearings are so much more durable than bearings of the sleeve type becomes at once apparent. Note particularly that as all moving contact takes place within the bearing itself, no wear occurs on the shaft.

Small Amount of Attention and Lubrication Required.

The method of mounting the ball bearing provides for an oil-tight bearing housing, a feature which materially reduces the required amount of lubricant and consequent attention. Grooves, provided with felt washers, effectually seal the housing, preventing the escape of lubricant as well as the intrusion

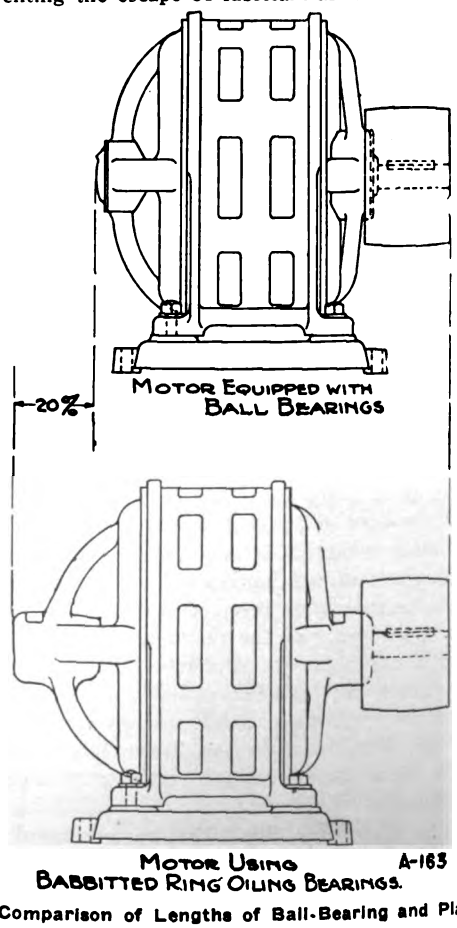

Fig. 4.—Comparison of Lengths of Ball-Bearing and Plain-Bearing Motors.

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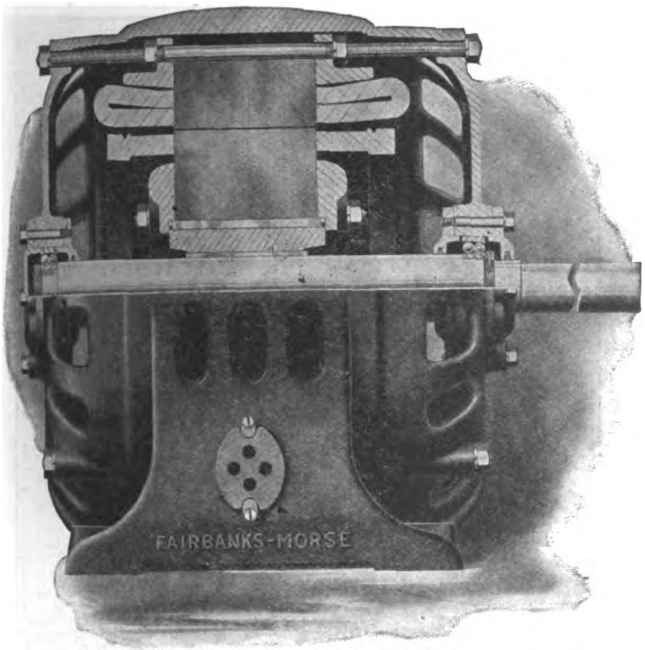

Fig. 5.—Partial Section of Motor with Ball Bearings.

of dust and foreign matter. (See sectional view of bearing housing.)

As no lubricant is wasted through leakage, commercial ball-bearing motors will usually run satisfactorily if oiled every three or four months. The required attention is correspondingly small, as it is not necessary to inspect the bearings except when they are oiled. In ceiling installations, ball bearings are particularly valuable, as it is not necessary to inspect them every time the motor is started: the operator need not concern himself about the possibility of oil rings sticking. The maintenance bill is, in consequence, considerably lower, the saving in lubricant alone being no small item. Aside from the occasional inspections, the only requisite for ball-bearing machines is a chemically neutral lubricant, free from acid or alkali, and of such consistency that it will circulate in the lubricant chamber. The action of the bearing provides thorough circulation of the lubricant, assuring long life to the bearing. Oil is recommended for horizontal machines operating at speeds in excess of 2,500 revolutions per minute, and in most cases in vertical motors; for low-speed machines a good grade of grease is preferred.

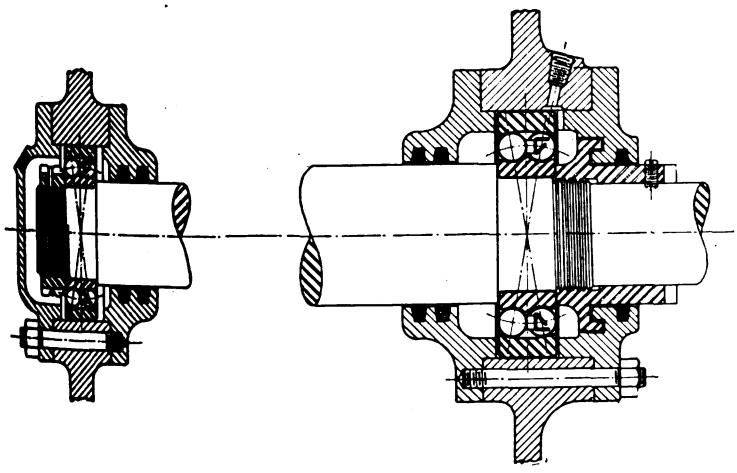

Fig. 6.—Special Dustproof and Waterproof Mounting for Use in Cement Mills and Other Dusty or Wet Places.

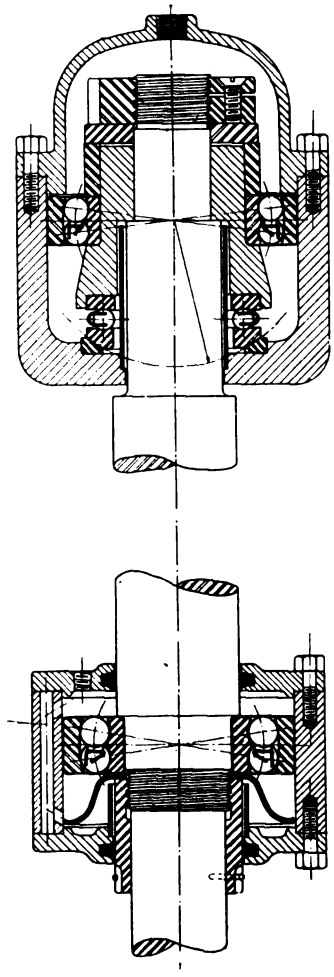

Fig. 7.—Radial and Thrust Bearings for Vertical Motor.

Uninterrupted Service.

Continuous service is an important feature of modern shop requirements. Ball bearings are tightly sealed; consequently frozen bearings, due to the interference of dust and lint with the circulation of the oil, are avoided. The small amount of friction to overcome and the freedom from binding in self-alining ball bearings, reduces the amount of heat generated with the result that the danger of overheated bearings and the resulting shutdown is eliminated.

Fire Risks.

In addition to the freedom from shutdowns, the use of ball bearings materially reduces the fire hazard, as many fires have their origin in hot bearings. The insurance companies appreciate the fire-preventive qualities of ball bearings and are staunch advocates of their use.

On direct-current machines the commutators remain free from oil, better commutation resulting. Freedom from sparking commutators is very desirable in flour mills, in coal mines, in textile mills, in wood-working plants, etc., because of the combustible dust which is usually present in these plants.

Efficiency.

Although, at first sight, there does not appear to be much room for improvement in mechanical efficiency, the fact remains that ball bearings do improve the efficiency, particularly where the load is overhung. When the motor is direct-connected, as in the case of the direct-driven centrifugal pump, motor-generator sets, etc., the pressure on the bearings is not great and the friction loss is correspondingly small, probably not more than four per cent. But when the motor drives through a belt or gear, the pressure on the driving-end bearing is greatly increased and the friction loss becomes appreciable. The accompanying efficiency curves were obtained from tests made by a motor manufacturer who equips his motors with either sleeve type or ball bearings at the option of the cus-

1 Andrew Gibson, in a paper on "Bearings of Electrical Machinery," read before the West of Scotland Branch of the (British) Association of Mining Electrical Engineers.

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tomer. It will be seen that, although the difference in efficiency at minimum speed is not large, the improvement at maximum speed is worthy of consideration, amounting, for this motor, to 6.5 per cent at full load. This difference in efficiency is exceptional, as the friction loss of electric motors under ordinary running conditions is frequently not much over one per cent. But practically all of this loss may be saved by ball bearings, and manufacturers using them as standard equipment figure that even this slight saving will pay for the bearings within one year. Note that, whereas with plain bearings the efficiency decreased as the speed increased, the reverse was true of the motor when equipped with ball bearings.

Ball-bearing motors start with a minimum effort. Plain-bearing motors are frequently subject to excessive starting effort, when, having stood idle, the oil is pressed out from between the bearing lining and the shaft, and lubrication is not established until the machine is up to speed. Ball bearings are not subject to this disadvantage as they do not require an oil film to reduce friction; the function of the lubricant is to preserve the highly finished surfaces of the balls and races.

Reduced Length.

Babbitt bearings are usually designed with the box length two and one-half to three times the diameter of the shaft which they support. Contrasted with this, the length of ball bearings along the shaft is usually not over one-half of the shaft diameter. This feature allows a reduction of 10 to 27 per cent in the over-all length of the motor, an item of importance where space is at a premium, as it offers a material saving in floor space and aisle room.

Methods of Mounting the Bearings.

It is important that ball bearings be mounted properly. The inner race must have a tight fit on the shaft and should be permanently seated, by means of a locknut or distance piece, in a fixed position against the shaft shoulder. The outer race, on the contrary, should seldom be held rigidly in the housing. A sucking fit within the housing will permit the outer race to creep and insure a more perfect distribution of the load over the whole circumference of the race.

Where there is more than one radial ball bearing on the same shaft without a thrust bearing, one bearing only should be used to secure the shaft against end motion. In the electric motor this should be the bearing opposite the pulley end. The outer race of the other bearing should have ample clearance on both sides so that it will be free to locate itself laterally. On direct-current motors, the outer race of both bearings may be allowed endwise freedom, so as to permit sufficient end play to insure even wear on the commutator.

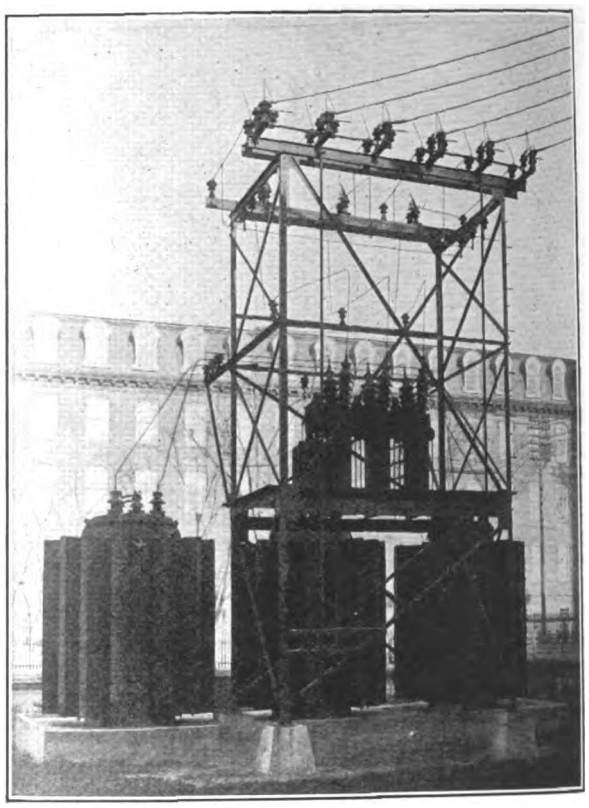
Fig. 7 shows the arrangement of the bearings for a motor employing a vertical shaft. The thrust bearing is seated in a washer which forms a spherical seat, the center of which coincides with the center of the radial bearing. Thus the two bearings form a completely self-alining unit.

If reasonable care is used in applying the bearings and in keeping them clean after installation, no trouble need be anticipated in using them.

The employment of ball bearings on motors is advancing so rapidly that it is evident that the old prejudices against them have been largely overcome. They have proved their worth both in this country and abroad. The greater compactness which ball bearings make possible, their durability and ease of application, the small amount of attention they require and the power which they save, all these have contributed toward their ability to accept the part which they have so successfully played in the field of modern machine construction.

Outdoor Substation for 6,000 Kilovolt-Amperes.

The outdoor substation illustrated in the accompanying cut is said to be the most simple high-voltage transformer station of 6,000 kilovolt-amperes capacity in operation. It is installed at Cohoes, N. Y., and serves power to one of the largest woolen mills in the world. The station was designed and



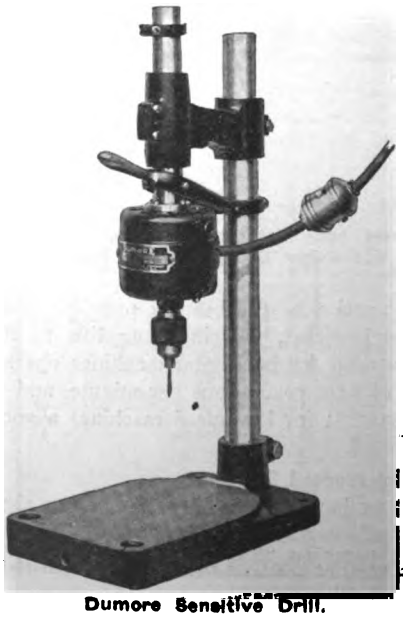
Outdoor Substation at Cohoes, N. Y.

built by the Railway & Industrial Engineering Company, Pittsburgh, Pa. The equipment consists of Burke horn-gap switches and Burke lightning arresters mounted on the top of the steel structure which carries the oil circuit-breakers. The illustration shows quite clearly the method of carrying the wiring and connections to the three 2,000-kilovolt-ampere Westinghouse transformers.

Dumore Motor-Driven Sensitive Drill.

Manufacturers of small specialties, in fact all manufacturers who are working up small parts, will be greatly interested in a small, high-speed sensitive drill that has been brought out by the Wisconsin Electric Company, Racine, Wis. This bench drill is motor-driven and direct-connected. It is equipped with a 13/64 Jacobs chuck and has a capacity in steel up to 3/32, and in brass, aluminum and wood up to 13/64.

This little drill is equipped with S. K. F. ball bearings and is extremely sensitive, owing to the special coil-spring mechanism column. It stands 18 inches high and has a two-inch stroke. The motor and bracket can be readily raised or lowered on the main column. The motor overhangs sufficiently to enable the operator to drill in the center of a six-inch circle.



Dumore Sensitive Drill.

The Dumore sensitive drill is extremely accurate and small holes can be drilled with great rapidity. This drill sells at a relatively low price and is furnished with motor, cord and plug.

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INDUSTRY ACTIVITIES

Condit Electrical Manufacturing Company, Boston, Mass., manufacturer of electrical protective devices, is distributing a mailing card on its quick-delivery facilities.

Belden Manufacturing Company, Chicago, Ill. has prepared catalog supplements giving discounts and base prices, effective March 13, on its magnet and rubber-covered wire, cables, bakelite and other products.

The Universal Motor Company, Oshkosh, Wis., has issued Bulletin No. 20, on its "Universal" four-kilowatt generator set. This set is a direct-connected gas or gasoline-driven, four-cylinder unit designed for town or house lighting, battery charging and kindred uses.

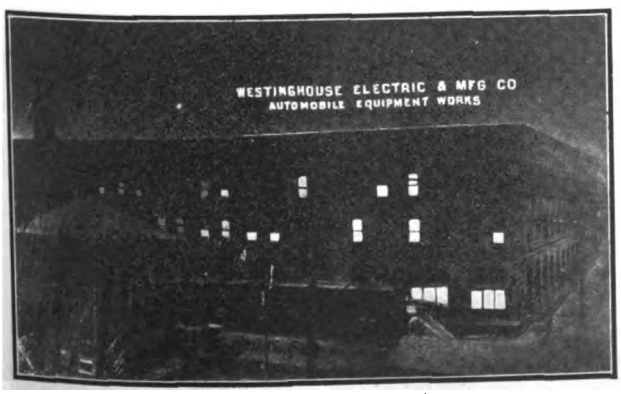
The Safety Insulated Wire & Cable Company, 114 Liberty Street, New York City, has issued its new price list, No. 1233, covering its line of National Electric Code standard lamp cord and flexible cables. Copies of the list will be mailed to anyone upon request.

The Beardslee Chandelier Manufacturing Company, 216 South Jefferson Street, Chicago, Ill., is sending out a letter giving a brief resume of the metal market. It is stated that the average advance in price of soft metal products since the European war has been 253 per cent. Changes in list-price discounts are announced.

The Union Metal Manufacturing Company, Canton, O., manufacturer of metal columns and standards, has issued catalog S-103, which is a 96-page loose-leaf catalog showing a complete line of standards for lighting business and residential districts and parks. A very complete line of standards for cluster lighting is also shown.

The Boustead Electric & Manufacturing Company, of Minneapolis, Minn., recently purchased from the Pillsbury Flour Mills its generating plant, consisting of two 150-kilowatt generators, equalizers, boosters and switchboards, which material the Boustead Company is putting in first-class running condition for future use. The company offers the above material, as well as a large line of other used apparatus for sale.

Westinghouse Electric & Manufacturing Company.—One of the most effective electric signs recently erected in the vicinity of Pittsburgh, Pa., is that shown in the accompanying illustration. It is erected on the Shadyside works of the Westinghouse Electric & Manufacturing Company, which plant is devoted to the manufacture of the starting, lighting and ignition equipments for gasoline automobiles. The letters are of the metal-channel type, the company name in three-foot letters, and the lower words in two-foot letters. To supply the illumination, 566 five-watt, 55-volt Mazda lamps are used. The sign was designed by the Westinghouse company, built and erected by the Federal Sign System (Electric) of Chicago, and the energy for lighting it is furnished by the Duquesne Light Company.



Striking Electric Sign at Pittsburgh.

Hughes Electric Heating Company, 215 West Schiller Street, Chicago, Ill., manufacturer of electric ranges, has opened a branch office at 333 Old South Building, Boston, Mass., with W. B. Pierce as manager. The entire Eastern sales work of the company will be carried on from this office. Mr. Pierce has been engaged in sales organization in the electrical industry for the past 12 years and brings to the Hughes company a fund of selling ideas and experience that will be of great value in gaining greater recognition for the company's appliances in the Northeastern territory.

The Wheeler-Arnold Company, Wittenberg, Wis., which recently succeeded the Wittenberg Cedar Company, announces that it has a good-sized stock of seasoned poles and will have a fairly large volume of new poles. The company produces most of its own poles and besides its Wittenberg yard it has eight other yards favorable for making prompt shipments. W. W. Wheeler, a well known lumber man of Des Moines, Iowa, is president of the company, W. L. Arnold, treasurer and general manager, William Gates, vice-president, J. M. Dusel secretary.

Electric Storage Battery Company, Philadelphia, Pa., recently maintained an exhibit in the Clark Street display window of the Commonwealth Edison Company, Chicago, that attracted a great deal of attention and elicited much favorable comment. The general idea of the exhibit was one of "Preparedness," the central exhibit being an "Exide" submarine cell, type U-29. Each of these cells weighs 1,128 pounds and is 12.75 inches wide by 20 inches long by 46.5 inches high overall; 120 of these cells is the usual equipment on the new L submarine boats, which boats have a displacement of 450 tons. The 120 cells of battery weigh approximately 68 tons. The complete battery of 120 cells has the following, approximate, ratings: 90 horsepower continuously for 20 hours, or 400 horsepower continuously for 3 hours, or over 825 horsepower continuously for one hour. These batteries can discharge momentarily at 2,000 horsepower. The unique feature of this new type of submarine battery is that each cell is a separate unit and each cell can be quickly removed from the battery compartment for repairs. Each cell is completely sealed and has two air inlet tubes into which air is drawn by a ventilating system, this system being connected by rubber tubing to an outlet in each cell. In passing out, the air diluted with hydrogen gas is conducted through a number of perforated screens of hard rubber which remove and return to the cell any entrained stray electrolyte. The filling plug of each cell is removable by making a quarter turn which throws a valve, so that the cell cannot be overfilled. A battery of this type is said to be absolutely proof against explosion, due to hydrogen gas; and on account of the method of sealing the entire battery can be completely emersed in salt water to the depth of several inches above the cell covers and no salt water can get into the cells. In addition to the exhibit of the submarine cell, there were shown in this window a tray of Ironclad batteries for use in electrically propelled vehicles; some Exide batteries for use in automobile starting, lighting and ignition; some Chloride cells for use on alarm and clock circuits and several other types of batteries.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

BUSHINGS, Porcelain.—Thomas & Betts Company, 105 Hudson Street, New York, N. Y.

T. & B. screw-threaded porcelain bushings with stamped-steel locknuts; catalog Nos. 1, 2, 2½, 3, 3½.

Listed January 3, 1916.

CUTOUT BASES, Plug Fuse.—C. & P. Electric Works, 92 Hayden Street, Springfield, Mass.

Barrier cutouts designed to be made up into panels and having upturned edges to form a barrier around wiring gutter. Furnished with sectional or solid busbars.

C. & P. 0-30 amperes, 125 volts, 2 and 3-wire main, double 2-wire plug fuse branch cutout bases, catalog Nos. B2587, B2199, with end pieces, catalog Nos. B2587E, B2199E.

Standard for use only up to 18 circuits with sectional busbars, and 40 circuits with solid busbars.

Listed January 12, 1916.

FIXTURES, for Use with Gas-Filled Lamps.—E. H. Baxter Sales Company, 208 North Fifth Avenue, Chicago, Ill.

Chain pendent type. 100-200 watts, 110 volts, catalog No. 813. 200-300

Porcelain Bushing.—Thomas & Betts Company.

watts, 110 volts, catalog No. 1013. 400-500 watts, 110 volts, catalog No. 1217.

Listed February 1, 1916.

FIXTURES, for Use with Gas-Filled Lamps.—Harter Manufacturing Company, 1132 West Austin Avenue, Chicago, Ill.

Ceiling type De Luxlite, 500 watts, catalog No. 2923½.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill.

Type G.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—Crouse-Hinds Company, Syracuse, N. Y.

Series V, VH and Type WV.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—McGill Manufacturing Company, Valparaiso, Ind.

McGill type.

Listed February 1, 1916.

FIXTURES, Vapor-proof. — Frank W. Morse, 293 Congress Street, Boston, Mass.

Morse, catalog No. 26.

Listed February 1, 1916.

FIXTURES, Vapor-proof.—V. V. Fittings Company, Philadelphia, Pa.

Type 5.

Listed February 1, 1916.

GROUND CLAMPS.—Thomas & Betts Company, 105 Hudson Street, New York, N. Y.

A copper strap ground clamp with formed soldering lug, a malleable iron rider and a clamping bolt. Marked "T. & B.," adjustable for pipes up to 3-inch sizes.

Listed February 15, 1916.

HEATERS, Electric.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Electric linotype and intertype pots.

Electrically heated melting pots and control panels for the melting and automatic temperature regulation of type metal. Maximum rating, 1,600 watts, 250 volts, alternating or direct current.

Standard when installed to form part of a typesetting machine.

Listed February 5, 1916.

PICTURE MACHINES AND APPLIANCES.—Kinoikon Apparatus Corporation, Bridgeton, N. J.

Kinoikon projector. Type E, two types; one for hand operation, the other driven by a special motor and equipped with mechanical speed controller, and with an automatic device for stopping motor in event of breakage of or lack of tension on film.

Listed February 16, 1916.

ROSETTES, Link-Fuse.—Manhattan Electrical Supply Company, 17 Park Place, New York, N. Y.

Mesco, 2 amperes, 125 volts.

Cleat, catalog No. 6565.

Listed February 1, 1916.

ROSETTES, Fuseless.—Manhattan Electrical Supply Company, 17 Park Place, New York, N. Y.

Mesco, 3 amperes, 250 volts.

Cleat type, catalog No. 16445.

Molding type, catalog No. 16446.

Concealed type, catalog No. 16447.

Listed January 31, 1915.

SWITCHES, Automatic.—Owen T. Snyder & Company, Columbus, O.

Safety elevator door switch.

Emergency switch.

Consisting respectively of:

An inclosed, series, quick-make-and-break switch automatically operated by elevator door, connected in series with car controller, so that car cannot be started until doors are properly closed, 2 amperes, 250 volts.

An inclosed, double series, spring-actuated switch normally open, automatically operated by breaking of glass, one side connected across door switches, and other side in series with signaling device. 2 amperes, 250 volts.

Listed February 16, 1916.

SWITCHES, Pendent Snap.—Pass & Seymour, Solvay, N. Y.

P. & S. switches with pull-chain mechanism, 3 amperes, 125 volts; 1 ampere, 250 volts; catalog No. 3006.

Listed January 5, 1916.

SWITCHES, Push-Button Flush.—The Trumbull Electric Company, Plainville, Conn.

Four-way; 5 amperes, 250 volts; 10 amperes, 125 volts; catalog No. 204.

Listed February 5, 1916.

THERMOSTAT CONTROL FOR ELECTRIC CAR HEATERS.—Thermo Electric Regulator Company, 617

Pendent Snap Switch.—Pass & Seymour.

West Jackson Boulevard, Chicago, Ill.

Consisting of an electromagnetically operated switch, controlled by contacts in a mercury thermometer and a relay. All operating parts are inclosed in a metal case.

This system is judged to be suitable for use when wiring is installed in accordance with Rule 40 of the National Electrical Code.

Listed February 16, 1916.

THERMOSTAT VALVE CONTROL.—Gold Car Heating & Lighting Company, 17 Battery Place, New York, N. Y.

Temperature-regulating system for steam or hot-water radiators. Consisting of solenoid-operated radiator valves, each requiring 10 watts at 125 or 250 volts direct-current and controlled in groups of from one to four magnet valves in multiple by special thermostatic wall switch.

Standard for use when the wiring is installed in accordance with Class C rules of the National Electrical Code.

Listed February 5, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. FRANK T. WYMAN, formerly chief engineer of the Pittsburgh Transformer Company, Pittsburgh, Pa., has accepted a similar position with the Packard Electric Company of St. Catharines, Ontario, Can. Mr. Wyman is a graduate of the University of Vermont. After his graduation he was a member of the faculty of the electrical engineering department of Drexel Institute, Philadelphia, Pa., for two years, and the University of Pittsburgh for two years. For the past seven years Mr. Wyman has been connected with the Pittsburgh Transformer Company, and has been chief engineer of that company since 1912.

MR. W. E. HASELTINE, who was elected president of the Wisconsin Electrical Association at its annual meeting in Milwaukee on March 17, is secretary and general manager of the Ripon Light & Water Company. Mr. Haseltine was born in Schofield, Wis., in 1874. He received his engineering

W. E. Haseltine.

education at the Massachusetts Institute of Technology and after leaving school accepted a position in the Alaska mining fields. He later, with his father, organized the Ripon Light & Water Company and has been actively connected with this company continuously for the past 16 years. Mr. Halestine is also secretary and manager of the Markesen Electric Company, which is controlled by the Ripon Company. He has been long identified with the Wisconsin Electrical Association and in 1914 was elected second vice-president, being advanced in 1915 to the offce of first vice-president. He was also vice-president of the Wisconsin Gas Association and is a member of the American Water Works Association, the Wisconsin Engineering Society and other organizations.

MR. C. E. ROBERTSON has recently been appointed sales manager of the General Vehicle Company, with headquarters at the general offices of the Company in Long Island City, N. Y. He succeeds MR. C. W. SQUIRES, JR., who has resigned that position. Mr. Squires will remain with the Gen-

C. E. Robertson.

eral Vehicle organization and will take at his own request an important position in the West. Mr. Robertson is an expert sales director of unusual experience and executive ability. His broad training should stand him in good stead at a time when the General Vehicle Company is not only expanding its sales organization but planning to increase its lines of gasoline and electric trucks.

MR. JAMES B. OLSON, who has been identified with the electric wire and cable industry for many years, recently has been appointed general sales manager of the Habirshaw Electric Cable Company, 10 East Forty-third Street, New York City. This company is a consolidation, made several weeks ago, of the Habirshaw Wire Company, the Electric Cable Company and the Waterbury Company. Mr. Olson first entered this field as a member of the sales organization of the New York Insulated Wire Company. Later he accepted a similar position with the Habirshaw Wire Company, remaining with this company for 20 years. During the last 18 years of that period he has been sales manager of the Habirshaw Company.

James B. Olson.

OBITUARY.

MR. JOHN C. MANLEY, assistant construction superintendent of the Commonwealth Edison Company, Chicago, Ill., dropped dead March 17 while playing handball in a Chicago gymnasium. Mr. Manley, who gave every appearance of a man in the very best of health, occasionally indulged in a little exercise before luncheon. He was actually playing the game when he toppled over, and apparently died instantly. Mr. Manley exemplified his name in every sense of the word. He was a manly man. He was active and alert, eminently fair and just, and fond of athletic sports. It may be remembered, perhaps, that in the famous baseball game between the East and the West at the Atlantic City convention of the National Electric Light Association in 1909, it was Mr. Manley, a strong amateur player, who made the three-base hit that resulted in the

John C. Manley.

Western team winning the game. Mr. Manley was born in 1869. He had been with the Commonwealth Edison Company and its predecessor, the Chicago Edison Company, since June, 1895, beginning as a wireman and rising to the position he held when he died. He was one of the most popular men in the company, and his death came as a great shock to many. Always quick-thinking and enterprising, Mr. Manley was selected to direct many special construction installations. Mr. Manley was a man of considerable inventive ability, and a number of improvements in the art of electrical wiring are to be attributed to him. He was an associate of the American Institute of Electrical Engineers, a member of the Jovian Order, in which organization he was Second Tribune for Chicago. He was second vice-president of the Electric Club-Jovian League, a member of the Knights of Columbus, and other fraternal organizations. He was prominent in affairs of the Commonwealth Edison Company Section of the National Electric Light Association, and was at one time president of this Section. Besides a widow he leaves two sons, both of whom are at college.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

MONTPELIER, VT.—The Vermont Public Service Commission has approved an issue of $250,000 in stock by the Montpelier & Barre Railway Company.

ST. JOHNSBURY, VT.—C. C. Braley, of this city, T. W. Chase, of Passumpic, and others have incorporated the Essex Storage Electric Company with a capital of $200,000. The company plans a large hydroelectric development at the town of Victory on the Moose River, from which energy will be transmitted to St. Johnsbury and neighboring communities for power and lighting purposes.

EASTHAMPTON, MASS.—J. N. Lyman, manager of the Easthampton Gas Company, states that the company is planning to install two transmission lines to its power plant at Mount Tom, a distance of 2.5 miles.

SHIRLEY, MASS.—The Shirley Electric Company proposes to build a 13,000-volt transmission line between this town and Pepperell, about five miles of which would be on public highways.

SPENCER, MASS.—The Bigwood Woolen Company is installing electric motors to run its yarn making department, to enable operation with night and day shifts.

ROCKVILLE, CONN.—W. A. Howell is chairman of a committee that plans to install a white way around Central Park. About 20 two or three-light standards will be purchased.

LANSDALE, PA.—The City Council has revived the question of moving the Lansdale Electric Company's plant from its present location in this city to the town of Chalfont, six miles east of here, where water power is available.

NEWTON, PA.—The City Council has approved a five-year contract with the Bucks County Electric Company for lighting the main streets here.

GRATZ, PA.—The Johnson Construction Company, of Pittsburgh, has been granted a franchise for the construction of an electric lighting system here.

WILMINGTON, DEL.—The Northwestern Power & Manufacturing Company has been incorporated here with a capital of $750,000 for the purpose of acquiring real estate, power sites and water rights for the generation of electrical energy. The incorporators are H. E. Latter, N. P. Coffin and C. M. Egner.

WASHINGTON, D. C.—The electrification and double-tracking of the Chesapeake Beach railway is being considered by a group of men identified with the Merchants' Bank of this city, according to report. The electrification of the railway would mean the building of a power plant on the banks of the Patuxent to generate electricity for Chesapeake Beach as well as for the railway line running there.

RADFORD, VA.—The Enterprise Power & Manufacturing Company will be the name of the new company to construct an electric lighting and power plant here. Oren Dodds will be general manager.

WILLIAMSBURG, VA.—The City Council has received an application from Mr. Davidson of Richmond for an electric lighting and power franchise in Williamsburg.

BUFFALO, N. Y.—The Buffalo General Electric Company has filed application with the Public Service Commission for authority to issue $3,625,000 in bonds, to be used for the construction of its steam-electric plant at Tonawanda, work on which has already been started.

COHOES, N. Y.—The Cohoes Electric Light Company has asked the Public Service Commission to extend its transmission lines to Watervliet and Green Island.

POUGHKEEPSIE, N. Y.—As a part of the plan to extend the electric zone of the New York Central railroad from Harmon northward to Poughkeepsie the old tunnel at Storm King will become a thing of the past. The preliminary work along this line has already been started by the engineers of the road and a number of surveys have been made.

SYRACUSE, N. Y.—Mayor Stone is considering the advisability of installing an electric lighting system in Schiller Park.

TROY, N. Y.—Rehabilitation of the municipal lighting plant is being considered by city officials.

FREEHOLD, N. J.—The Monmouth Light Company, of this city, has made application to the City Council for a long-term contract for lighting the city. Extensions will be made to the system if the contract is approved.

SPENCER, W. VA.—R. G. Wieland, of Audubon, Iowa, has purchased the power plant of the Robey Electric Company, of this city. Extensions and improvements are being planned by the new owner.

LEAKSVILLE, N. C.—The Leaksville Light & Power Company is planning to build and equip a distributing station. Power will be purchased from the Southern Power Company, of Charlotte.

MARSHALL, N. C.—A hydroelectric development of 1,200 horsepower is being planned by the Capitola Manufacturing Company, of this city.

ATLANTA, GA.—The aldermanic board has passed a resolution providing for 19 additional electric lighting standards on Alabama Street.

ATLANTA, GA.—The contract under which the Federal Construction Company and the Atlanta & North Georgia Railway are seeking a franchise for electric lines on certain streets in connection with proposed construction of interurban line between Atlanta and Creighton, Ga., has been submitted to the city attorney.

METTER, GA.—An election will be held March 30 to vote on the question of issuing $8,500 bonds to construct an electric lighting plant here.

CLEARWATER, FLA.—The General Utilities & Operating Company, headed by J. C. Lucas, of Baltimore, Md., has purchased the property of the Clearwater Lighting Company and has made final arrangements for taking over the concern.

NORTH CENTRAL STATES.

CANTON, O.—The Canton Electric Company, under due authority from its stockholders, will change its name to the Central Power Company, increase its capital stock from $2,500,000 to $12,500,000, and proceed immediately with the acquisition and construction of additional plants and interests for the purpose of operating electrical lighting and power plants through Central and Southern Ohio. The increase in capitalization, which is subject to the approval of the Public Utilities Commission, will enable the company to acquire the Ohio Light & Power Company and the Sunnyside Electric Company, with such other companies as may be decided on later. All of the companies named are understood to be controlled by the American Gas & Electric Company.

CLEVELAND, O.—Legislation authorizing a bond issue for the extension of the municipal electric lighting plant has been introduced in the City Council. The Commissioners are considering a proposal to supply power to the Cleveland Railway Company, and authorization has been asked for an extension of the Cedar Avenue power plant.

HAMILTON, O.—The report of the superintendent of the city electric plant recently submitted to Service Director Garver states that repairs and improvements required to place the plant in good shape will cost about $68,515. New lines and pole construction and the installation of a pumping system are among the items required.

LIMA, O.—Henry Mack, of this city, has acquired a site for a modern fireproof garage, with an adequately-equipped repair shop. No elevator will be used.

MIDDLETOWN, O.—The purchase of the Middletown Gas & Electric Company and the Franklin Electric Company properties by the Ohio Electric & Gas Company, incorporated recently at Lisbon, O., is one of the first steps toward the consolidation of interests through which the new company proposes to market the production of a large power plant to be constructed between Middletown and Hamilton. Charles A. Munroe, of Chicago, is one of the promoters of the new company. The financial plans will be presented to the Ohio Public Utilities Commission for approval in a short time.

READING, O.—The Board of Education will receive sealed bids until noon of April 5 for the various work involved in completing the new Reading public school. Plans and specifications are on file with the architects, Garber & Woodard, of Cincinnati, and with the board. Separate bids may be submitted for the electrical work.

REPUBLIC, O.—Plans are being discussed by Mayor Gilcher and other city officials for the installation of an electric lighting plant here.

SPRINGFIELD, O.—The Western Union Telegraph Company has secured the permission of the city authorities to make the necessary excavation incident to the installation of the clock and call systems in the new Hotel Shawnee. The company has completed a considerable amount of underground work in the city, and connections with the new building will be underground.

COLUMBIA, IND.—The Common Council will receive sealed bids March 27 for furnishing of electric energy delivered at the municipal electric light plant for supplying light and power to Columbia for a period of 20 years, beginning January 1, 1917. Edward E. Erdman is city clerk.

GREENSFORK, IND.—The Greensfork Electric Company has been organized with a capital of $1,500, by H. H. Fagan and others, to supply electric service here.

MADISON, IND.—The Public Service Commission has granted authority to the Madison Light & Railway Company to issue $13,000 in securities for new construction in its power plant.

BELLEVILLE, ILL.—A committee appointed to investigate the feasibility of a municipal lighting plant has reported that the first estimated cost of $150,000 will have to be raised to $272,000, which does not include the cost of installation of underground conduit.

DANVILLE, ILL.—A resolution providing for the placing of the proposition to establish a municipal light plant in Danville on the city election ballot was adopted without a dissenting vote, as was also the proposition to bond the city for $200,000 to pay for the establishment of such a plant.

FRANKLIN, ILL.—The Public Utilities Commission has granted a certificate of convenience and necessity to the Central Illinois Public Utilities Company to rebuild the electric lighting plant here.

HEBRON, ILL.—The L. E. Myers Company, of Chicago, has purchased the gas plant of the Hebron Gas Company. It is the intention of the former company to operate the gas plant until July, when facilities will be ready for the operation of an electric lighting plant.

HEYWORTH, ILL.—The Heyworth Electric Light & Power Company, G. W. Powell, president, is planning to install an ornamental lighting system on Main Street.

OTTAWA, ILL.—The members of the Rotary Club having in charge the lighting of LaSalle Street south of Main Street and the Illinois bridge and approaches are planning to extend the ornamental lighting system to these points.

LAPEER, MICH.—The question of establishing a boulevard lighting system is being considered by Mayor Flary and others.

MONROE, MICH.—The question of issuing $90,000 electric light bonds will be submitted to vote April 3.

SODUS, MICH.—A number of leading

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citizens of Sodus are considering the erection of an electric lighting plant on Pipestone Creek to furnish service here.

ZEELAND, MICH.—The City Council has decided to buy poles and install a boulevard lighting system along the main street here.

COLFAX, WIS.—The Colfax Light & Power Company has been organized with a capital of $25,000 by C. O. Larson, W. R. Larson and M. B. Larson.

LA CROSSE, WIS.—The County Commissioners of Whitman County have been petitioned by Harry G. Wilson for a franchise to construct and operate an electric lighting and power system in the town of La Crosse.

EYOTA, MINN.—The question of issuing $2,500 electric-light improvement bonds will be submitted to the voters at the spring election.

FREEPORT, MINN.—A new telephone line, about 13 miles long, will be built in the spring. Christ Fuchs and Leonard Scheunemann, managers.

ST. CLOUD, MINN.—St. Joseph's Rural Telephone Company has authorized the secretary to purchase necessary supplies for construction of telephone work at Jacobas Prairie.

GRINNELL, IOWA.—The Iowa Light & Power Company has been organized with a capital of $1,000,000. A large modern building will be erected.

DAVENPORT, IOWA.—The Tri-City Railway Company is contemplating extending its lines. Address F. E. Wettstein, representative of firm.

HUMBOLDT, IOWA.—Formation of an electric power syndicate second in size only to that which operates the power plant at Keokuk, Iowa, has been announced by officers of the new concern. According to the statement the company will be known as the Northern Iowa Gas & Electric Company and its formation will involve the expenditure of several millions of dollars. Eastern capital, it was said, is behind the project. With the large power plant of the Northern Iowa Power Company at Humboldt as a nucleus, plants will be established in 13 different communities.

ST. LOUIS, MO.—The Cupples Station Light, Heat & Power Company, Hugo Wurdack, president, is to increase its capital stock, to permit the company to build a large power generating plant.

ABILENE, KANS.—The Riverside Light & Power Company is considering plans to extend its transmission lines north to Oakhill and intermediate towns and south to Harrington and Hope. Address R. B. Gemmill, superintendent.

HANOVER, KANS.—The Hanover electric light plant recently was sold by Fred Meyn to James Barry, of Odell, Neb. The new owner expects to build transmission lines to Odell, Landham and Diller, Neb., and supply the energy from the Hanover plant.

HOLTON, KANS.—Contracts have been signed by the municipal electric lighting plant of Holton for the erection of transmission lines and the sale of energy to the towns of Circleville, Soldier and Havensville. The contracts for electric service cover a period of 20 years, and the price to be paid for energy varies from 4.5 to 5.25 cents per kilowatt-hour, depending on the amount desired in any one month.

EUREKA, S. D.—Articles of incorporation have been filed for the Citizens' Light & Power Company at Eureka by Christian Volander, E. A. Warner and others. The capital stock is $25,000. An electric lighting and power plant will be built and operated by the company.

SOUTH CENTRAL STATES.

HAZARD, KY.—Electric lighting service will be furnished to this rapidly growing coal-mining center by the Kentucky River Light & Power Company.

LAGRANGE, KY.—The franchise for a new electric lighting plant has been sold to Adams & Company, of Sulphur, Ky. The company proposes to give continuous service and will be allowed eight months in which to get the plant installed and in running order.

PIKEVILLE, KY.—New equipment has been purchased for the Sandy Valley Light & Power Company to supply the city with continuous service. L. L. Stone is manager.

HARRIMAN, TENN.—Right of way for construction of a transmission line to this city has been obtained by the Dayton Light & Power Company and service is to be supplied shortly. The city has given up a project for a municipal plant, it is stated. The Dayton company is owner of the Rockwood power plant and is a subsidiary of the Tennessee Power Company.

LIVINGSTON, TENN.—The Livingston Light & Power Company has been organized with S. O. Kennedy, of Schenectady, N. Y., president, for the purpose of furnishing electric service to several towns.

SMITHVILLE, TENN.—The chief engineer and promoters of the Nashville & Smithville electric railroad are buying right of way and taking other preliminary steps necessary for the building of the road. W. B. Foster, of Smithville, is interested in the project.

BIRMINGHAM, ALA.—The voters here will be called upon shortly to decide upon issuing bonds to increase the capacity of the present municipal power plant in North Birmingham. Commissioner Barber is urging the issue. The possibility of increasing the size of the plant has been under consideration for some time.

NEWPORT, ARK.—The Newport Water, Light & Power Company has filed notice of an increase of capital stock from $100,000 to $125,000. The company has reorganized its board of officials, A. N. Walker now being president. Extensions of service are being planned.

RUSH, ARK.—Ambrose Estes, promoter of the Rush townsite, states electric lighting service will be installed this spring by a local company. The plant will be installed at the Edith mill.

ENID, OKLA.—The City Council is making plans to increase the facilities of the municipal electric lighting system.

STROUD, OKLA.—The Benham Engineering Company, of Oklahoma City, is preparing plans for the reconstruction of the local lighting and water systems, $20,000 in bonds having been voted for that purpose.

COOPER, TEX.—The Cooper Electric Company, E. D. Broadhead, manager, is planning to make extensions of its transmission lines.

IRENE, TEX.—The town of Irene may soon have 24-hour electric lighting and power service if plans now under consideration by the Texas Power & Light Company are carried out.

LOCKHART, TEX.—The Citizens' Water Works & Lighting Company is being organized for the purpose of building a water works and electric lighting plant.

M'KINNEY, TEX.—The Texas Power & Light Company, of Dallas, which recently purchased the two local electric light plants for a total consideration of about $100,000, will extend the lighting system.

SEGUIN, TEX.—The Seguin Electric Light & Power Company, O. A. Gafford, manager, is building a new power house, in which will be installed a turbogenerator to deliver about 200 horsepower. The company is making a campaign on electrical appliances, especially cooking apparatus.

DATES AHEAD.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

WESTERN STATES.

BIG SANDY, MONT.—The power lines of the Great Falls Power Company in this city are to be extended into the Riney addition.

DOOLEY, MONT.—Lloyd Goss, of Hannaford, N. D., has purchased the local electric lighting plant, and expects to make improvements.

TEMPE, ARIZ.—At a special meeting of the City Council, the committee on street lighting reported on the proposed municipal lighting plant, and the matter was taken under advisement.

PROVO, UTAH.—A notice of application by Caleb Tanner to change the nature of use of five cubic feet per second of water from the Provo River will be contested by Provo City and by canal companies on the south side of the river. The original application was for water for electric power purposes to be used at a point near the mouth of Provo canyon. Tanner's application for change of use provides for the water to be taken on Provo bench for irrigation, which, if granted, would prevent it from being used for irrigation in the canals south of the river. Provo city also has applied for the same water for its contemplated municipal lighting plant.

SALT LAKE CITY, UTAH.—Eighteen miles of land bordering the Snake River in Idaho has been withdrawn for power sites by the government, according to a communication received from Washington, D. C., by the local United States land office. The land withdrawn is in Township 3 North, Ranges 41, 42 and 43 east of the Boise meridian.

SALT LAKE CITY, UTAH.—It is announced from the office of the general manager of the Utah Light & Power Company that construction will shortly begin on a 70-mile extension of its power lines from Provo to Price and other points in Carbon County, to furnish coal mines there with power at 44,000 volts. The necessary outlay is estimated at $500,000. Chief Engineer M. Cheever, with A. B. Cudebec, W. F. Jennens and J. L. Mess of the engineering department, have just returned from a trip over the proposed route. Five months is the time required for completion of the improvement.

ALBION, IDAHO.—A certificate of public convenience and necessity has been granted this city for the operation of a municipal electric lighting plant.

WALLACE, IDAHO.—The Hector Mining Company is preparing to install electric power to take the place of water power in running its compressor.

VALDEZ, ALASKA.—The Inter-Mountain Traction & Power Company has been organized and incorporated under the laws of the state of Washington to utilize power generated by the Illes power plant located across the bay from Valdez. Alfred B. Illes is manager of the new company, which plans the construction of a distributing system in Valdez and the construction of transmission lines later to the mines in the immediate vicinity of Valdez.

CHELAN, WASH.—According to recent reports, the Great Northern Railway Company plans to begin, in the immediate future, actual construction on a large hydro-electric power plant at Lake Chelan, same to entail the expenditure of about $3,000,000. Lake Chelan is in the heart of the Cascade Mountains. According to reports, the power to be developed will be used by the railway company in electrifying its line from Spokane to Seattle.

COULEE CITY, WASH.—The Grant County Power Company has been granted a franchise to construct a pole and conduit system for the transmission of electrical energy for power and lighting purposes.

COUPEVILLE, WASH.—The local electric light plant is to be enlarged and improved this spring, according to W. C. Cheney, owner.

EVERETT, WASH.—The city attorney, acting under instructions from the City Council, has instituted proceedings against the local water plant, owned and operated by the Everett Railway, Light & Water Company. The step is the initial one to be taken by the city in acquiring possession of the system, which is to be condemned, appraised and taken over by the City of Everett and operated as a municipal utility. Extensive improvements and additions will then be made to the plant.

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SEATTLE, WASH.—L. B. Youngs, Superintendent of Water, reports the Puget Sound Traction, Light & Power Company, of Seattle, of the Stone & Webster interests of Boston, has turned into the city treasury $8,000 for damage done to water mains by electrolysis on Twelfth Avenue near Jefferson Street, and on other streets in this section of the city. The Puget Sound Traction, Light & Power Company is at this time completing an elaborate system of negative feeders, by which it is proposed to return stray current to the various substations. This system will cover practically every electric line in the city, and is considered by the traction company the best means of controlling the current with the exception of a double trolley system on the street railway lines, which is considered so expensive as to be prohibitive. It is estimated the traction company will expend about $50,000 in construction of this system.

PORTLAND, ORE.—Work has started on the electrification of the Southern Pacific Company's west side line from Whiteson to Corvallis. The cost is estimated at $800,000, not including the terminals at Corvallis.

WEST LINN, ORE.—The Portland Railway Light & Power Company, of Portland, has petitioned the Town Council for a franchise for installing power lines and distributing energy for power and light in the suburbs of Oregon City. In return for this franchise, the company offers 18 free street lights to West Linn. The company is seeking a blanket franchise.

EAST SAN DIEGO, CAL.—The San Diego Electric Railroad Company has secured a franchise for the extension of its University Avenue line from Fairmont to Euclid Avenue, a distance of eight blocks.

FILLMORE, CAL.—Arrangements have been completed whereby the Ventura County Power Company will install a distributing system in the Bairdsdale community. The work is to commence at once and be completed within 60 days.

LOS ANGELES, CAL.—E. F. Scattergood, chief engineer of the power bureau, has announced that the city has signed light and power contracts with 60 per cent of the consumers in the district north of East Main Street and north of the river. The district includes East Los Angeles, Carvanza and Highland Park, and was selected as a beginning in a local distributing system.

SAN FRANCISCO, CAL.—Plans will be completed shortly for the new building of the Western Union Telegraph Company to be erected on the northeast corner of Montgomery and California Streets.

SAN FRANCISCO, CAL.—Working drawings have been completed by the engineering department of the Great Western Power Company for the new power station to be erected on Bush Street, near Grant Avenue, at a cost of $100,000.

CANADA.

TORONTO, ONT.—The Hydroelectric Commission of the Province of Ontario has arranged to purchase the holdings of the Electric Power Company and its 22 subsidiaries for $8,500,000. The plants will hereafter be operated under government supervision. The Electric Power Company controlled water powers on the Trent River and the government has purchased the plants in order to serve Central and Eastern Ontario with cheap power, similar to the plan now in operation in Western Ontario, the distribution to be made at cost. It is expected the Trent development will be extended as far east as Picton and Kingston, Ont.

EDMONTON, ALTA.—A light and power system is contemplated by the Alliance Trust Company, of Calgary, Alta., R. B. Bennett, president, M. P.; George Robinson, manager of the trust company, will form a separate company to furnish city with power, and seek franchise for 25 to 30 years.

New Publications

CANADIAN MINES BRANCH.—The Mines Branch of the Department of Mines at Ottawa has issued two interesting publications. No. 406 describes the laboratories of the department, and is replete with illustrations. Among the equipment are an electric furnace and apparatus for fuel testing. No. 408 is a "Preliminary Report on the Mineral Production of Canada During 1915," prepared by John McLeish.

RADIATION FROM BLACK BODY.—Scientific Paper No. 262, issued by the Bureau of Standards, Washington, D. C., is entitled "Present Status of the Determination of the Constant of Total Radiation From a Black Body," by W. W. Coblentz. The constant referred to is that of the Stefan law, connecting its radiated power with the absolute temperature, and its value is 5.75×10^{-12}, the units being the watt, centimeter and centigrade degree.

Proposals

CHOTEAU, MONT.—Bids will be received April 3 for installation of a lighting system. About 26 single street light posts, 40 street hoods, and 6,000 feet park and suburban cable will be required. Address G. M. Coffey, mayor.

WILLISTON, N. D.—Bids will be received April 1 for the construction of telephone line, about 22 miles of main and 2 miles side line. Bids will also be received for telephones in houses; material f. o. b. Williston. McKenzie Farmer Telephone Company, A. J. Panger, clerk.

SPRINGFIELD, ILL.—Sealed proposals will be received by the Board of Administration in its office in the Capitol Building, Springfield, April 4, for installing switchboard, placing new tile floor, and interior painting of engine rooms at the Peoria State Hospital, South Bartonville, Ill. Address Frank D. Whipp, fiscal supervisor of the Board of Administration, Springfield, Ill.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9413—Washington, D. C., 600 feet six-pair, rubber-insulated cable; 200 steam-tight, marine lighting fixtures, and miscellaneous electrical supplies. Schedule 9427—Philadelphia, Pa., 2,000 refillable plug fuses, and miscellaneous renewable inclosed fuses. Schedule 9427—Brooklyn, N. Y., 20 portable ventilating sets. Bidders desiring to submit proposals should make application for schedules to the Bureau or Purchasing Office nearest to navy yard where delivery is to be made.

ELECTRICAL SUPPLIES.—Sealed proposals will be received until March 27 at Room 614, City Hall, Chicago, Ill., for furnishing and delivering to the Department of Gas and Electricity electrical supplies, strictly in accordance with specifications on file in the office of the Commissioner of Gas and Electricity, in the following approximate quantities: 5,000 feet two-conductor and 5,000 feet four-conductor, No. 16 B. & S. gauge, rubber and lead-covered fire-alarm cable; 11,000 feet 10-pair, 32,120 feet 15-pair, 12,000 feet 30-pair and 2,000 feet 50-pair, No. 19 B. & S. gauge, paper and lead-covered fire-alarm cable; 3,000 feet type RS, 7,000-volt, single-conductor cable; 3,000 feet type RS, 2,500-volt, duplex, No. 8 stranded conductor, rubber-insulated, tinned copper wire; 24,000 feet No. 6 B. & S. gauge, single-conductor, rubber-covered, varnished-cloth insulated, lead-covered, electric-light cable; 1,000 feet No. 6 B. & S. gauge, varnished-cambric insulated, lead-covered, armored and braided cable; 11 miles No. 6 B. & S. gauge triple-braided, weatherproof, hard-drawn copper wire; 400 pounds No. 6 B. & S. gauge triple-braided, weatherproof, soft-drawn copper wire; 1,000 pounds No. 10 B. & S. gauge soft-drawn bare copper wire; 25 miles No. 10 B. & S. gauge copper-clad bare wire, 40 per cent; 13 miles No. 10 B. & S. gauge triple-braided, copper-clad weatherproof wire, 40 per cent; 35,000 feet No. 14 B. & S. gauge, rubber-covered, single-braided copper wire, New Code; 16,000 feet ¼-inch non-rotating wire rope, for Bureau of Electric Wiring and Repairs. William G. Keith, Commissioner of Gas and Electricity.

Financial Notes

Chicago Telephone Company reports 512,700 telephones in service, or 40,000 more than a year ago.

The annual report of the Western Electric Company, Incorporated, covers a year's operation of the business, although the present company was organized last December. The report says: "As the incorporation of this company under the laws of the state of New York, on November 17, 1915, together with the purchase of the going business of the Western Electric Company (an Illinois corporation) and the assumption of the latter company's obligations, was in effect a reorganization and change of domicile of the latter company, in this report we shall cover the operation of the two companies during the year, thus giving the results of the continuing business, without attempting to segregate that part which pertains only to the operations of the Western Electric Company, Incorporated." Significant comparisons with previous years are as follows:

	1915.	1914.	1913.
Sales	$63,852,000	$66,408,000	$77,533,000
Div. paid	1,609,500	1,500,000	1,500,000
To surplus	1,217,613	1,170,960	1,671,675

The orders on hand at January 1, 1916, amounted to $2,111,000 more than on January 1, 1915. The number of employees on January 1, 1916, was 17,135, as compared with 15,650 on January 1, 1915. The total disbursements from the Employees' Benefit Fund for 1915 amounted to $230,468, and were made to 2,120 beneficiaries. Through the *Eastland* calamity of July 24, 1915, 465 employees of the company lost their lives. Many of them were younger employees in period of service, and their relatives were not entitled to relief under the benefit plan. The directors, however, authorized general measures for the aid of those who depended for their support upon Western Electric employees who were lost. The total expenditure on account of benefits and relief made by the company during 1915 amounted to upwards of $331,000.

Dividends.

	Term	Rate	Payable
Am. Gas & Elec	Q	2.5 %	Apr. 1
Am. Gas & Elec., pf	Q	1.5 %	May 1
Asheville Pr. & Lt., pf	Q	1.75%	Apr. 1
Bangor Ry. & Elec., pf	Q	1.75%	Apr. 1
Cal. Ry. & Pw., prior pf	Q	1.75%	Apr. 1
Can. Westinghouse	Q	1.75%	Apr. 10
Cap. Trac., Wash	Q	1.25%	Apr. 1
Caro. Pw. & Lt., pf	Q	1.75%	Apr. 1
Cin. & Ham. Trac	Q	1 %	Apr. 1
Cin. & Ham. Trac., pf	Q	1.25%	Apr. 1
Cin. & Sub. Bell Tel	Q	2.5 %	Apr. 1
Cities Service, deb	—	3 %	July 1
Cities Service, pf	M	0.5 %	Apr. 1
Columbia Ry., Pw. & Lt.	Q	1.5 %	Apr. 1
Conn. V. St., pf	—	3 %	Mar. 1
Dayton Pw. & Lt., pf	Q	1.5 %	Apr. 1
Elec. Securities	Q	2 %	Apr. 1
Elec. Securities	Q	1.25%	Apr. 1
Halifax Elec. Tram	Q	2 %	Apr. 1
Houghton Co. Trac., pf	—	3 %	Apr. 1
Indiana Pw. & Lt	Q	$2	May 15
Nat. Gas & Elec	Q	1 %	Apr. 1
Nat. Gas & Elec., pf	Q	1.5 %	Apr. 1
N. Y. St. Rys	Q	1.25%	Apr. 1
N. W. Elec., pf	Q	1.5 %	Apr. 1
Phila. Co., pf	S	3 %	May 1
Ridge Av. Pas., Phila	Q	$3	Apr. 1
Scioto Val. Tr., 1st & 2d pf.	Q	1.25%	Apr. 1
Sierra-Pac. Elec., pf	Q	1 %	May 1
Sou. Util., pf	Q	1.75%	Apr. 1
Toronto Ry.	Q	2 %	Apr. 1
Tri-City Ry.	Q	2 %	Apr. 1
Wash., Balt. & Annap., pf.	Q	1.5 %	Mar. 31
West India Elec	Q	1.25%	Apr. 1
West. Pw., pf	Q	1 %	Apr. 15
West. Union Tel	Q	1.25%	Apr. 15

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 20	Mar. 13
American Tel. & Tel. (New York)	129½	128⅝
Commonwealth Edison (Chicago)	143	143
Edison Electric Illuminating (Boston)	248½	245
Electric Storage Battery, common (Philadelphia)	64	63¼
Electric Storage Battery, preferred (Philadelphia)	64	63⅛
General Electric (New York)	169½	169
Kings County Electric (New York)	129	129
Massachusetts Electric, common (Boston)	7	7
Massachusetts Electric, preferred stamped (Boston)	37	37
National Carbon, common (Chicago)	183	—
National Carbon, preferred (Chicago)	—	122
New England Telephone (Boston)	136	136
Philadelphia Electric (Philadelphia)	27⅝	27¼
Postal Telegraph and Cables, common (New York)	29⅛	78
Postal Telegraph and Cables, preferred (New York)	67	66⅞
Western Union (New York)	91	89¼
Westinghouse, common (New York)	68½	65
Westinghouse, preferred (New York)	77	75

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New Incorporations

ALBANY, N. Y.—Radio Engineering Company of New York. Capital, $100,000. Devices appertaining to wireless telegraphy and telephony. Incorporators: J. H. Hammond, Jr., Harris Hammond, and R. D. Hanna, all of 120 Broadway, New York City.

WILMINGTON, DEL.—General Public Service Corporation, of Philadelphia. Capital, $100,000. To conduct the business of an electric light company in all its branches. Incorporators: W. J. White, W. A. Welsh, Philadelphia; R. R. Kenney, Dover.

PHILADELPHIA, PA.—Rosen Manufacturing Company. Capital, $5,000. Manufacture combination fixtures. Incorporators: Frank Rosen and others.

ST. LOUIS, MO.—Potter Signal & Manufacturing Company. Capital, $150,000. Electric-signal manufacturing. Incorporators: C. E. Potter, A. L. Potter and C. A. Powers.

Electrical Patents Issued March 14, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,174,952. Trolley Wheel. H. C. Adam, Hamilton, and J. C. Adam, Trenton, Ont., Canada. Has roller bearing.

1,174,955. Motor-Driven Centrifugal Extractor. F. Balzer, assignor to Troy Laundry Machinery Co., Chicago, Ill. Mounting of motor driving vertical shaft.

1,174,956. Player for Sound-Producing Devices. D. W. Barton, assignor to W. G. Maxcy, Oshkosh, Wis. Electromagnetically controlled hammer for pianos, etc.

1,174,957. Piano Attachment. D. W. Barton, assignor to W. G. Maxcy. Several instruments electrically controlled by same keys.

1,174,958. Means for Insulating Electromagnets. D. W. Barton, assignor to W. G. Maxcy. In electromagnetic piano-players.

1,174,962. Desk Lamp. E. H. Binns, Pittsburgh, Pa. Lamp stand and downward reflector for roll-top desk.

1,174,966. Electrical Scenic Effect. R. H. Burnside, New York, N. Y. Series of ladders have illuminated rungs and carry combined floral and electrical display.

1,174,969. Signal-Transmitter. W. J. Davis and D. G. Knittel, assignors to American Fire Alarm Company, Pittsburgh, Pa. Fire-alarm call box.

1,174,974. Electric Switch. L. H. Ford, Abilene, Kans. Knife switch operated by pull cords.

1,174,989. Automatic Throw-Off and Cylinder-Adjusting Mechanism for Rotary Presses. E. L. Jones, assignor to A. B. Huey, Philadelphia, Pa. Electromagnetically controlled by sheet.

1,174,992. Car Fender. J. B. Klein, Kansas City, Kans. Pushing in of bumper applies brakes and operates switch.

1,175,010. Thermostat. E. M. Petersohn, Chicago, Ill. Details of contact device.

1,175,040. Combination Electric Fan and Lamp. R. W. Armstrong and W. S. Evans, assignors to Safety Car Heating & Lighting Co., Jersey City, N. J. Ceiling structure for railway car.

1,175,047. Multiple Pump-Controlled Device. H. S. Clark, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically interconnected compressor and motor governors.

1,175,048. Transmitter. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. Granule chamber for microphone with special vibration damping.

1,175,051. Signaling Device for Automobiles. R. F. Darrow, East Chicago, Ind. Electromagnetically operated direction indicator.

1,175,052. Plug and Socket. J. N. Davis, Denver, Colo. For establishing charging connections with electric vehicles.

1,175,053. Electropneumatic Brake. J. S. Doyle, assignor to Westinghouse Air Brake Co. Air brakes electrically controlled from master switch.

1,175,059. Accounting System. F. O. Heuser, assignor to W. R. Heath, Buffalo, N. Y. Electrically operated wage-calculator.

1,175,062. Automatic Switch for Vehicles. W. A. Johnson, Yonkers, N. Y. Operated by pendulum according to inclination of vehicle.

1,175,063 and 1,175,064. Motor Road-Vehicle for Searchlight and the Like Operations. I. Koechlin, assignor to Societe Anonyme des Automobiles et Cycles Peugeot, Paris, France. First patent: Truck for transporting electric searchlight has provision for shifting it about on truck. Second patent: Modification.

1,175,077. Sheet-Metal Polearm. C. L. Pierce, Jr., Pittsburgh, Pa. Insulator-supporting crossarm.

1,175,078. Insulator-Supporting Fixture. C. L. Pierce, Jr. Pole-bracket formed of metal pipe. (See cut.)

1,175,082. Apparatus for the Electric Transmission of Signs or Speech in Mines. J. H. Reineke, assignor to Studiengesellschaft für Drahtlose Grubentelefonie M. B. H., Cologne-Lindenthal, Germany. Utilizes the conventional conductive metal construction in mine service.

1,175,086. Electrical Signaling Device. E. E. Salisbury, Chicago, Ill. Indicators selectively controlled by variation of duration of contact of interrupter.

1,175,089. Safety Device for Cars. W. V. Turner, assignor to Westinghouse Air Brake Co. Switch in motor circuit operated by pressure from brake cylinder.

1,175,103. Pothead Cutout. P. F. Williams, assignor to G. & W. Electric Specialty Co., Chicago, Ill. Mounting of fuse box.

1,175,104. Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Signal arrangements for main and branch exchanges.

1,175,111. Means for Preventing Inductive Disturbance in the Test Circuits of Telephone Switchboards. H. M. Bascom, assignor to American Telephone & Telegraph Co., New York, N. Y. Operator's instrument connected with test conductors through repeater coil having differential primaries.

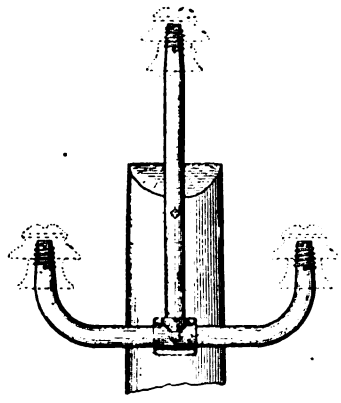
1,175,112. Telephone System. H. M. Bascom, assignor to American Telephone & Telegraph Co. Supervisory relays short-circuited on connecting link circuit.

1,175,119. Automatic Telephone Switching Apparatus. A. H. Blessing, assignor to Automatic Electric Co. Operation of automatic connector switch.

1,175,170. Remote-Control Pumping System. T. F. Mulligan, assignor to S. F. Browser & Co., Fort Wayne, Ind. Circuit of pump motor controlled by valve in discharge line.

1,175,176. Self-Cleaning Spark Plug. J. Prescott, St. Boniface, Man., Canada. Outside points from cage containing ball.

1,175,177. Controlling Device for Variable-Speed Electric Motors. C. Redfield,



No. 1,175,078.—Insulator-Supporting Fixture.

Ogden, Utah. Alternating motor controlled by varying magnetic circuit, of inductance in armature circuit and of compensating coils.

1,175,220. Door-Controlled Elevator System. A. Beck and C. Beck, assignors to Safety Appliance Co., St. Louis, Mo. Controls safety, signal and motor circuits.

1,175,222. Phase-Modifying Apparatus. H. J. Blakeslee, Syracuse, N. Y. For varying phase of voltage on shunt of meter regardless of phase of meter current.

1,175,234. Electric Water-Heater. G. A. Burroughs and W. Grant, Sudbury, Ont., Canada. Arrangement of electric heater in header of hot-water furnace.

1,175,241. Automatic Train Signal. W. J. Cook, Denver, Colo. Electromagnetically actuated mechanism for operating signal.

1,175,252. Method of Producing Rotating Electric Arcs. A. Foss, assignor to Norsk Hydro-Elektrisk Kvaelstofaktieselskab, Christiania, Norway. Arc supported throughout its length by two concentric, annular gas currents.

1,175,268. Underrunning-Trolley System for Electric Cars. J. Joyce, Oswego, N. Y. Structure for use with sectional conductor and continuous main conductor.

1,175,271. Vehicle Signal. H. R. Kennedy, Los Angeles, Cal. Electrically illuminated and operated semaphore.

1,175,279. Switch. A. J. Loguin, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Has special operating levers and links for wiping butt contacts in closing and pressing them firmly together.

1,175,280. Storage Battery. J. O. Luthy, San Antonio, Tex. Sealed device having paste in electrolyte embedding electrodes and gas-absorbing material, with venting and liquid-charging opening in bottom.

1,175,295. System of and Apparatus for the Control of Electric Motors. C. V. Raper, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. For planers, etc.

1,175,305. Trolley-Supporting Mechanism. W. Schaake, assignor to Westinghouse Electric & Mfg. Co. Readily detachable spring mechanism mounted in vertical, cylindrical pole base.

1,175,308. Electric Switch. H. R. Schultz, assignor to Westinghouse Electric & Mfg. Co. Oil switch adjustable into and out of operative relation to overload trip and for manual operation.

1,175,320. System of Distribution. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co. Arrangement of transformer windings for phase transformation.

1,175,321. System of Electric-Motor Control. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Resistance controlled by magnetic switches having coils tending to close but normally excessively energized to hold switches open and opposing coils energized according to counter E. M. F. of armature.

1,175,322. System of Electric-Motor Control. H. C. Walter, assignor to Westinghouse Electric & Mfg. Co. Method of braking direct-current motor.

1,175,323. Electromagnet and Electrically Operated Switch. R. Wikander, assignor to Westinghouse Electric & Mfg. Co. Operates switch within predetermined limits of magnetization.

1,175,326. Automobile-Starter. C. E. Wilson, assignor to Westinghouse Electric & Mfg. Co. Mounting of starting motor and gearing to engine shaft.

1,175,330. Circuit-Breaker. J. L. Adams, Jr., assignor to Westinghouse Electric & Mfg. Co. Magnets close breaker on predetermined voltage conditions in number of circuits and open same on abnormal conditions.

1,175,333. Starting Device for Automobiles. H. L. Beach, assignor to Westinghouse Electric & Mfg. Co. Automatic gearing for connecting starting motor.

1,175,335. Fuse-Tester. H. A. Bremer, Jr., Jersey City, N. J. Device for mounting cartridge fuse in testing position and having lamp indicating condition of fuse.

1,175,338. Device for Producing Polar Oscillograms. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Manner of exposing sensitized film.

1,175,339. Signaling System. W. Churchill and A. H. Rudd, assignors to Position-Light Signal Co., Maine. Manner of illumination for light signaling by day and night.

1,175,343. Plug Connector. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Simple structure for end of insulated, flexible conductor.

1,175,344. Electrical System. A. W. Copeley and B. D. Kunkle, assignors to Westinghouse Electric & Mfg. Co. For engine ignition.

1,175,346. Control System for Electric Motors. R. J. Dearborn, assignor to Westinghouse Electric & Mfg. Co. For hoist or crane control.

1,175,350. Hoist-Operating and Controlling System. E. Friedlaender, assignor to Westinghouse Electric & Mfg. Co. Motor controller actuated by the hoist-driving mechanism.

1,175,358. Starting Apparatus for Electric Motors. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Resistance controlled by switches operated by magneto having differential coils across the resistance steps and in series with the motor respectively.

1,175,359. System of Motor Control. H.

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D. James, assignor to Westinghouse Electric & Mfg. Co. Speed of main motor controlled by automatically connected and disconnection auxiliary motor.

1,175,362. Ignition System. B. D. Kunkle, assignor to Westinghouse Electric & Mfg. Co. Interrupter connections reversed on closing starting motor circuit.

1,175,367. Motor-Control System. W. O. Lum, assignor to Westinghouse Electric & Mfg. Co. Automatic torque-controlling means operative for one direction of rotation only.

1,175,368. Controller for Elevators. B. McInnerney, assignor to Westinghouse Electric & Mfg. Co. Selective, interlocked station relays and switches rendered ineffective by failure of current in emergency relay circuit.

1,175,370. Secondary-Battery Electrode and Process of Making the Same. W. Morrison, Des Moines, Iowa. Superficially permeated with titanium compound.

1,175,377. Motor Vehicle. J. W. Pearson, Chicago, Ill. Storage-battery system for automobiles including series motors with dynamic brake and directional connections controlled by steering wheel.

1,175,378. Circuit-Controller. H. P. Reed, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. For motors; power-operated with electroresponsive trip.

1,175,396. Telephone System with Service Meters. G. D. Wolf, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. In cord circuit; registers both partial and completed connections.

1,175,417. Electric Meter and Fluid Gauge. A. Fehrenbach, K. O. Fehrenbach and R. Fehrenbach, Woodbury, N. J. Electric indicator operated by float-controlled rheostat.

1,175,418. Wireless Telegraphy. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Darrett, Bloomfield, N. J. Movable electrode of spark gap driven by generator and frequency and spark point on potential curve varied by adjusting stationary electrode.

1,175,424. Insulating Composition. W. K. Freeman, Oscawana, N. Y., assignor to Hydrolose Process Corporation. Made from sulphite cellulose liquor.

1,175,432. Thermoscope. E. Garretson, Buffalo, N. Y. Body of silver sulphide depending for its operation on impressed voltage and surrounding temperature.

1,175,433. Resistance Unit and Manufacture Thereof. J. G. Goetsch, assignor to Cutler-Hammer Mfg. Co. Resistance ribbon has beads defining its points of flexure.

1,175,434. Motor Controller. M. M. Goldenstein, assignor to the Cutler-Hammer Mfg. Co. Automatically controlled starter and accelerator.

1,175,435. Electric Transporting Device. H. Gradenwitz, W. Vollbrecht and H. Levzow, assignors to Elektromotoren-Werke Hermann Gradenwitz, Berlin, Germany. Operating device for a hoisting grab.

1,175,441. Electric Controller. J. H. Hall, assignor to Electric Controller & Mfg. Co., Cleveland, O. Motor resistance controlled by automatic, successive electromagnetically operated switches.

1,175,442. Electric Cooking or Heating Apparatus. M. W. Hanks, Indianapolis, Ind. For cooking eggs, etc.

1,175,444. Signal Box. B. B. Hatch, Boston, Mass. Adapted to enter recess in wall.

1,175,450. Cabinet for X-Ray Apparatus. G. R. Hogan and H. P. MacLagan, Chicago, Ill. Special arrangement of opaque and fluorescent screens and door.

1,175,452. Lightning-Arrester. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Electrolytic type.

1,175,470. Water-Heating Apparatus. F. C. Perkins, Buffalo, N. Y., assignor of one-eighth each to G. J. Meyer, G. H. Meyer, L. P. Meyer and E. Meyer. Water circulating through tank and pipe coils heated by current through tank and coils.

1,175,472. Coupling for Electrical Oscillation Circuits. R. H. Rendahl, assignor to Gesellschaft für Drahtlose Telegraphie M. B. H., Berlin, Germany. Oscillation circuit and circuit containing non-inductive detector connected by high-frequency transformer without stray flux.

1,175,488. Telephone-Switchboard Operating and Signaling Device and System. H. S. Turner, San Diego, Cal. Special switchboard arrangements and connections.

1,175,489. Self-Inductive Means for Electrical Oscillatory Circuits. G. von Arco and R. H. Rendahl, assignors to Gesellschaft für Drahtlose Telegraphie M. B. H. Special flat, spiral coil of ribbon formed of transposed strands.

1,175,498. Extension Electrical Fixture. E. G. K. Anderson, Chicago, Ill. Has reel for lamp cord connecting attaching plug with lamp socket.

1,175,508. Excess Wattmeter. A. W. Burke, Wilmington, Del. Potential coil neutralizes effect of series coil up to a certain current value.

1,175,516. Rotary Electric Welding Machine. L. P. French, assignor to T. J. French, Stoughton, Mass. For welding wire intersections of screens, etc.

1,175,528. Socket Shell. J. Keefe, assignor to The Zee Socket & Mfg. Co., Boston, Mass. Relates to insulating lining.

1,175,535. Storage-Battery System. J. T. Lister, assignor to Turbine Motor Electric Car Co., Cleveland, O. Has duplicate batteries, one charging while the other is in use.

1,175,541. Circuit-Timing Device. W. Meyer, Chicago, Ill. Dashpot controls duration of circuit closure.

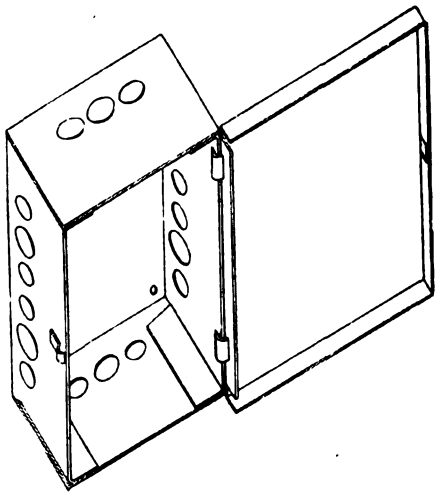
1,175,554. Electric Light and Power System. C. C. Nichols and W. G. Wright, assignors to Nichols & Wright Motor Co., Buffalo, N. Y. Regulation of gas engine, generator and storage-battery system.

1,175,572. Apparatus for Bleaching by Electrolysis. J. W. Webb, Battersea, London, and W. W. Williams, Enham, England. Electrolytic preparation of bleaching fluid.

1,175,573. Automatic Weighing Machine. H. S. Weyant, Yonkers, N. Y. Magnetically operated hopper valves controlled by scale beam.

1,175,579. Service-Meter Circuit for Telephone Systems. F. Aldendorff, assignor to Western Electric Co., New York, N. Y. Conversation counters in automatic system.

1,175,588. Railway Signaling. E. F. Bliss, assignor to Union Switch & Signal Co., Swissvale, Pa. Block system for single-track sections having sidings between stations.



No. 1,175,865.—Switch Cabinet.

1,175,590. Electric-Light Socket. T. A. C. Both, assignor to Zee Socket & Mfg. Co. Relates to the switch mechanism.

1,175,610. Clock or Watch. G. H. Cove, New York, N. Y. Has electromagnetically operated balance wheel.

1,175,630. Switch. D. C. Hare, Wilkinsburg, Pa. Details of structure for group connections.

1,175,661. Terminal Connector for Storage Batteries. P. M. Marko, New York, N. Y. Structural details.

1,175,668. Electrical System. R. Varley, Englewood, N. J. Engine-ignition system.

1,175,669. Motor-Control System. T. Varney, assignor to Westinghouse Electric & Mfg. Co. Control of motor in conjunction with magnetic brake.

1,175,670. Telephone Mechanism for Trolley Cars. L. Zsitkovszky, Philadelphia, Pa. Arrangement of connections through trolley pole.

1,175,676. Commutator-Slotter. G. E. Austin, New York, and F. A. Lachance, Brooklyn, N. Y. Special machine for purpose indicated.

1,175,685. Tachytelegraph and Teletype Machine. E. Belin, Paris, France. Special transmitter controlled by perforated band.

1,175,699. Electrical Relay. S. G. Brown, London, England. For inclusion in wireless detector circuit for relaying signals.

1,175,704. Automatic Railway-Train Stop. R. Cecchini, Springfield, Mass. Electropneumatic control of locomotive effected by danger position.

1,175,724. Chromium Alloys. W. B. Driver, East Orange, N. J. For resistance elements.

1,175,746. Music-Leaf Turner. C. R. Greene, Reading, Pa. Electric motor operated.

1,175,749. Lightning-Protecting System for Oil Tanks. C. H. Gunthorpe, Beaumont, Tex. Wires about tank connected with ground through arresters.

1,175,754. Electric Attachment for Clocks. J. O. Hamilton, Manhattan, Kans. Automatic program attachment.

1,175,788. Animal-Feeding Mechanism. E. Martin, Huguenot, N. Y. Electrically operated, clock controlled.

1,175,797. Rat-Trap. G. E. Newell, Eliasville, Tex. Doors electromagnetically operated by weight of animal.

1,175,821. Igniter Mechanism for Explosive Engines. E. Rounds, assignor of one-half to Gunther-Wright Machine Co., Owensboro, Ky. Make-and-brake sparking mechanism.

1,175,838. Electric Switch. C. J. Sutter, St. Louis, Mo. Combination pull cord and push button.

1,175,843. Traffic Signal. J. Tomaszewski, Pine Bluff, Ark. Details of electric motor-operated direction pointer.

1,175,849. Insulator Base. F. A. Warren, Canon City, Colo. For securing insulator to side of pole.

1,175,857. Apparatus for Forming Filaments. L. P. Wilson, assignor to Courtaulds, Ltd., London, England. Tubular cellulose filament encloses, as it is formed, a core filament.

1,175,864. Magnetic Valve. E. E. Gold, assignor to Gold Car Heating & Lighting Company, New York, N. Y. Valve structure comprises operating electromagnet.

1,175,865. Box for Electrical Installations. R. A. Griswold, A. E. Griswold and C. B. Bush, Seattle, Wash. For switch and cut-out cabinets. (See cut.)

1,175,896. Telephone Apparatus. B. D. Willis, assignor to First Trust & Savings Bank, Chicago, Ill. Semi-automatic exchange system.

1,175,901. Timer for Internal-Combustion Engines. R. E. Noah, assignor to C. A. Beardmore, Anne Arundel County, Md. Structural details.

1,175,905. Process of Hydrogenating Oils or Fats. W. D. Richardson, assignor to Swift & Co., Chicago, Ill. Submerged arc is formed in treated material.

Reissue 14,085. Lock for Automobiles. P. Cyr, assignor of one-half to W. J. Downey, Hyde Park, Mass. Original No. 1,162,224, dated Nov. 30, 1915. Electric contacting device requires predetermined combination of operations similar to combination lock.

Reissue 14,088. Flashlight. H. M. Koretsky, New York, N. Y. Lamp, battery, etc., in casing resembling watch.

PATENTS EXPIRED.

The following United States electrical patents expired March 21, 1916:

621,321. Electric Railway System. G. L. Campbell, Dushore, Pa.

621,324. Combined Pump and Motor. N. A. Christensen, Milwaukee, Wis.

621,346. Automatic Telephone Switch. C. S. Karoly, Aurora, Ill.

621,352. Supply of Current to and Governing Arc Lamps. F. M. Lewis, London, England.

621,361. Electric Burglar-Alarm System. D. W. McCaughey, Chicago, Ill.

621,412. Transfer Wattmeter Switch for Storage-Battery Circuits. C. Hewitt, Philadelphia, Pa.

621,417. Electric Arc Lamp. E. Hungerbuhler, London, England.

621,422. Trolley Catcher. R. I. Kroft, Avon Lake, Ohio.

621,449. Telephone System. C. E. Egan, E. L. Lawton and E. C. Wilcox, Meriden, Conn.

621,471. Switch for Altering Speed and Direction of Revolution of Electric Motors, etc. W. R. Edwards and S. F. Beevor, London, England.

621,492. Electric Railway. W. J. George, Johnstown, Pa.

621,575. Electrical Warp Stop Motion for Looms. F. E. Kip, Montclair, N. J.

621,594. Electrical Warp Stop Motion for Looms. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

621,604. Electric Heater. E. E. Gold, New York, N. Y.

621,631. Section Insulator. E. J. Cook, Cleveland, Ohio.

621,661. Insulator. M. Harloe and W. S. Bloes, Peckville, Pa.

621,716. Secondary-Battery Plate. A. Schanschieff and A. E. Hodgson, Halifax, England.

621,717. Dynamoelectric Machine. C. Sellers, Philadelphia, Pa.

621,733. Electric Belt. T. F. Wynne, Lindale, Tex.

621,739. Automatic Electric Switch. R. Baumann, St. Louis, Mo.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

STUDYING COURT DECISIONS.

Legal documents usually possess little interest for the engineer, or in fact for any one except the lawyer and the persons directly affected by them. Court proceedings, unless of a sensational character, are usually shunned for a similar reason. Reports of decisions are looked upon as the dryest kind of reading that could possibly be selected. A little investigation, however, might dispel this attitude. The decisions of the higher courts are usually concerned with questions and cases of considerable importance. They frequently contain not only stories of human interest, but discussions of engineering subjects and analyses of conditions, facts and points of law of vital importance to the engineer, the contractor, the central-station manager, or in fact any one connected with the electrical industry.

Patent cases of course involve many engineering points, but in addition to these there are accident cases, rate cases, and many others involving items of interest. Such can easily be picked out from a volume of reports, and many of them constitute interesting reading and well repay time spent upon them in the information and points of view which they disclose. The circumstances attending accidents are frequently instructive and may point the way to preventive measures which will make a repetition impossible. Moreover, the attitude of the court in placing responsibility is often illuminating. Defects in material, carelessness in operation, failure to provide safeguards or to follow specifications and many other contributory causes of accidents repeatedly come up for consideration, and many ideas may be gleaned which will be helpful in future practice.

Interesting sidelights are frequently thrown upon so-called expert testimony. Experts will frequently be found expressing contradictory opinions, and it is noticeable that some of the best authorities on a given subject are never called into court. Presumably this is because neither litigant considers a certain expert "safe"—he might disclose some truth which would be of benefit to the opposing side. Such conditions disclose the absurdity of having so-called witnesses retained by either party to a suit. Partisan experts should be recognized as advocates for one side or the other, and any expert assistance needed by judge or jury should be called in independently of the litigants. This would promote a greater measure of justice. If, in addition, the pay of such witnesses were limited to the ordinary witness fees, at least one incentive for hiding a part of the truth would be removed.

AN IMPORTANT ADVANCE IN TELEGRAPHY.

When one of the electrical arts has attained the hoary age of seventy years without a radical improvement in the original methods employed, one is prone to admit that the pioneers in that art succeeded in developing methods and apparatus as near perfection as the inherent nature of the media employed will permit. And yet an impartial survey of the history of the submarine cable, second of all electrical industries in amount of capital invested, proves again the truth of old axioms concerning ruts. For here again, as was the case with the long-sought telephone repeater, the radical improvement comes at last not from those engineers who made this their every-day work, but from an outsider, free from the hidebound traditions of the cable builders.

It should be to Americans a special source of satisfaction that although practically every improvement in cable methods, manufacture and operation has by common consent originated in Great Britain, the first genuinely radical improvement in cable signaling since the days of Cyrus Field, is the work of an officer of the United States Army Signal Corps.

Col. George O. Squier, our military attaché at London, has during the past two years developed a cable signaling system, transmitting and receiving, which possesses so many striking advantages, and offers such unquestionable improvements over all previous methods as to be certain of eventual general adoption. In a paper presented before The Physical Society of London, and abstracted in this issue, Colonel Squier describes his novel method of attacking the cable problem along lines of electrical power transmission. By substituting for the time-honored make-and-break battery-current transmitter a low-frequency single-phase sine-wave alternator, the current from which is never broken; and a single time element for the differing durations of dot, space, and dash, he achieves simplicities and economies which are truly astonishing.

Consider first the novel form of received record, a reproduction of a portion of an alphabet of which is given. The dot is a single stroke, the dash a triple stroke, but covering the same length of paper as the dot or the space. The ease with which this record is read is most striking. Here at once the Squier method does away with the need for specially trained, highly paid cable readers. The veriest novice can translate such tape with accuracy at present unknown over long cables. Again, the abolition of the siphon re-

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corder permits the use of cheap paper tape, a trifling consideration until one realizes that the annual bill for siphon recording tape of the Eastern Cable Company alone amounts to thousands of pounds sterling. This novel alphabet, moreover, permits relaying directly from cable to land wires, or *vice versa,* for it is "universal"—can be employed equally well and with like economies for both.

By use of the sine wave at the transmitter a relatively much larger percentage of transmitted power is received at the distant station, so that we have now a margin of safe working in automatic relaying as well as in tape recording, which was impossible with the use of square-topped waves at the transmitter. Then, too, and for the same reason, the high voltages existent from the higher harmonics in the square-topped waves, which may under certain conditions endanger cable insulation, are done away with. With the unbroken, pure sine wave, higher average potentials can be safely employed with a correspondingly increased energy delivered at the receiver. Particularly would this advantage be applicable if the first 200 or 300 miles of a submarine cable were made of higher insulation than would be necessary for the deep-sea portions.

Undoubtedly the most important of all advantages achieved by the Squier method is the economy of time effected. As sample comparative records show, from 50 to 100 per cent more letters per minute can be transmitted than with the old methods and old alphabet. With the make-and-break methods, the transmitting end of the cable must be connected to earth after each signal, to clear out the excess charge which was thereby unavoidably put in. In other words, at present the entire cable plant is idle for 25 per cent of the time, a plant representing a cost approximating $2,500,000 shut down, so to speak, for sweeping-out purposes, six hours a day.

Major O'Meara, in a paper on the new Squier method, read before the Royal Engineers Society of London, states that two transatlantic cables can now do the work of three, representing a saving in initial cost of plant of over $2,500,000, to say nothing of savings in operation of the third cable.

But these economies are figured on a basis of alternating current of 4 to 10 cycles per second. There is no reason why with higher sine-wave voltages (or even with present voltages and amplifiers at the receiving end) frequencies at least as high as 50 per second may not be used. This would correspondingly multiply the signal speeds permissible by the Squier method of transmitting.

Now as to long land lines, where Wheatstone or other rapid transmission methods are employed, we need in this field the same revolutionary change. Telegraph engineers, no less than cable men, have labored consistently in the rut of square-head signal transmission. Hence they are driven to endless expedients to cut down induction troubles, especially over composite circuits or on neighboring telephone lines. It is the 99 upper odd harmonics of the square-head waves which cause most of this trouble. When telegraph engineers also will adopt the sine-wave base of an uninterrupted alternating current for signaling purposes, not only will it be relatively simple to cut out the induction from such currents, but they will find a simplicity of operation and economies of time quite impossible so long as interrupted direct currents are employed.

The simplification in artificial lines and possibilities of multiplex telegraphy made available by the use of uninterrupted sine-wave currents are not the least among other advantages which this new principle places before both cable and telegraph engineers.

Surely, America, with its pressing telegraph needs, its long lines and its present complete freedom from bureaucratic restrictions, is the logical place for the evolution of the fruitful ideas which Colonel Squier has given us.

SELLING ELECTRICAL APPLIANCES.

The experience of the Chicago housewife, described by Mr. Vogel in this issue, contains several suggestions to the electrical merchandiser as to how he should conduct his business to make the most out of it. The average purchaser appreciates keen interest in his problem and the best means of meeting it, provided this is not carried to the point of annoying him, by trying to force a particular make of article upon him before he has decided whether it will best meet his needs. Other things being equal, however, the dealer who will follow up an inquiry and is ready to place an appliance upon trial will be more likely to meet with a sale than the one who is content to merely display and explain his wares.

Every purchaser appreciates attention, and, of course, courtesy is to be taken for granted. Suggestions as to what will best meet the problems of the home and lighten the work of the housewife are nearly always gratefully received and frequently lead to sales. The fact that the prospective buyer wishes to investigate other makes of devices should not discourage the earnest salesman. It is really an evidence of intelligence and should encourage the salesman who really believes in the merits of his merchandise that he can make the sale, even in competition with other brands. A little follow-up work, however, is frequently necessary to do this, and tact and resourcefulness come into play in the manner of carrying this out. In the instance cited, it does not necessarily follow that the washing machine finally sold was the best of its kind. It was, however, one that would do the work satisfactorily, and, this, coupled with efficiency and discretion upon the part of the salesman, culminated finally in a purchase. The same result will ordinarily follow the same sequence of events. When an entrance to the home has once been secured, it is often easy to make further sales by careful observation of the needs, or the lack of conveniences for which there is an excellent opportunity.

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COMPETITIVE BIDDING.

The cost of any job of electrical installation is made up of three portions: the cost of material, the cost of labor and the overhead expense. Before making a bid upon any piece of work, the electrical contractor should have estimated these items as accurately as possible. The cost thus estimated forms the minimum which he may bid without likelihood of losing money on this particular job. His actual bid may vary from this figure upwards. The margin between the bid and the estimated cost constitutes expected profit.

When there is knowledge that others are also bidding upon any particular piece of work, there is temptation to reduce the amount of the tender to a figure which will be low enough to get the contract, and many contractors succumb to this temptation. They are especially likely to do this when their methods of estimating are so loose that they do not feel confidence in the calculated figures for the cost of the job. In a majority of cases, however, bids which are made without knowledge of the probable cost, or which are made lower than the estimated cost, result either in a loss to the contractor or else in skimping the material or the workmanship in a way which is not only dishonest, but is likely to give the perpetrator a bad reputation

Bidding in competition with others is not necessarily bad where each bid is based upon the actual estimate of the bidder. Competitive bidding, however, often results in one bidder endeavoring to find out the figures to be submitted by his competitors and cutting under them, or else in a general contractor actually making the matter an auction between the various bidders, quoting the prices of one against the other. The process is like an auction in more ways than one. An auction usually indicates a loss or sacrifice upon the part of one party in the endeavor to realize something regardless. Auctions are the magnet of the bargain hunter, the man who wants to get something for less than it is worth, while the other party loses. Competitive bidding is very similar and usually results in the contract going to the contractor who has made the biggest mistake or has taken the largest chance. The contractor who wins in a competition of this kind usually really loses and the man for whom the work is done gets a poor job.

The contractor who declines altogether to enter into competitive bidding, or who fixes a price independently of others and irrespective of the fact that others are bidding on the same work, is the one who will ultimately build up the choicest kind of business, and one that will not be wrecked by some unlucky development in a piece of especially large work. He will have a chance to build up a reputation for first-class work and will usually find there is enough of this kind wanted to make him independent of the contracts which are only to be obtained by the auction route.

A NEW STEP IN STREET ILLUMINATION.

Street lighting was the earliest application of electric lighting and remains one of its most important branches. Relatively speaking, however, the progress in electric street lighting since its early days has not been so marked as that in other fields of electric lighting, at any rate it has not been predominantly of a scientific character. Where some of the most successful street-lighting installations have been made it has usually been as the result of trials of various types of units arranged at different spacings and mounting heights, from which the seemingly best combination has been selected.

In marked contrast to this "hit and miss" method is the planning of a system based on a careful study and analysis of the actual requirements to be met, followed by the selection or special design and arrangement of equipment that can be predetermined as best meeting these requirements. Such an installation, when designed by an experienced illuminating engineer of good judgment, should prove a decided advance in the art.

It is a pleasure to be able to describe such an installation that has actually been begun in the city of Milwaukee. The first portion of an article on this system appears on other pages of this issue. Of the many distinctive features of this system one of the most interesting is that its design was preceded by probably the most extensive general and detailed survey of the entire subject of street illumination ever undertaken. Fully a year was spent by a large and able engineering corps in gathering the data, making an analysis of actual requirements and drawing up the general design of the system.

Probably the most important feature in this installation is that it is designed for uniform illumination of the street surface and those streets already lighted in accordance with the completed scheme actually have an exceptionally uniform illumination and that of a high intensity. The great superiority of such illumination over the spotty effect usually met with is so marked as to cause one to wonder why it has been attempted in only so few instances. Where almost unlimited funds are available it is easy to provide such lighting, but when it is done at almost no additional cost over antiquated and inadequate lighting, as is the case in Milwaukee, the result is a noteworthy achievement.

Among other interesting features in the new Milwaukee system are the almost exclusive use of concrete posts, lamp fixtures of original and ornate design, supply from standard central-station distributing circuits, automatic time switches for controlling the lighting circuits, elimination of constant-current regulators, almost entire absence of overhead circuits in the streets, permanency and neatness of the complete installation. That all these desirable features can be incorporated in a street-lighting system in an economical manner indicates that there has been made an important advance in street illumination.

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Happenings in the Industry

Important Topics Discussed by Minnesota Electrical Association at Minneapolis Convention—3,000 Engineers at New York Meeting Adopt Preparedness Resolutions—President Johnson, of Vehicle Association, Sees Great Future in Affiliation With N. E. L. A.—Meeting of Electrical Jobbers in New York—Miscellaneous News Notes

VARIOUS TOPICS DISCUSSED BY MINNESOTA ELECTRICAL ASSOCIATION AT MINNEAPOLIS.

Report of the Closing Sessions of the Ninth Annual Convention of the Association.

While the discussion concerning the practicability of the electric range was the feature of the ninth annual convention of the Minnesota Electrical Association, held at the Hotel Radisson, Minneapolis, Minn., March 21 and 22, many other questions of importance to central-station men were considered during the sessions of the last day of the convention. Following the sessions on March 21, a report of which was printed in last week's issue, a number of papers on varied topics were presented.

H. S. Whiton, superintendent of the manufacturing department of the Minneapolis General Electric Company, and J. L. Lawrence, who occupies a similar position with the St. Paul Gas Light Company, presented a paper on "Boiler Plant Efficiency." This paper brought out points of cleanliness for efficiency, beginning with the boiler room proper and then including the various pieces of apparatus in a boiler room, such as boiler tubes, feed-water heaters and economizers. Efficiency of maintenance was emphasized, boiler-setting, pipe and valve leaks being cited as extremely wasteful and due entirely to neglect. Central-station men were advised to buy coal on specifications after chemical analysis and tests, and to keep more and better records of boiler-room apparatus. A number of charts showing analyses of the combustion of coal were shown. The discussion, participated in by T. D. Ramm, St. Paul; Ludwig Kemper, Albert Lea; A. J. Bemis, St. Cloud, and others, emphasized the need of saving in coal consumption and of more instruments for recording boiler-room performances.

E. J. Le Blond, assistant electrical engineer, Minneapolis General Electric Company, presented the report of the Committee on Rural Extensions. The committee made out a list of 24 questions regarding general practice in furnishing power and light to farmers, these questions being mailed to over 200 operating companies in Minnesota and other states. The information received was tabulated and abstracted, and showed the trend of modern practice in regard to rural extensions, every phase of the service being considered, and bringing out valuable data and many points of interest.

H. E. Eisenmenger, assistant engineer, National Lamp Works of the General Electric Company, gave a paper on "Concentric Wiring." He outlined the relations between central stations and small consumers, stating some of the advantages of flat rates for this class of service in different countries, particularly in Europe. He then gave a review of the construction and evolution of concentric wiring. A number of slides showing the use of current-limiting devices for flat-rate customers were shown. The discussion was participated in by representatives of the insurance companies, electrical inspectors and central-station owners.

The afternoon session began with a paper by Prof. W. T. Ryan, of the University of Minnesota, on "Central-Station and Electric-Transmission Statistics," which gave figures on waterpower resources in the United States, central-station investment and income, high-tension transmission lines, and economic and other interesting statistics concerning central stations in this country.

O. A. Rofelty, of the credit department of the Minneapolis General Electric Company, read a paper on "The Attitude of the Central Station Towards the Consumer." He stated that the proper attitude had more earning capacity than most efficiency devices, and stated numerous correct attitudes that should be assumed, that rebates should be made promptly and on fast meters, even if no complaint had been made, was brought out in the discussion by Ludwig Kemper, Albert Lea; W. L. Wadsworth, Minneapolis, and B. N. Cowperthwait, Faribault.

The following officers were elected for 1916:

President, Ludwig Kemper, Albert Lea; first vice-president, W. R. Harvey, Warren; second vice-president, E. W. Erick, Canby; secretary-treasurer, F. R. Porter, St. Cloud; executive committee, T. D. Crocker, Minneapolis; D. J. Fleming, Red Wing and E. F. Strong, Waconia.

The annual banquet, held Wednesday evening, was largely attended. Ex-Congressman J. Adam Bede, of Minnesota, was the principal speaker of the evening. Among the entertainment features of the convention were inspections of a number of Twin City industrial plants. The Northwestern Electric Company, of St. Paul, chartered two street cars for a party of 140, which inspected the company's new building. The company was also host at a banquet and provided entertainment for its guests.

Engineers Adopt Preparedness Resolutions.

At a special meeting in New York on March 20, attended by 3,000 engineers, the following resolutions were adopted:

The engineers assembled in public meeting on March 20, 1916, under the auspices of the Engineers' Committee on Military Lectures, believe that it is unworthy a great nation like the United States and that it is dangerous to the peace, safety and liberty of its people, to remain in our present position of inadequate military, naval and industrial preparedness.

We believe that between pacifism and militarism there is a just, safe and proper ground, greatly in advance of our present position—a ground which involves large additions to both the navy and army, a large increase in our schools for training officers and a co-operation and mobilization of the physical and industrial resources of the nation.

We believe that this nation should never make war except to enforce peace; that when strongly supported by armed resources its influence in maintaining its own liberties and rights, and the liberties and rights of the weak and oppressed throughout the Americas, will be greatly strengthened.

We believe that Congress should give due weight to the opinion of experts and should then appropriate sufficient money to put the nation in a position of defense against attack on either the Atlantic or the Pacific Coast.

We demand that our representatives in Congress act in accordance with this expression.

Many prominent electrical engineers are among those subscribing to the foregoing resolutions.

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Affiliation of Vehicle Association with N. E. L. A. Marks Epoch in Electric-Vehicle Industry.

"The affiliation of the Electric Vehicle Association of America with its older and larger sister society—the National Electric Light Association—marks an epoch in the history of the electric-vehicle industry," according to W. H. Johnson, president of the Electric Vehicle Section, N. E. L. A.

"During the past six years the far-reaching and aggressive activities of the Electric Vehicle Association of America, through its membership which has been tripled in the last few years to approximately 1,200, has attracted the attention of the National Electric Light Association, and it has been felt that if closer relations could be established between the two Associations that the prestige which the National Electric Light Association has acquired in its 39 years of useful life, would materially assist electric-vehicle propaganda. Considering that the National Electric Light Association numbers among its 14,000 members the majority of the 6,000 central stations in the country, such an affiliation is especially desirable.

"In turn the electric-vehicle co-operative activities would increase the scope of the National Electric Light Association, thereby adding to its usefulness and strengthening its influence in which all electrical developments would profitably participate. Furthermore, co-operation between the two Associations would tend to centralize educational and development work, and would mark a desirable step toward eliminating duplication which frequently results when two or more associations attempt to cover in whole or in part like fields.

"The electrical industry is generally regarded as the best organized commercial group. As electricity is destined to supersede all other forms of energy for light, heat and power, and as such a condition can be more readily and easily secured through the scientific co-ordination of all related efforts, it would appear desirable to bring the efforts of multifarious developments together into one, great, highly organized body whose carefully systematized work would rapidly assure results that might otherwise be delayed if sought through miscellaneous and distinct bodies.

"It will therefore be apparent that the affiliation of the Electric Vehicle Association of America, including its executive officers and entire staff, with the National Electric Light Association, to be known as the Electric Vehicle Section, represents a distinct advancement calculated to considerably strengthen the Associations' positions and to secure greater results."

Electric Vehicles Discussed at Chicago.

That the electric vehicle presents the cheapest method of trucking, especially where short hauls or frequent stops are a characteristic of the service required, was strikingly brought out at a meeting on Monday evening in Chicago. The Chicago Sections of the Electric Vehicle Association and the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers held a joint meeting in the rooms of the latter society.

Four short papers were presented, the first three being illustrated with lantern slides. F. A. Putt discussed "Automobile Motor Characteristics," showing the required characteristics and giving curves of actual performance of this type of motor. High efficiency is necessary, combined with light weight and ruggedness.

Gail Reed spoke on "Accomplishments of the Electric Passenger Car." He showed the influence which the electric car has had on gasoline-car development and also upon the development of storage batteries. He pointed out the refinements of the modern electric car and illustrated the latest types.

W. J. McDowell read a paper on "The Electric Commercial Vehicle." He rehearsed the evolution of the truck and indicated the special service for which it is recognized as the most efficient type of commercial vehicle. For short hauls it can be operated at a cost of only one-half to two-thirds that of the gasoline motor truck. The last paper was by W. F. Hebard on the subject "Storage Battery Industrial Trucks and Tractors." He pointed out the various applications of this type of truck and showed its advantages.

The subject was discussed by Messrs. Postel, Jones, Street, Dent, Cook, Bowman, King, Naylor, Montgomery, Mabbs, Milton, Frankel, Pearson, Bates and McRae. It was pointed out that the rising price of gasoline is making the advantage of electric operation all the more pronounced and the factories of the manufacturers are now running at full capacity. Data given showed the cost of electric energy to be a small part of the total. Batteries have to be renewed at periods of from one to five years according to type.

Public Utility Companies of Utah Submit Tax Schedules.

The Utah Power & Light Company, through its tax agent, C. M. Brown, has submitted to the Utah state board of equalization schedule of its taxable property in the state, together with a statement of the value of such property. According to the statement this company owns properties to the value of $5,472,890 in the state of Utah and in addition has leased from the Utah Light & Traction Company property with a total value of $3,424,055.

Group of Eminent Telephone Men in Washington.

On the occasion of the recent dinner of the National Geographic Society, at Washington, D. C., in recognition of the recent development of the telephone in its relation to long-distance conversation, and in honor of the gentlemen responsible for this development, an interesting group photograph was taken on the steps of the Society's building, and is reproduced on this page. The picture shows

Group of Well-known Telephone Men at Washington, D. C.
Front Row: Theodore N. Vail, Alexander Graham Bell.
Second Row: Union N. Bethell, Thomas A. Watson, John J. Carty, Gilbert H. Grosvenor.

the distinguished gentlemen at an unposed moment, descending the steps of the building.

Mr. Vail and Dr. Bell met on this occasion for the first time in 30 years. In the first days of the telephone they saw a great deal of each other, but for the last three decades their visiting has been done largely through the medium of the telephone.

The present picture was taken on March 7, 1916.

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Atlantic Division of Electrical Jobbers Meets in New York.

The Electrical Supply Jobbers' Association, Atlantic Division, met in New York City, at the Hotel Biltmore, March 23 and 24. The attendance was thoroughly representative and numbered about 60 delegates. Frank S. Price, of Pettingell-Andrews Company, Boston, was chairman of the meeting, and Franklin Overbagh general secretary. The session were essentially executive and were attended only by the electrical jobbers.

A number of interesting, practical subjects were discussed at length. Following are the titles of the subjects, with names of those who led the discussion:

(1.) Do purchases from manufacturers during the past six months and at present represent: (a) Demand for present consumption; (b) Desire to provide for future requirements; or (c) Speculation? E. C. Graham, of the National Electric Works, Washington, D. C., and V. C. Bruce Wetmore, of Wetmore & Savage, Boston, led in the discussion.

(2.) Have the jobbers reasonable ground to expect an abnormal demand this spring from: (a) New construction in office buildings, hotels, or residences; (b) Industrial plants; (c) Transportation lines; (d) Old residences? W. E. Robertson, of the Robertson Electric Company, Buffalo, opened the discussion.

(3.) Do present conditions in the copper market warrant the jobbers to expect lower prices for copper during the next six months? George L. Patterson, of Stanley & Patterson, Inc., New York, opened the discussion.

(4.) Do present conditions in the steel market warrant the jobbers to expect lower prices for steel during the next six months? George W. Provost, of the Union Electric Company, Pittsburgh, opened the discussion.

On the second day the following subjects were taken up: (1.) What is the condition of the rubber-covered wire market as to manufacturers' and jobbers' stocks on hand, deliveries, prices, demand, etc.? M. A. Oberlander, of the Western Electric Company, New York, opened the discussion.

(2.) What is the condition of the rigid-iron-conduit market as to manufacturers' and jobbers' stocks on hand, deliveries, prices, demand, etc.? J. A. Pizzini, of the Western Electric Company, opened the discussion.

(3.) What is the condition of the metallic-flexible-conduit market as to manufacturers' and jobbers' stocks on hand, deliveries, prices, demand, etc.? C. P. Scott, of the Royal Company, opened the discussion.

(4.) What is the condition of the schedule-material market as to manufacturers' and jobbers' stocks on hand, deliveries, prices, demand, etc.? F. S. Price, of Pettingell-Andrews Company, Boston, opened the discussion on this subject.

(5.) What is the condition of the miscellaneous stock market as to manufacturers' and jobbers' stocks on hand, deliveries, prices, demand, etc.? A. M. Little, of the Mohawk Electrical Supply Company, Syracuse, N. Y., opened the discussion. The meeting began at 10 a. m.

The next meeting of the Atlantic Division of the Electrical Supply Jobbers will form part of the general meeting to be held at Hot Springs, Va., in May next, on which occasion manufacturers and all others interested will be present.

Bonus to Employees of General Electric Company.

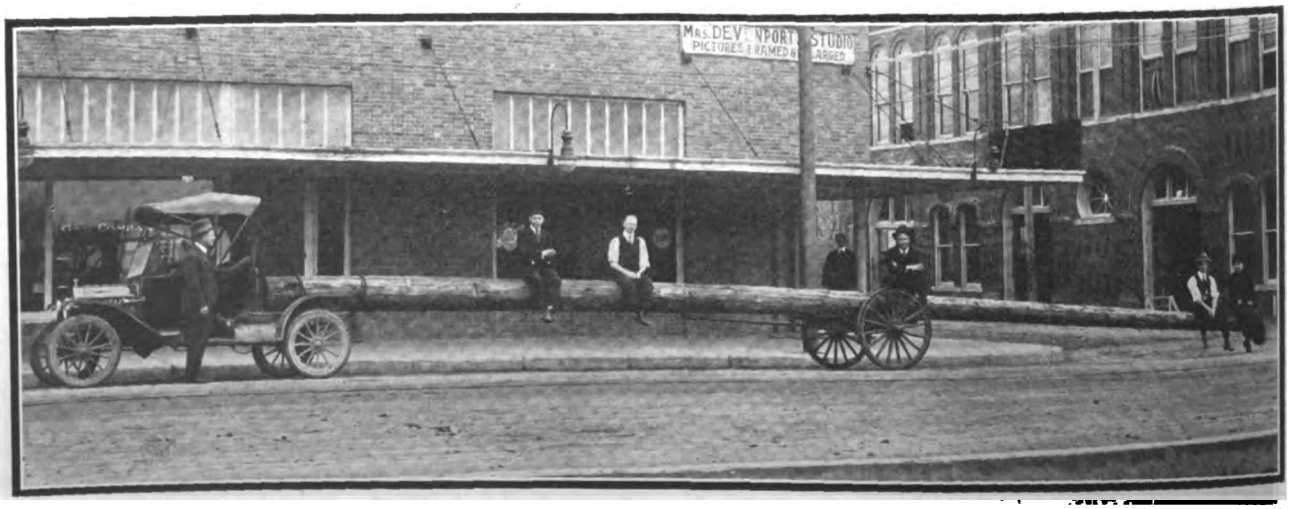
E. W. Rice, president of the General Electric Company, sent notices last week to all plants of the company that all employees in the service of the company for a period of five years or more would receive a bonus of 5 per cent of a year's salary, payable in two installments. It is estimated this will mean a distribution of over $1,000,000 per annum to employees.

According to the bulletin, the first installment will be payable on or before August 1 of this year and will be a sum equivalent to 5 per cent of the individual earnings for the six months ending June 30, 1916. The second payment will be made on or before February 1, 1917, when 5 per cent of the individual earnings for the six months ending December 31, 1916, will be distributed. By the arrangement of two payments many employees who would not be entitled to participate in the distribution if all were paid in one installment will share in the second distribution, having completed the five years' service between June 30 and December 31.

The distribution, as stated by officials of the company, is being made by the company to signify its appreciation of the services of the employees who have been with the company for a term of years, and is a result of a desire to promote long, faithful and efficient service by its employees.

An Emergency Pole Installation in Texas.

That the automobile can be used in almost any capacity is shown by the accompanying illustration, which shows a 60-foot pole attached to a Ford roadster by means of a trailer. The necessity for quick action was caused by a pole burning down on a transmission line of the Texas Power & Light Company. The pole shown was secured from a neighboring store yard and hauled about 15 miles, via the Ford.



Handling Poles in An Emergency. A 60-Foot Pole Ready for a 15-Mile Dash Across Texas Prairies to Replace a Burned Pole.

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Miscellaneous NEWS NOTES

Detroit Edison Company Publishes House Organ.—The Detroit Edison Company has inaugurated the publication of a monthly house organ which is termed the "Synchroscope" and which, it is stated, will deal with all inter-departmental activities of the company. The March issue contains an interesting article on "Load-Water-Rate Curves Applied to Plant Operation," by W. A. Hirt, and an article on electric steel furnaces by E. L. Crosby.

California Company to Pension Employees.—General Manager John A. Britton of the Pacific Gas & Electric Company, San Francisco, Cal., has perfected plans for a pension system for the old employees of the firm. The company has been pensioning some of its employees, but the system did not extend to all.

Kentucky Companies Inaugurate Safety-First Campaign.—A joint safety-first campaign has been inaugurated by the Paducah (Ky.) Light & Power Company and the Paducah Traction Company. The work is to be handled through four employees' committees, of which Manager W. L. Weston has named the chairmen.

Section of A. I. E. E. for Kansas City.—A petition has been prepared, with the necessary signatures, for the locating of a section of the American Institute of Electrical Engineers at Kansas City, the district including St. Joseph, and Excelsor Springs, Mo., and Lawrence, Leavenworth and other Kansas cities.

Jersey City Electrical Contractors Organize.—A number of electrical contractors in Jersey City, N. J., are forming an organization to be called the South Hudson Electrical Contractors' Association, Louis Fort being temporary chairman. Co-operation and a uniform price list for electrical supplies is the purpose of the association.

Commission Approves Sale of Electric Companies.—For economic reasons the Pennsylvania Public Service Commission has approved the sale of the Eastvale Light Company and Beaver Valley Electric Light, Heat & Power Company to the Beaver County Light Company. The latter company owns seven other power companies in Pennsylvania. The sale was approved because the holdings could be operated more conveniently and economically.

Copper Wire Stolen from Louisville Companies.—Special attention is being paid by all concerns with copper wire distributing systems in and around Louisville, Ky., to the safety of their property, since several instances of wrecking of these systems merely for the metal have come to light. The most daring attempt of this kind was perpetrated by three men on a Western Union cable over the K. & I. bridge. A 50-foot section was cut away with a hatchet. Two instances of similar theft are reported by the Louisville Traction Company. A switch trolley was cut at the positive end first, and 100 feet of copper was stolen. Another attempt was frustrated after thieves had cut a trolley at the dead end and it dropped to the tracks, throwing open the circuit-breaker in the power-house.

New Turbine for Boston Elevated Railway.—A new steam turbine of 35,000-kilowatt rating will be installed at the South Boston alternating-current generating station of the Boston Elevated Railway Company, to provide for increasing power demands of the system. The installation of this large unit conforms to the recommendations of the Stone & Webster Engineering Corporation in a report to the company on the most efficient means of increasing the power supply. In the report the engineers pointed out that, while the first cost of a 35,000-kilowatt turbine is about $200,000 more than for a 20,000-kilowatt unit, installed, the economy of operation with this turbine carrying the station base load, would compensate for it in five years.

Directory of Electricians in Massachusetts.—A 220-page booklet, giving the names and addresses of licensed electricians of both the Masters' (Class A) and the Journeymen's (Class B) grades has been issued by the State Board of Electrical Examiners of Massachusetts. The list is arranged by cities and towns, and is a convenient handbook for use in checking up authorized electricians in the state. The laws relating to the licensing of electrical workers are also presented.

Chicopee, Mass., to Keep Municipal Light Plant.—The Committee on Public Lighting of the Massachusetts Legislature has given the petitioners for legislation authorizing the sale of the city of Chicopee's municipal lighting plant "leave to withdraw." A Chicopee attorney has secured the necessary number of signatures to introduce the bill, but at the final hearing in Boston no one appeared in favor. The mayor, city solicitor and representative spoke briefly against the bill, stating that there is no sentiment in Chicopee in favor of disposing of the plant. Among those recorded against the bill was General Morris Schaff, a member of the Gas and Electric Light Commission.

Los Angeles Jovians Discuss Workman's Compensation.—At the meeting of the Los Angeles Jovian League, March 22, T. Harvey Dukelow, claim agent for the Southern California Edison Company, gave a half-hour talk on the "Workman's Compensation and Insurance Law" which became effective in California, January 1, 1914. The theme of his address was "Safe and Sound" and in his talk he made the following comments: "The companies are now fully awake to the significance of education as a prevention of accidents. Technical skill is desirable, but so, also, is education that will develop mental alertness, accuracy of judgment and a genuine and lively interest in the company. Education is imperative for bringing the workman to a clearer appreciation of life and its responsibilities and making him more alert to the opportunities and dangers of his profession. But the man who has been at a trade for years is set in his ways and intolerant of change and, unfortunately, this has its bearing on others. Thus, we turn more and more to the younger man—the new hand at the business—and endeavor to produce workmen who not only will tolerate safeguards, and will use them, but who from force of habit will be addicted to safe methods of working."

Louisville Central Station Subscribes $25,000 to Industrial Fund to Secure Industries.—The Louisville Gas & Electric Company is the latest Louisville, Ky., concern to make a subscription to a proposed million-dollar fund which would be used by commercial interests of that city in establishing new industries there. A contribution of $25,000 is provided for conditionally in the action of the Board of Directors, $5,000 to be set aside each year for five years. This makes $40,000 subscribed without any effort to obtain subscriptions. The electric company conditions its subscription on the expectation that other contributions will be made to bring the sum up to the required figure, that it shall be safely administered, etc. It is expected that the fund will be in the hands of a division of the Board of Trade, an Industrial Bureau having been undertaken by that body. Donald McDonald, vice-president and general manager of the electric company, announced the contribution and stated that he and the directors hope to see the fund completed in time to meet proposed tax reforms which would improve conditions for new industrial enterprises in Louisville. Numerous other concerns, it is understood, have decided voluntarily on subscriptions but are waiting for further developments before announcing them.

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First 1,200-Pair Cable in Boston.—The first 1,200-pair 24-gauge underground cable in the Boston metropolitan district is about to be installed by the New England Telephone & Telegraph Company, to provide facilities for additional trunk lines and local growth in the Back Bay exchange.

American Association of Engineers Enlarges Its Offices.—The American Association of Engineers has moved to suite 601-604, 29 South La Salle Street, Chicago, Ill. This is the second time in nine months the new society has been compelled to enlarge its quarters. It has now a membership of 500, 65 per cent of which is in and near Chicago.

Mississippi to Place Restrictions on Municipal Utilities.—A house bill has been introduced in the Mississippi Legislature authorizing cities of 10,000 or more inhabitants to construct lighting, water and power plants when the income therefrom will in five years pay for the investment and to issue five notes due annually in payment therefor.

Continued Improvement by Standard Gas & Electric Company Shown in Annual Report.—In his annual report to the shareholders of Standard Gas & Electric Company for 1915 H. M. Byllesby, president, maintains the policy of complete and candid publicity adopted several years ago, and shows that the company has made substantial progress during the year, while at the same time permitting subsidiaries to reinvest a large amount, $1,322,792, in the properties through depreciation reserves and undistributed surplus.

Earnings, after the payment of fixed charges, amounted to 6.3 per cent on the preferred stock, upon which dividends were paid at the rate of 4 per cent, leaving a surplus for the year of $270,979. The number of customers served advanced from 308,378 in 1914 to 325,153 in 1915.

Worcester (Mass.) Central Station to Expand.—Directors of the Worcester Electric Light Company, at their monthly meeting, March 15, voted to recommend to the stockholders that 2,000 shares of new capital stock be issued, at $200 per share, the proceeds to be used to pay for proposed additions to plant which will about double the capacity of the Webster Street power station. The company will probably install a 20,000-kilowatt turbo-generator and add to the station an extension 68 by 78 feet. Plans are being prepared by H. R. Kent & Company, New York. A special meeting of the stockholders will be held April 26 to vote on the stock issue. The company's present capital stock is $1,400,000.

Flood Lighting Planned for Utah Capitol Building.—Secretary of State David Mattson, of Utah, has proposed to the Utah State Capitol Commission that this magnificent new building be illuminated by means of flood lighting at the time of its dedication and thereafter. The building is located on a high bench on the east side of Salt Lake valley at a point where it can be seen readily from all points of the valley. The building is faced on the exterior with a very light colored granits, which lends itself readily to the flood-lighting scheme. The architecture of the building is such that particular striking and beautiful effects in lights and shadows could be produced with a flood-lighting system. W. d'A Ryan has examined the building and pronounced it particularly well adapted to the installation of a flood-lighting system.

New Personnel of New York Commission.—The Senate of the State of New York on March 16 confirmed the nominations made by Governor Whitman of Travis H. Whitney and Charles S. Hervey, both of Brooklyn, to be members of the Public Service Commission for the First District. Mr. Whitney succeeds Commissioner J. Sergeant Cram, whose term expired January 31, 1916. His term of office, therefore, will expire January 31, 1921. Mr. Hervey succeeds Commissioner George V. S. Williams, who resigned in January. Mr. Hervey's term will expire January 31, 1917. Commissioners Whitney and Hervey were sworn in at Albany on March 17, and both immediately entered upon their new duties. With their accession the membership of the Commission for the First District again became complete. It is now an entirely new Commi[illegible] the oldest member, in point of service, being Col. W[illegible] Hayward, who took office April 1, 1915. The new chairman, Oscar S. Straus, was appointed in December, 1915, and Commissioner Henry W. Hodge in January, 1916.

Plan Electrically Lighted Lincoln Highway Between Illinois Towns.—The section of the Lincoln Highway between Aurora and Geneva, Ill., a distance of 10 miles, is to be electrically lighted for the benefit of travelers at night. This follows close upon the news that a rural section of the Lincoln Highway leading out of Salt Lake City, Utah, has been so lighted, and proves the value of the closer communication established through the development of the Lincoln Highway.

Aurora is known as the "City of Lights," and the new arrangement will complete a system which is now favorably commented upon by all visitors. Decorated Lincoln Highway lights are found along the route of the Lincoln Highway in Aurora and electrically lighted warning signals have just been placed at the street-car crossings. They were supplied by the local automobile club, and the street-railway company furnishes the power.

Incinerating Plant at Boston Proves Economical.—An incinerating plant, consisting of furnace room, baling room and sorting shed, has been built by the Boston Edison Company adjoining its heating plant at the Service Building. Heretofore waste has been hauled to the dump. With the plant on the grounds, the haul is much shorter, and materials can be disposed of oftener, thus reducing fire risk. The plan of sorting the materials results in the salvage of much straw, paper, etc., which is baled and sold. This also allows more or less reclaiming of missing objects.

Insulated wire in short lengths is reduced to metal, 1,000 pounds being handled in 20 minutes. Returned coupling boxes are burned out preparatory to repairing and putting in stock, and office waste and useless materials are disposed of. Wooden materials, boxes, barrels, reel lagging, etc., are, however, separated from the other debris and either sold or used in starting boilers.

During 1915 the Edison Company sold 1,077 tons of metal, worth $107,096. About 90 per cent required only sorting. The other 10 per cent was made available by reduction.

New England Power Company Makes Good Showing.—An output of energy, larger by 50,000,000 kilowatt-hours than in any previous year, is reported by the New England Power Company, for 1915. The company says the demand for power is so large that the great problem is to provide increasing supply to meet the growing requirements of customers. This increase is due both to the great business activity and the purchase of electricity by more manufacturing and utility companies.

During the year plant No. 5, on the Deerfield River, went into partial operation, producing 35,000,000 kilowatt-hours. High-tension lines were extended south from Uxbridge, Mass., through Woonsocket to Providence and Pawtucket, R. I., and a substation placed in operation for supplying energy in central Rhode Island, in which state contracts for over 15,000 horsepower have been closed, with others pending. Connection has been made at tidewater with two steam plants.

In July, 1915, a plant and water power on the upper Deerfield, at Readsboro, Vt., were acquired and the dam and hydraulic plant have been rebuilt, and a new hydro-electric station is now under construction, to be in operation about April 1. The ownership of this property, which has an available head of 72 feet, gives the companies the entire control of the Deerfield from just south of Wilmington, Vt., to Shelburne Falls, Mass., 35 miles.

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The New Street-Lighting System of Milwaukee

Part I

This article describes a street-lighting system which incorporates in a unique manner the latest scientific and practical developments of the art and which very economically provides uniform street illumination of a relatively high intensity. The extended survey that preceded the design of the system is briefly summarized. Some of the more original features of the plan are described. In the second part of the article, to appear next week, further technical details will be taken up and cost data given.

In the city of Milwaukee, Wis., the first section of a new municipal street-lighting system has been installed, which in its entirety is decidedly unique. It includes many novel features that have been tried out with complete success in other installations, but in no case known has such a large number of new elements been incorporated in a single installation. The new system is also unique in being the first instance in which a street lighting system on a large scale has been laid out after a prolonged preliminary study of the scientific and practical requirements of street illumination and in strict accord with the most advanced principles of illuminating engineering.

Conditions Prevailing Before New System was Proposed.

To understand what led to the scheme for complete rehabilitation of street lighting in Milwaukee, a brief review of the situation is desirable. The city is situated on the west shore of Lake Michigan and possesses excellent facilities for shipment by rail and water, which among other things have promoted its rapid industrial development in recent years. To accommodate the increase in population, which in 1915 was estimated by the United States Census Bureau as 428,000, outlying parts of the city are rapidly building up and several suburbs have been annexed. In these outlying sections the street lighting has either been extremely meager or entirely absent, many miles of streets having been laid out that are as yet unpaved and unlighted. In the more settled parts of the city the street lighting has also been very inadequate. Even on some of the principal business streets the practice was still followed of suspending an old arc or some obsolete type of lamp across the street at intersections only.

As the result of these unsatisfactory lighting conditions accidents from collisions, especially with automobiles, were common and the work of the police was hampered. Burglaries and other crimes increased, particularly assaults on women. These led to a strong agitation for improved street lighting and the city authorities realized that something would have to be done. Complicating the situation, however, was a movement for a municipal electric plant to be built primarily for street lighting; this was urged by the Socialists, who dominated the city government for several years without proceeding further than purchasing a site for the proposed plant, however.

Street-Lighting Survey Undertaken.

The agitation for improved street lighting resulted in January, 1914, in the City Council voting in favor of having a study of the entire subject made, but for some months little headway was made in this until in June, when F. A. Vaughn, of the consulting engineering firm of Vaughn, Meyer & Sweet, was appointed engineer of street-lighting survey. The work was then undertaken in earnest. Mr. Vaughn was ably assisted by A. J. Sweet and a large engineering staff.

A brief outline of the extended scope of this survey is of

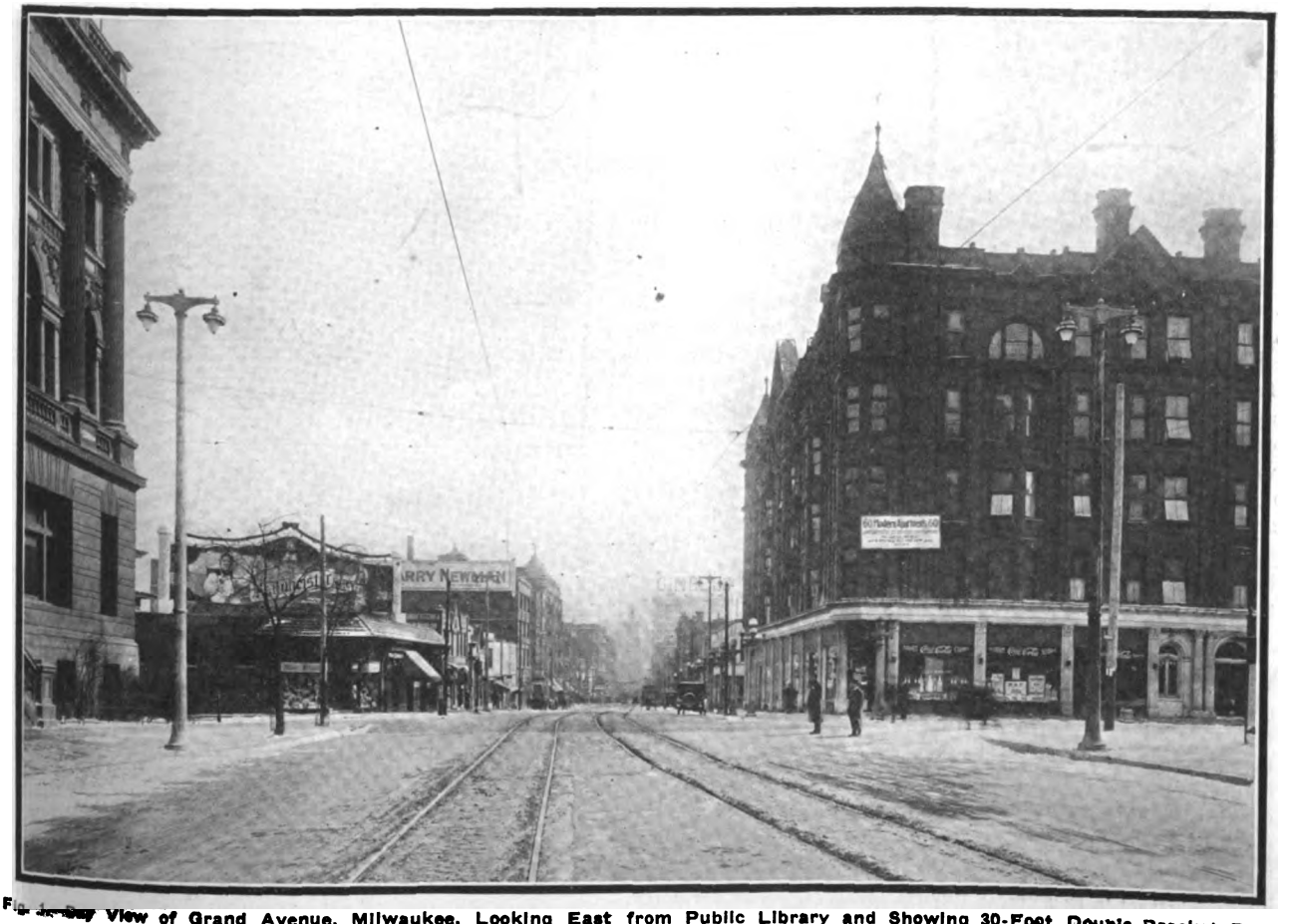

Fig. [illegible] View of Grand Avenue, Milwaukee, Looking East from Public Library and Showing 30-Foot Double-Bracket Posts.

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interest. One of the first things considered was an analysis of the general principles of street illumination, involving a study of the various objects of street lighting, an investigation of the methods of discernment outdoors at night and to what extent they satisfy these different objects, a review of the methods of generating light efficiently and of utilizing it efficiently

Fig. 2.—View in Twelfth Street, Showing 22.5-Foot Single-Bracket Posts and Former Lighting Arches Still in Place.

and in such a way as to leave the eye in a condition to perform its visual functions efficiently. A summary of the findings of this part of the study was presented in a paper[1] by Mr. Sweet before the Illuminating Engineering Society at Chicago on May 21, 1915.

New Design Determined On.

In continuing the survey it was found that the street-lighting equipment in use was not only obsolete and inadequate, but could not be remodeled to any practical degree so as to meet satisfactorily at least the most important requirements of a scientific street-lighting system. Therefore, it was determined to design an entire new system which would meet all these requirements efficiently. In working up a new design it was decided that it should be laid out to provide as far as possible directly from the start (and at any rate ultimately) for uniform illumination of the streets to intensities depending on the amount of traffic and use of the streets. It was found that uniform light distribution on a street is the only kind that permits of discernment by illumination effect and therefore much more fully satisfies all the requirements than the non-uniform illumination commonly produced from lamps far apart, which necessitates dependence to a large extent on silhouette effect.

How Survey was Made.

Before working out the features of the design, it was necessary to make a detailed analysis of street and traffic conditions throughout the city in order to determine exactly what were the illumination requirements of each street and block. The night traffic was gauged by the number of automobiles and street cars passing given points per hour. Field notes were made of these data, together with observation of street pavement, character and number of buildings, the presence, nature and density of trees and the height above ground of their lowest branches, and other conditions that affect street-lighting requirements. Large sectional maps of the city were then made to scale on which these data were recorded.

These observations disclosed the exact nature of the problem. Among the facts brought out were the following: The area of the city is about 37 square miles and the total mileage of streets is about 600, of which close to 26 per cent are paved with pavement having permanent concrete base. Nearly all the business streets have double-track street-car lines. The main business streets have buildings ranging all the way up to 14 stories in height; in the less important business streets two and three-story buildings predominate. In residence streets, two-story buildings are most common. In the better residence streets and boulevards, trees are plentiful, but as a rule are either old and high or can have their lower branches trimmed to leave about 15 feet above the ground clear. Many former residence streets are in a state of transition to business streets and the trees therein are rapidly dying.

Illumination Requirements and Lamp Selection.

After all these facts had been ascertained it was possible to determine the illumination intensities needed for the successive blocks of each street. In general it was found that five values of intensity would suffice, as follows:

Nature of Street.	Foot-Candle Intensity.
Alleys and outlying streets	0.01
Residence streets	0.03
Subsidiary traffic feeder or thoroughfare	0.06
Main traffic feeder or thoroughfare	0.12
Promenade and principal business street	0.50

Some variations from these values were necessary to meet special local conditions. The amount of light to be generated for each of these intensities was then calculated and entered on the maps in terms of lumens per running foot of street.

Fig. 3.—A Typical Residence Street with New 15-Foot Harp Post Contrasted Against Old Gas Post.

From this figure, together with the length of block and the number of lamps to be installed therein, the size of the necessary lamps was determined in lumens, this figure giving the total light units generated in the lamp, which is 10 times the rated candlepower.

After considering the subject of lamp selection from all angles, it was decided to recommend tungsten-filament lamps of the gas-filled type as the standard unit. Among factors in-

1 See abstract in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, May 29, 1915, pages 999 and 1,000.

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fluencing this choice were the high efficiency of these lamps, their steadiness and good quality of light, simplification of maintenance to monthly cleaning and occasional lamp renewal, possibility of using scientific reflectors or refractors, large range of sizes available, possibility of eliminating special substation equipment and adaptability to artistic fixtures. An inverted-mantle gas lamp, especially developed for the purpose, was also considered as a suitable alternative unit for certain residence streets.

Lamp Mounting and Spacing.

Although nearly all the electric lamps formerly in use in Milwaukee street lighting were suspended either by cables across street intersections or mounted on mast-arms, making the cheapest possible installation, this type of mounting was far from attractive and therefore was recommended to be used in an improved form and only at certain intersections and where it would prove unobjectionable. For the great bulk of the lighting a post mounting was chosen, this to be of simple, but artistic, design and at as great a height as local conditions would permit in order to place the lamps above the line of vision as far as possible and thus diminish blinding effect to a minimum.

Four standard heights of lamp mounting were selected: 15, 22.5, 30 and 45 feet from street surface to center of lamp. The first was to be used on posts in residence streets and boulevards where trees prohibit any greater height. The second for suspension and post units principally on secondary business streets, where any higher mounting would bring the lamps above the roof levels of the low buildings prevailing. The 30-foot height was selected for the principal business streets, important and unforested thoroughfares and boulevards where trees and buildings offered no restrictions. In a few public squares and large open spaces in parks, 45-foot posts were deemed most desirable. These two latter heights are an innovation in American practice.

Before determining the spacing distances, a study was made of a large number of prototype curves showing the light distribution which the lighting units would have to produce in order to give uniform illumination of the street surface for various ratios of spacing distance to mounting height. It was found that unless this ratio (designated by M) is eight or less, the shape of the curve cannot be approximated by any lighting units available, even when equipped with reflectors or refractors. The curve for M=8, shown in Fig. 4, can be practically obtained by equipping an incandescent lamp with a proper refracting globe. The curve for M=6 is still better. Therefore the ratio of M=8 was adopted as standard, except for the more congested streets where a ratio of M=6 was chosen and in some of the residence districts where M=12 was used.

This means that lamps 15 feet above the street are 15×8, or 120 feet apart, measured along the length of the street; lamps 22.5 above the street are 22.5×8, or 187 feet apart; lamps 30 feet above the street are 30×6, or 180 feet apart. These standard spacings were departed from only for local requirements and in cases where only part of the ultimate equipment was to be installed at first. For example, on a street with 15-foot

Fig. 5.—New 22.5-Foot Suspension Unit at Street Intersection Contrasted with Old Open Arc.

lamp mounting height, four lamps would be called for on a block of 480-foot length; however, at first only two of these lamps 240 feet apart might be installed, the circuit being arranged to permit the easy addition of the two other lamps a year or so later when more funds would be available. Even with this partial installation greatly improved lighting would be produced.

Other Features Recommended for New System.

The street-lighting survey was of such magnitude that it required practically a year for its completion. The report was submitted to the City Council by Mr. Vaughn in June, 1915; in printed form it covered over 70 pages, supplemented by numerous atlases of maps, drawings and tables; a supplementary report of 40 pages is just being published. Space does not permit giving more than an outline of the more important of the recommendations made, some of which have been already touched on in the preceding paragraphs. Among the other features provided for was that entirely new street-lighting circuits be installed and that these be supplied at convenient centers from the public utility distribution feeders through suitable transformers and time switches, the latter automatically turning the lighting circuits on and off at the proper time. These circuits were to be run like series circuits, without using

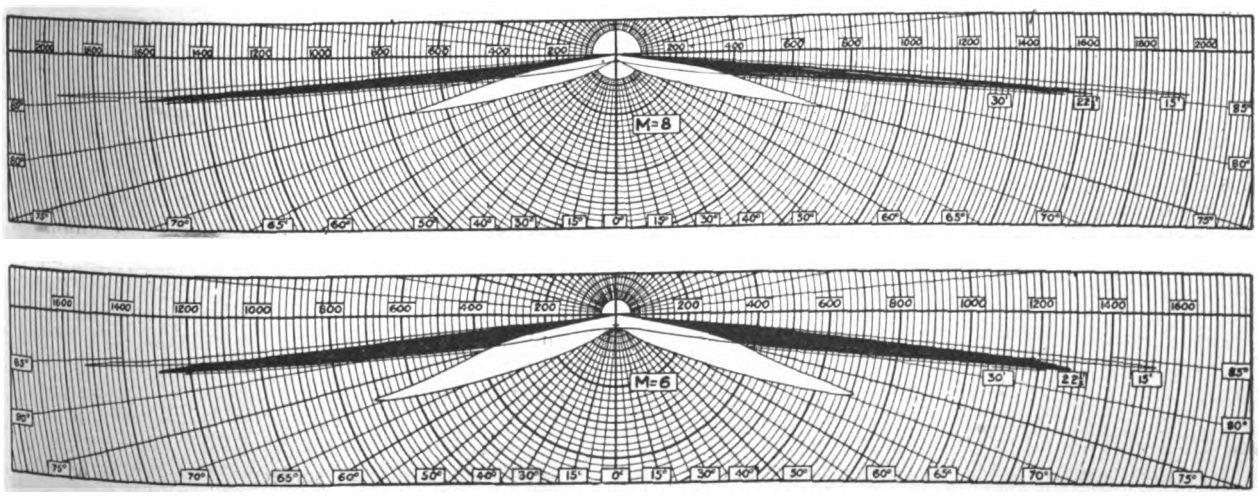

Fig. 4.—Protoype Curves for M=8 and M=6. White Area Shows Light Distribution Required for Uniform Horizontal Illumination, Black Area for Uniform Vertical Illumination.

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constant-current regulators, however, the lamps being connected to the line through individual series transformers.

The special street-lighting circuits, together with the entire equipment of posts and lamps, were to be installed and owned by the city; bond issues were recommended to permit the major part of the equipment to be put in during the year 1916 and the remainder during 1917, the underground circuit being installed at the earliest possible time, especially in streets where new paving was to be put in. Purchase of energy for the electric lamps was recommended on the kilowatt-hour basis on a contract of five years; gas for gas lamps, together with maintenance of the mantles and burners, was likewise recommended to be purchased on a five-year contract. Maintenance of the electric lamps and of the electric circuits was recommended to be taken care of by the city. A good general review of the report and its recommendations, together with the reasons on which the latter were based, was contained in a paper presented by F. A. Vaughn before the Illuminating Engineering Society's last annual convention, September 21, 1915.

First Part of Installation Begun.

After deliberating on the report several months, the City Council in September, 1915, appropriated $34,000 to pay for installation of an initial part of the new system, this covering a section just west of the central part of the city in which improved lighting was urgently needed. The streets chosen included several types for which different types of units were called for in the new system. Thus this initial installation would typically demonstrate the possibilities of the new equipment and it was therefore called the demonstration installation. Based on its results would hinge the installation of the rest of the new system involving a total expenditure of over $1,250,000.

Work was begun late last fall and continued through the winter to completion in February. This demonstration installation covers 40 squares, or about three-fourths of a square mile; nearly eight miles, or 90 blocks, of streets have been equipped. The new equipment placed in service comprises the following:

No. of Units.	Height, Feet.	Type of Unit.	No. of Lamps. Electric.	Gas.
45	15	Harp post	45	....
22	15	Harp post	....	22
41	22.5	Center suspension	41	....
52	22.5	Single-bracket post	52	....
16	30	Double-bracket post	32	....
176			170	22

Design and Construction of Posts.

The designs of the posts used are shown in Figs. 1, 2 and 3. These simple and graceful designs, as well as that of the lamp housing or fixtures, were chosen through co-operation with a committee of the Milwaukee Chapter of the American Institute of Architects. Fully 72 per cent of all the lighting units throughout the city will be mounted on these ornamental posts.

All bracket and harp posts are made of reinforced concrete, this material being chosen chiefly on account of its strength and extremely low maintenance. Twelve of the posts are of cruciform section supplied by the Chicago Concrete Post Company, Chicago. The other posts are of tubular section and supplied by the Universal Concrete Products Company, Milwaukee. These latter posts are molded in horizontal position in one piece, even in the case of the longest posts, by a special centrifugal process that is said to insure a very strong and homogeneous tubular structure. Tests of the posts have shown them to possess abundant strength for the most severe requirements. None of the 45-foot posts has as yet been made, but they will probably be constructed in the same manner.

In the case of what is called the 30-foot post, the lamp is supported 30 feet above street surface, the post itself extending three feet above this point. The outside diameter just below the bracket is 7 inches and the diameter directly above the base is 13 inches; 8 steel reinforcing rods are spaced symmetrically around the two-inch pipe core, which forms a central wireway. Integral with the post is a base or butt extension 6 feet long, making the entire post 39 feet long. After the posts are set and cured, they are ready for erection. The foundation for the post is dug 6 feet deep and in this is poured a concrete hollow socket for the post. After this has properly set the post is brought to the site, lifted by means of an A frame and lowered with its butt into the concrete socket; cement grout is used to seal the joint around the base. The entire handling and erection of the post is much like that of iron trolley poles. No special difficulty was met in this work. A hole left in the side of the butt and a corresponding hole in the socket gives access to the center pipe for wiring.

The general construction and erection of the 22.5 and 15-foot posts is similar, as far as the shaft portion is concerned, to that just described. The brackets for the higher posts are also made of concrete and are mounted on top of the extended central pipe after the post has firmly set in place. A view of one of the 22.5-foot posts just before the bracket was put on is shown in Fig. 6. The 15-foot post has an ornamental harp casting for holding the lamp fixture.

Fig. 6.—A 22.5-Foot Concrete Post Ready for Mounting of Bracket.

At street crossings where lamps are suspended across the intersection, as on most residence streets and on some streets in a transitory state, tubular steel poles are now used, as shown in Fig. 5. It is possible that reinforced-concrete poles may be used for this purpose also in the extension of the system throughout the city. The lamp is permanently suspended from a steel messenger wire over the middle of the crossing; the lead-covered duplex supply cable passes up one post and is supported directly below the messenger by means of special cable clips, these also keeping the cable tightly stretched.

These lamps, like all others in the new system, are reached for cleaning and renewal by means of a tower wagon. By eliminating the lamp-lowering gear and by the use of slim, smooth poles, a neat and unobtrusive method of suspension is obtained, which is in striking contrast to the old type of suspension formerly used. Fig. 5 shows this, both the new and old lamps being in place.

Further details of this installation, together with cost data, will be published in the next issue.

(To be continued.)

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Electricity in By-Product Coke Manufacture

A Description of the Manufacture of Illuminating Gas and Methods for the Utilization of Waste Gases for Generating Electricity for Use in the Manufacture of By-Product Coke

Industrial Power Series—Article No. 159.

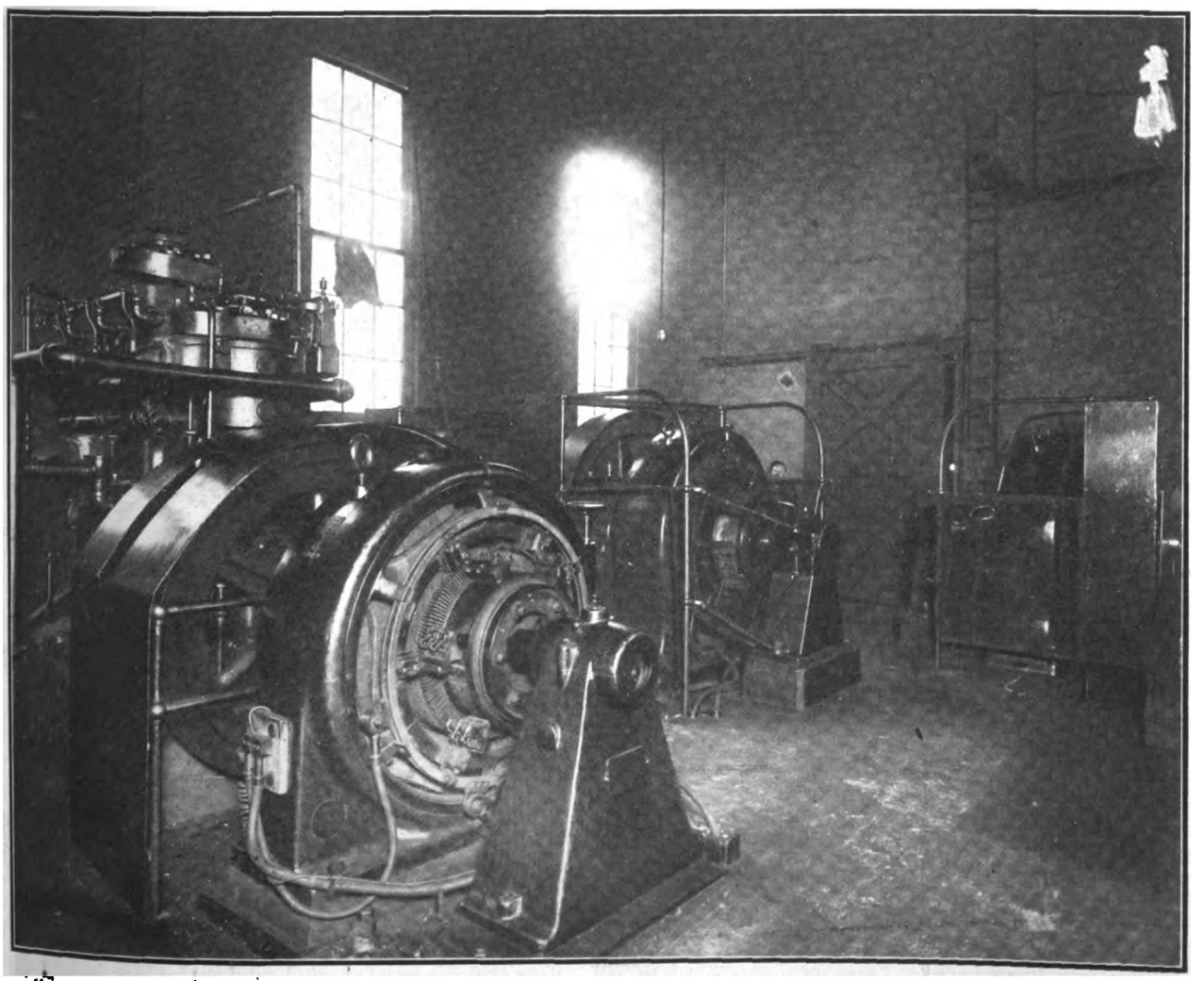
With the march of progress in the inauguration of new industries and with the developments in existing industries the field of endeavor of the operating and commercial engineer is broadening to such an extent that a superficial knowledge, at least, of manufacturing processes is demanded. Although there are few industries where the central-station service does not show a decided advantage over private plants, there are certain industries in which there are emitted from the processes large amounts of waste heat which can be used to economical advantage for the generation of electrical energy for use in connection with electric drive. Among such industries may be mentioned illuminating-gas plants and by-product coke plants, which are closely allied, where the waste heat from the ovens and the surplus gas from the retorts can be converted into useful work.

This article illustrates and describes the power equipment and some of the auxiliary apparatus of the by-product coke plant of the Semet-Solvay Company at Geneva, N. Y. This installation consists of two power plants, one steam and one gas, the former utilizing the waste heat from the coke ovens and the latter surplus gas from the retorts. It may be said, therefore, that the entire power requirements are furnished from waste products.

About 30 per cent of the output of coke in this country is made in by-product ovens, its chief use being for metallurgical and domestic purposes. The remaining principal product of commercial value from by-product ovens is illuminating gas. The latter product from this installation is marketed by the Empire Gas & Electric Company in towns and cities of Central New York.

The Manufacture of Illuminating Gas.

Before taking up the details of the Semet-Solvay plant a brief description will be given of the manufacture of illuminating gas and some of the advantages of electric drive for such establishments. Bituminous coal is the material from which the products of this industry are derived. Although one of the most important chemical industries of today, its inception dates but little before the beginning of the nineteenth century. From that time the manufacture and use of illuminating gas from soft coal has extended and expanded until it has reached its present enormous development.



Group of Gas-Engine Driven Generators.

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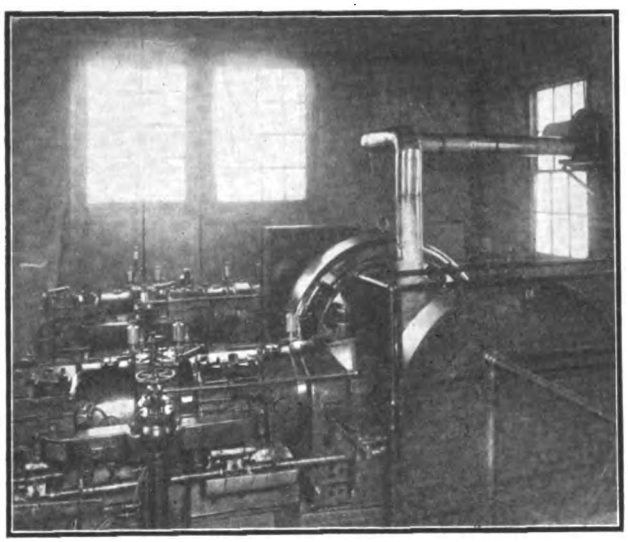
The general principle of the manufacturer is exceedingly simple. Its commercial growth, however, has been assisted by the invention and application of a multitude of delicate and ingenious appliances. Gas is made in several types of furnaces, but all have the same principle. The



Large Generating Unit.

coal is placed in retorts of clay or steel and subjected to high temperature from a coal furnace or from gas flames. Suitable pipes are attached to the retorts to carry the gas to those other portions of the works which serve to perform upon the crude gases certain purifications such as the condensation of the condensable vapors and the removal of objectionable gases.

The operations spoken of show that the gas must be carried from one portion of the establishment to another. Illuminating gas is made up of material substances and although lighter than air, distinctly possesses weight. Gas will not move itself and mechanical appliances must be resorted to for the movement from one place to another. This is accomplished by an exhauster which consists essentially of two impellers geared together and revolving in an interlocking manner with the driving shaft connected to one impeller only. In characteristics and power requirements the exhauster is not dissimilar to a centrifugal pump and is well adapted to motor drive. On account of the inflammable nature of the gases handled by exhausters, induction motors lend themselves to this class of work, as any material sparking from a direct-current motor would be liable to ignite escaping gases. If the exhauster were not used there would be a constant tendency to the creation of pressure in the retorts.

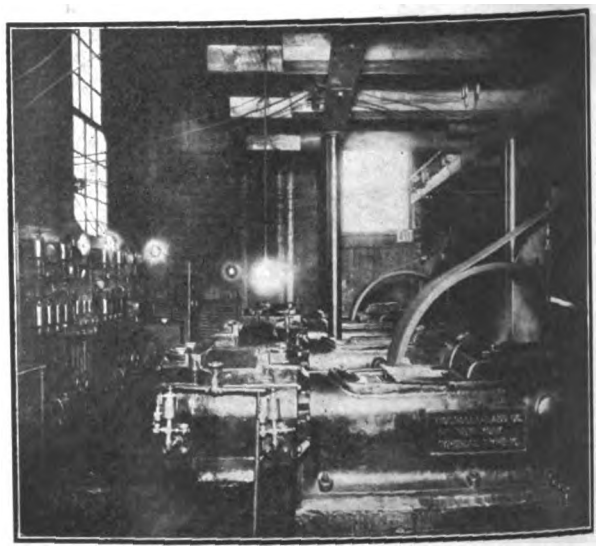
The essential parts of a gas works include furnaces; retorts in which the coal is heated; the hydraulic main; a trough in which the gas is cooled, and which also serves as a gate through which the gas can pass forward toward the purifiers, but not backward toward the retorts; condensers, in which the gas is cooled and some of its vapors are condensed to tarry liquids; scrubber, in which the gas is cleansed by a spray of water; purifiers, where sulphuretted hydrogen, and some other objectionable gases are removed; the gas holder, in which the finished gas is stored.

For the first operation a suitable quantity of soft coal is placed in the retorts and streams out of the openings. The openings are then quickly closed and the gas passes up the dip-pipe into the hydraulic main, bubbling up from this pipe through the water. Once delivered in the hydraulic main, the gas cannot go back to the retort. The gas next passes through the condensers, which consist of a series of pipes. The condenser cools the gas so that it deposits tarry liquids which have been suspended in the form of vapor until this stage. The gas next flows to a scrubber which may be built in a number of styles. Its essential office is to wash the gas and it does so by the use of water, which is applied to the gas in sprays or in thin films. Ammonia gas is the principal substance absorbed by the water in the scrubber and the liquid thus produced is the principal source of ammonia and its compounds. The gas next goes to purifiers containing dry quicklime which absorbs sulphuretted hydrogen and some other acid gases. From the purifiers the gas passes to the holder.

Equipment of Semet-Solvay Plant.

At the Semet-Solvay plant there are 46 coke ovens and the coke chambers or retorts are approximately 35 feet by 7.5 feet by 16.5 inches. There are five flues built in the walls of the horizontal ovens. The gas returned from the condensing house is burned in four burners and mixes with preheated air from beneath the ovens. The path of the gases is from the top flue downward through the remaining flues passing the fresh gas burning at each burner. The gases pass into a single flue beneath each coking chamber, which are provided with thin walls, thence to an underground flue to the boilers in a separate building. From seven to nine tons of coal can be coked in each oven every 24 hours. After completion of coking process the charge is removed by an electrically operated pusher or ram, which pushes the whole charge out of the opposite side through doors in the ends of the retorts which are closed and luted with fire clay during the coking process. The coke is then rapidly cooled by a stream of water.

The waste-gas flue extends into the boiler house beneath the floor surface and in front of three of the boilers. There is a fourth boiler which is hand-fired for use during the time of peak loads. The waste-heat boilers comprise two Abendroth & Root water-tube units, rebuilt by Babcock & Wilcox, each rated at 250 horsepower, and an Altman & Taylor water-tube boiler of the same rating equipped with 162 18-foot tubes. The hand-fired boiler is rated at 130 horsepower and is of the fire-tube type. The normal path of the waste gases is from the waste-gas flue to the fire boxes, through the boilers and breeching, and thence to the stack. The temperature of the flue gases ranges from 500 to 700 degrees Fahrenheit. There is a by-pass connecting the waste-gas flue directly with the stack. Each



Gas Compressors Driven by Electric Motors.

waste heat unit and the by-pass to the stack can be shut off by means of water-cooled dampers which are lowered in place by means of a hand-operated crane. The dampers consist of steel plates approximately seven feet square, with pipe coils between them. The coils are connected to a source of water supply and to a sewer connection by means of flexible-hose couplings. When the boilers are

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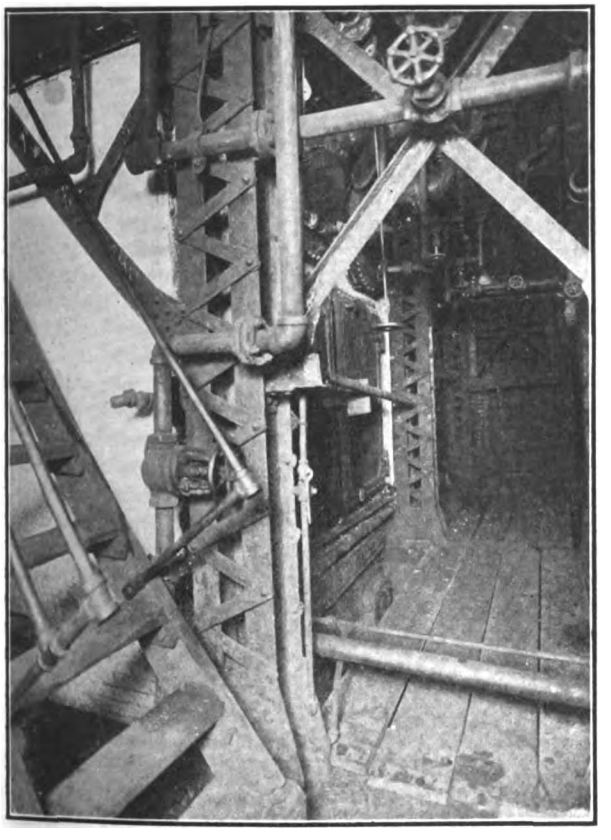
not in use all of the gases pass through the by-pass to the stack, or when there is a surplus of heated gases the by-pass can be used to convey a portion of the gases through the stack to the atmosphere. The boiler feed pumps, the feed-water heaters and the water purifiers are located in a separate building where are also located the steam-driven exhausters and some of the other necessary auxiliary apparatus.

To purify the gas for use in the gas-engine generating plant there are several auxiliaries, including the primary and secondary condensers, tar extractor, scrubbers, washer and purifier. The gas from the ovens passes from the retorts to a common main and thence to the first condenser and so on through the various devices. The exhausters operate to maintain a constant pressure in the retorts and to furnish the necessary pressure to overcome the resistance of the purifying apparatus and to force the gas into the holder. The exhausters are driven by steam engines which utilize steam derived from the waste-heat boiler equipment.



View of Waste-Heat Boilers.

Electrical Equipment.

The gas-engine generating plant carries the lighting load and furnishes energy for a large number of motors. The electrically driven rams for discharging the retorts are two in number and operate on trucks which run on a track extending the length of the tier of ovens. They are operated by series-wound motors. In addition there are motors for operating miscellaneous pumps, crushers, car hoists, etc.

The gas-engine plant is located in a one-story concrete building where are also located the compressors for furnishing pressure to the gas. The engine room proper is divided into two sections. One part is on the ground level and contains a two-unit Alberger tandem gas engine, each unit consisting of a size-17 engine operating at 215 revolutions per minute. Mounted on the common shaft there is a Crocker-Wheeler 200-kilowatt, 250-volt, 800-ampere, direct-current generator. In the second part of the engine room, which is elevated several feet above the first, there are three generating units, a Westinghouse, 11-by-12-inch, vertical, three-cylinder gas engine direct-connected to an engine-type 75-kilowatt, 250-volt, 300-ampere, direct-current generator, operating at 365 revolutions per minute, and two Buffalo, size-17, tandem gas engines, each driving an engine-type 100-kilowatt, 250-volt, direct-current generator, operating at 215 revolutions per minute. There is a marble panel switchboard, with the necessary generator and feeder switches and instruments.

For forcing the gas sold commercially under the proper pressure, there is an equipment of two 14-by-12-inch Ingersoll-Rand compressors belt driven by two Westinghouse 50-horsepower direct-current motors. The motors are located on a platform above the compressors and are belted to a countershaft which in turn drives the compressors. The motors are variable speed, one rated at from 350 to 1,000 revolutions per minute, and the other from 500 to 1,000 revolutions per minute. The motors are started by automatic switches and the speed is varied by motor-operated field rheostats. The scheme of the motor connections is as follows: In starting, the solenoids of the automatic switches are operated from an auxiliary circuit by closing the main switch. First one solenoid draws up the core, closing the motor circuit through a resistance, at the same time energizing the second solenoid, whose contacts cut out one section of the starting resistance, and so on, until the motor has accelerated to normal speed. The speed is varied to change the pressure of the gas in the compressors by the motor-operated field rheostats.

In addition to the compressors in this room there is an 800-gallon-per-minute Goulds triplex pump belted to a 50-horsepower motor. The gas is metered by a Venturi meter which has the advantage of occupying much less room than most other types.

Third National Safety Exposition to be Held in New York, May 22-27.

Preparations are nearly complete for the opening of the third National Exposition of Safety and Sanitation in New York City in May. This promises to be the largest safety exposition ever held as well as the most comprehensive single effort to bring together under one roof the thousand and one things that make for greater safety in industry, the street, the home and in the daily life of every one. It will be held under the auspices of The American Museum of Safety and will open its doors on May 22 running through May 27.

"The Safety Exposition has become a permanent institution in our country," says President Arthur Williams, of The American Museum of Safety. "The splendid results shown by the previous Safety Expositions have demonstrated that a much greater interest in safety and sanitation was aroused. It is a lasting incentive to safety endeavors. Under the stress of competition offered by the Exposition, improvements are sought and put into practice, inventions made, new methods devised, greater care taken and new standards set. After all, preparedness in America should begin in our industries; keeping our workingmen fit and whole and sound, the men who will have to do the defending when the time for defense comes, is of the greatest importance. Half a million is a conservative estimate of the workers maimed in American industries every year. These half million cripples would otherwise constitute a formidable army. At the coming Safety Exposition there will be something of vital interest for everyone from the president of an industry to the man who wears overalls, from the housewife to the woman who works in the store, factory or office, and from the college student to the child in grammar school."

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Alternating-Current Submarine Telegraphy

Details of an Important Advance in Submarine Telegraphic Communication with Uninterruped Alternating Current As Developed by Col. George O. Squier

In a paper presented to The Physical Society of London last year, George O. Squier, United States military attache at London, analyzed the conditions to be met in submarine telegraphy and described apparatus for operating on the principles proposed. Experiments had been conducted for two years to determine the practical application of a sine wave in cable signaling.

If an engineer were required to design a system for operating an electric motor through an Atlantic cable, no form of generator could be proposed at present other than a single-phase alternating current of the sine-wave type. This form will deliver power at the receiving end of the cable more efficiently than any other shape of wave. During the operation of such a motor, the generator would be allowed to run smoothly and regularly, and the generator circuit would never be metallically opened or closed during operation. The opening and closing of an alternating-current circuit is well known to produce disturbances of a more or less pronounced character, depending upon the angle of phase at which the current is opened or closed.

Since improvement of the duplex-bridge balance is really at present a most important desideratum, experiments were made using the Muirhead artificial cable to compare the present forms of battery transmitters with various modifications of the sine wave of electromotive force.

In the last analysis it was always the opening and closing of the transmitter circuit which produced the final kick or "jar" in the balance. This is not surprising when we remember that, from an electrical standpoint, few things can be done to a circuit more severe than suddenly to introduce an infinite resistance into it.

It was only after many variations of the simple alternating current had been tried in the course of experiments to perfect the duplex-balance of the bridge that the fundamental principle of never breaking the transmitter circuit became impressed.

Continuing the analogy of the power plant, it may be remarked that practically every form of cable recorder, amplifier or relay is essentially an alternating-current motor. Its field magnet, armature coil, and the counter electromotive force of damping are subject to the same laws as in the motor for power purposes.

Let us assume, therefore, as a starting point, the standard type of circuit for operating a cable simply as a power plant as the ideal solution of the problem, and then determine by experiment how near this solution may be retained in practice for the purpose of transmitting cable signals according to the present alphabet. In this plan it will be the continued experimental purpose to determine the minimum possible variations in such a system to enable the alternating current received to be interpreted into dots, dashes and spaces.

A siphon recorder placed in the receiving end of such a cable plant would trace on the recording slip an uninterrupted sine wave of current which may be considered as the theoretically perfect form of siphon record always to be aimed at, although never to be actually attained in practical telegraphy.

In Fig. 1, D represents a single-phase alternating-current dynamo, R and R′ are resistances and M′ is a motor to be operated.

Since a circuit comprising an ocean cable is largely overloaded with capacity, and already includes a large ohmic resistance, it will be in the direction of increasing the resultant harmonic current flowing in such a circuit, to insert in the sending end of the cable a variable inductance, L_1 For symmetry, L′ is a variable inductance similar to L_1.

T and T′ are iron-cored transformers or auto-transformers, the coils of which are of low resistance, and connected directly to the earth at E and E′.

The circuits in Fig. 1 are closed circuits throughout.

For duplex working Fig. 1 becomes Fig. 2, in which L_1, L_2, L_3, L_4 are the inductance arms of the bridge, and the motors M and M′ are inserted in the usual manner for cable working; Al and Al′ are the artificial lines.

It now remains to inquire as to what modifications must be made in the typical duplex power circuit in Fig. 2 to enable the motor recorders to indicate the elements of the cable alphabet. These elements are three in number, and only three—the dot, the dash and the space—and each of them is equally important in interpreting the record, and for this reason they will each be considered in the general sense as signal units, rather than the usual way of regarding only the dots and dashes as the signals, and not the spaces.

Careful experiments on an Atlantic cable confirm the theory of the subject—that, no matter what the shape of the alternating current transmitted, approximate sine waves are received at the distant end of the cable. Battery reversals produce just as accurate sine-wave signals on the receiving record as does the alternator itself. In other words, it is the fundamental term of the Fourier analysis which is alone concerned in making the record at the receiving end of the cable.

Since, therefore, both theory and experiment show that a sine form of wave is the only one which can pass through the cable without changing its characteristic shape, it should be an advantage so to alter the typical power circuit in Fig. 2 as to preserve the sine characteristic as far as possible.

This can be done in a simple manner by operating upon the primary circuit of the transmitter containing the generator, to alter the impedance of the circuit in synchronism with the generator itself. The problem is the more simple from the practical standpoint, because we are dealing with frequencies from about 4 to 10 cycles per second, and, therefore, it is easy to operate with great accuracy on this primary current at any angle of phase. If the change of impedance of the primary circuit always takes place at the instants when the current flowing in the circuit is naturally zero, the fundamental frequency of the current will not be changed, and the sine characteristic of the wave will be very approximately maintained. Varying the impedance of the primary circuit will change the amplitude of the individual alternations of the current.

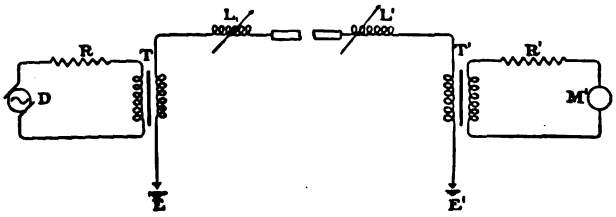

Fig. 1.—Simplex Circuit for Ocean Cable Considered as a Power Line.

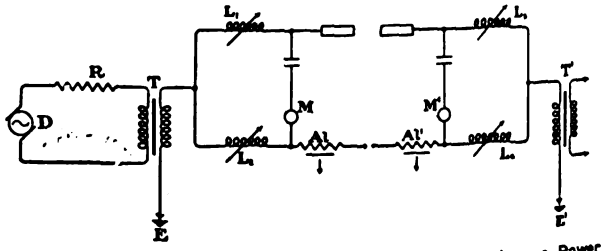

Fig. 2.—Duplex Circuit for Ocean Cable Considered as a Power Line.

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Another way of stating the effect is that the voltage between the end of the cable and the earth is made to vary by this process, to indicate the three elements of the cable alphabet. It should be noted that this plan transmits alternating current for the spaces between letters and words with exactly the same regularity and integrity as for the signals themselves.

Dots, dashes and spaces are each transmitted by impulses of either sign, differing from each other only in amplitude.

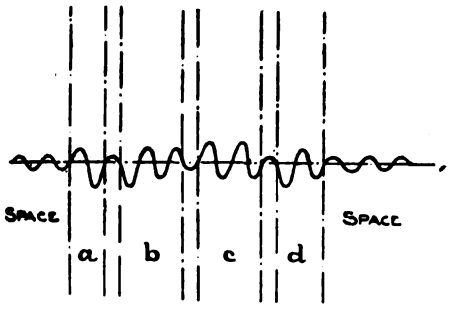

Fig. 3.—Current Waves for Transmitting the Letters a, b, c and d by Alternating Current.

Fig. 3 shows diagrammatically the form of current waves transmitted for the letters *a, b, c,* and *d,* with the accompanying spaces required.

Although an alternating current operated upon as above outlined could be read directly from a standard siphon record, yet it would be considered an advantage if the final received record could be printed in Morse characters on the usual receiver slip. To accomplish this it will be necessary to provide an apparatus which operates solely by the amplitude of the current waves received, and not by their sign. Furthermore, since the impulses transmitted and received for the spaces are not required on the printed slip, the apparatus should be capable of sorting out and omitting these parts of the record automatically.

Description of Circuits Used.

Fig. 4 shows diagrammatically one form of circuit arrangement based on the above principles for transmitting and receiving messages. The usual transmitting condensers are shown in the arms of the duplex bridge, instead of the inductances L_1, L_2, L_3, L_4. The ordinary transmitting tape is caused to move synchronously with the generator by being geared directly to its armature shaft. The perforations in the tape are of such a size that the tape advances a distance corresponding to one semi-cycle of the alternator for each individual perforation.

Since in a circuit comprising an ocean cable on which is impressed an alternating electromotive force the current leads the electromotive force by an angle, which in an infinite cable is constant at 45°, it is necessary to provide in the transmitter mechanism for moving the tape carriage longitudinally relative to the perforations in the tape. A micrometer screw is provided for this purpose, and by its use the current can be operated upon accurately at any angle of its phase, and in practice it is so adjusted that the impedance of the primary circuit will be changed at the instants of zero phase of the current. Since also the angle by which the current leads the electromotive force is dependent upon the resistance of the primary circuit, there is provided in addition an adjustment of the transmitter for the very slight difference of phase for the dot-and-dash conditions, so that in effect all operations on the primary current, whether for a dot, dash or space, are adjusted to take place at the zero point of current.

The general operation of the transmitter mechanism is as follows. When no holes are perforated in the tape *t*, the whole resistance R is in the primary circuit and an alternating current is transmitted, which corresponds to spaces between letters and words; when a perforation in the tape is on the dot side, part of this resistance R is short-circuited, and when a dash perforation occurs, all of this resistance is short-circuited. The relative values of these resistances being adjustable, the amplitudes of the individual alternations are under complete control by the ordinary transmitting tape.

In the figure is shown diagrammatically the arrangement for causing a dash impulse to be sent by the transmitter by short-circuiting the whole of the resistance R for a time corresponding to one semi-cycle of the alternator. *r* is an ordinary relay; *k* is an electromagnet which operates at the end of each signal or group of signals. The line *l* leads to an exactly similar arrangement which is provided for the dot impulse by which a certain proportion of the resistance R is short-circuited. In practice these two arrangements are side by side, and in the figure the dot arrangement would be immediately behind the one shown for the dash.

The tape carriage can be moved longitudinally by a micrometer screw which is not shown in the figure, and has an adjustment over a range of a complete semi-cycle. The contacts *s* and *s'*, and similar ones for the dot mechanism, are adjustable by slow-motion screws, so that the instants of contact for a dot and for a dash have an adjustment relatively to each other.

A convenient method of observing the wave-form produced by the transmitter, and for making the above adjustments, is to include an ordinary siphon recorder in the transmitter circuit, or, better, in the cable itself at the transmitting end, by connecting it at the terminals of a very low resistance in the circuit. At the very low frequencies involved, the siphon recorder becomes a most useful and accurate current curve-tracer, and enables the experimenter to observe exactly the shape of wave being transmitted into the cable for any adjustment of the transmitter. Once these adjustments are made for any particular cable they remain unchanged.

Form of Receiving Circuits.

One practical arrangement for receiving the signals on a Morse printer is shown diagrammatically in the upper part of Fig. 4. F is an adaptation of the well known Muirhead gold-wire cable relay, in which f^1 is the gold wire which oscillates between the platinum contact posts f^2f^2, about a fixed point at F. A second pair of posts f^3f^3 is provided, and each of these pairs has an adjustment for altering their distance apart, and also for moving them longitudinally along the gold wire, and relatively to each other. Instead of being separate contacts, as in the usual case with this relay, each of the pairs are electrically connected as shown. F' is a local wire relay of similar principle, and *f'* is its moving part which in its oscillations makes contact with the posts f^4f^4 adjustable as above; *h* and *h'* are electromagnets for operating the dot and dash arms of the

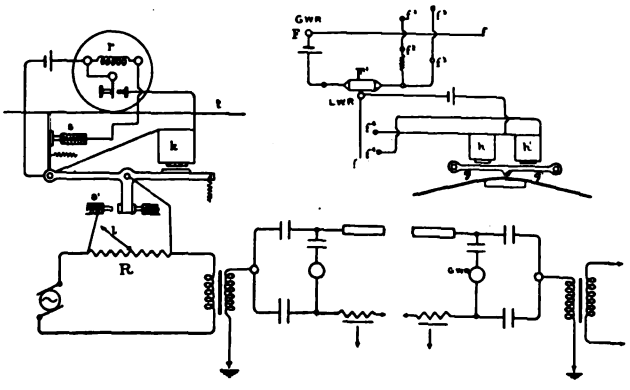

Fig. 4.—One Form of Duplex Circuit Arrangement for Transmitting and Receiving Messages by Alternating Current.

printer; *g* and *g'* are two arms pivoted at their outer ends, adapted to make a siphon record at their free ends in the center upon the moving tape shown beneath. The arm *g'* is forked to record two ink marks on the tape symmetrically on either side of the central mark made by the arm *g*, and in line with it across the tape, so that both arms can make a record simultaneously on the tape for a dash.

The incoming alternating current thus causes the gold wire *f*

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to oscillate back and forth with different amplitudes depending upon whether dots, dashes or spaces are being received, and the posts f^2f^2 are adjusted so that the space amplitude just does *not* make contact, but does make contact for a dot amplitude of either sign. In like manner the posts f^3f^3 are adjusted so as just *not* to record a dot impulse, but to make contact for the larger amplitude of a dash of either sign. It is seen that both a dot and a dash contact are made whenever a dash ampltitude is received. The flexible gold wire f in its motions about F first strikes the posts f^2f^2, and there is a bending or wrapping effect produced in the wire, which for the stronger dash impulses causes contacts with f^3f^3 also. The relay F' operates similarly through a moving arm, making contact with the posts f^4f^4 separately or both together, depending upon the amplitude of its swing.

The printer itself becomes an apparatus of marked simplicity, and is nothing more than two small siphons adapted to mark on the slip in the usual manner. Fig. 5 shows the record produced.

In practice, all adjustments are so made as to provide for transmitting for the spaces as large an amplitude as possible instead of as small an amplitude as possible, in order to approximate more nearly to the ideal electrical conditions for transmission through the cable itself.

In case a cable magnifier such as the Heurtley instrument is used instead of a gold-wire relay, it would be inserted in Fig. 4 in the recorder arm of the bridge, and operate a local wire relay and printer instead of the usual recorder. Since the relay operates on difference of amplitude of the waves, and not on their absolute value, a cable magnifier would serve to exalt the value of this difference and furnish a greater margin for practical working.

Resolving Power or Definition.

The ideal alphabet to employ in cable signalling would be one in which other things being equal, each letter had the same limit of legibility; because if this is not so, the speed of signalling is lowered to meet the legibility of certain letters only. In present cable practice, what may be called the "resolving power," or the definition, is not equal throughout the letters of the alphabet.

Letters like *a* or *n*, for instance, may be considered as perfect letters, and whether sent by one complete cycle of electromotive force of a dynamo, or by two square-topped waves of equal area and opposite sign separated by a time interval, produce on the siphon record approximate sine waves. On the other hand, letters like *s* or *h*, where three or four square-topped waves of the same sign are sent into the cable consecutively, the received record at high speed fails to resolve these separate impulses, and the siphon record becomes a more or less con-

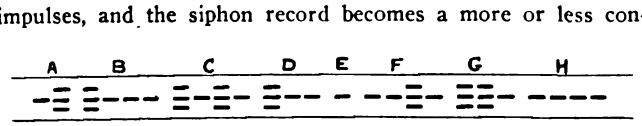

Fig. 5.—Reproduction of Record.

tinuous hump of large amplitude, which the expert operator learns to read without being able to detect the individual impulses; in fact, some practical operators seem to prefer these letters to what are known as "cross-letters" such as *a* and *n*.

Careful experiments have been conducted through long cables, which prove, however, that the so-called cross-letters have a superior legibility, which obviously should be the case from theoretical considerations only.

We may consider the siphon record of an uninterrupted alternating current as possessing 100-per-cent definition, independent of the frequency, the voltage employed, or the particular cable used, and regard it as the standard of definition for all signals. Indeed, such a record is, in fact, a message composed of a series of the letter *a* joined together without spaces between.

In present practice it is found necessary to insert a receiving condenser in series with the recorder coil, or an inductive shunt around the coil, for the purpose of improving the definition of certain letters of the alphabet, such as *s* and *h*, as well as to eliminate from the record the effects of earth currents of very low frequency induced in the cable.

Electrical Stress Upon the Cable.

Submarine cables are at present operated by primary batteries giving an open-circuit voltage of from 50 to 80. The main reason for this is, of course, the constant fear of subjecting the cable itself to undue electrical strain, particularly in the deep-sea portion, where repair is difficult and expensive. This is not the only reason, however, although it is the principal one.

The present form of battery transmitter impresses upon the cable square-topped waves, which may be analyzed by Fourier's method, and in the hands of Malcolm and a few others the wave-form has been worked out and predicted as the wave passed through the cable to the receiving end. Since we know that it is only the fundamental term of the Fourier analysis which produces an appreciable effect at the receiving end, all of the harmonic waves which are required to build up the square-topped form of wave are impressed upon the cable at the transmitting end, and are absorbed in the cable itself, and never reach the receiving end. These, therefore, represent superfluous electrical charge impressed upon the cable, and this charge for each signal must be got rid of before the succeeding signal can be sent into the cable.

It is, therefore, probable that a practical limit would soon be reached in the present form of transmitter, where the magnitude of this extra charge sent into the cable would become so great that there would be little advantage in further increasing the electromotive force.

The Cable Dynamo.

The alternator has been designed for the particular purpose of operating a cable, and possesses some novel features. Since we cannot reduce the number of poles to less than two, we must rely on a high magnetomotive force, and a minimum clearance for the armature to produce, at such low frequencies, the voltage required.

In addition, it is especially desirable to generate an accurate sine wave of electromotive force. These objects have been satisfactorily obtained in the design of the machine used in these experiments.

The resistance of each of the field coils is nearly 1,000 ohms, and the inductance of the armature largely controls the current in the armature circuit, so that the machine can be short-circuited at full voltage without harm.

In starting and stopping the dynamo no form of switch is used, but, instead, the motor which operates the dynamo, starting from rest, gradually builds up the electromotive force from zero, which gradually dies down to zero at stopping. In this manner there is never any possibility of a "break" in any metallic circuit connected with the transmitting apparatus.

Since the dynamo transmitter comprises the power plant for an ocean cable, it must, therefore, take its place on the instrument table, where the transmitter is directly geared to it. The armature is mounted on ball bearings, and runs with remarkable silence and smoothness under load.

It has been truly said that "we begin to understand a phenomenon when we can measure it."

It is seen that once we can employ a system of signalling in which we are dealing with one fundamental frequency only, and the circuit is never broken, the process of measuring the constants of the cable itself and the most suitable bridge arrangements for high efficiency are greatly simplified.

The removal of any form of arc or spark from the cable circuit has been shown to very materially increase the accuracy of balancing the duplex bridge, while the smooth type of waves employed in sending the signals has enabled this important object to be attained with an accuracy greater than has been possible before.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Street Lighting Contract on Kilowatt-Hour Basis for Spencer, Mass.

The town of Spencer, Mass., recently entered into a three-year contract with the Spencer Gas Company for the electric lighting of its streets on a schedule of prices which is somewhat of an innovation in central-station practice, that of a flat rate per kilowatt-hour, with a guaranteed minimum consumption per unit. The company supplies 220 60-candlepower (47 watt) and 50 80-candlepower (60 watt) type C street series lamps, the fixtures furnished by the company and the lamps, after the initial installation, by the town.

The rate paid is 14 cents per kilowatt-hour for the following number of kilowatt-hours as the monthly minimum consumption:

	Minimum Kilowatt-hours per Fixture.
January	13.0
February	11.5
March	9.0
April	7.5
May	7.0
June	6.0
July	6.0
August	7.0
September	7.5
October	9.0
November	11.5
December	13.0
Total for the year	108.0

For electricity consumed during the month in excess of the above schedule, the town pays 6 cents per kilowatt-hour.

The plan was adopted as the result of a study and report by William Plattner, consulting engineer, Boston. It was pointed out that if the town desires to increase its lighting hours or the capacity of its lamps, it is able to do so without entering into a new contract.

Bessemer, Mich., and Garner, Iowa, have street lighting contracts on the kilowatt-hour price basis, both of which are reported to be satisfactory to both the municipality and the company.

The total annual cost of street lighting at Spencer, 2,800 hours per year, is $5,260.68, made up from Mr. Plattner's estimate as follows:

220 60-candlepower lamps @ 47 watts	28,840	
50 80-candlepower lamps @ 60 watts	8,400	
15 per cent line loss, leakage, etc	5,586	
	42,826 or	
29,160 kilowatt-hours @ 14 cents	$4,082.40	
13,666 kilowatt-hours @ 6 cents	819.96	
Total cost of electricity		$4,902.36
Estimated cost of lamps plus 10 per cent for breakage and handling		358.32
Total		$5,260.68

For 3,400 hours per year the cost will be as follows:

220 60-candlepower units	35,020	
50 80-candlepower units	10,200	
15 per cent line loss, etc	6,783	
	52,003 or	
29,160 kilowatt-hours @ 14 cents	$4,082.40	
22,843 kilowatt-hours @ 6 cents	1,370.58	
Total cost of electricity		$5,452.98
Cost of lamps plus 10 per cent		577.76
		$6,030.74

VALUE OF RESIDENTIAL BUSINESS TO THE CENTRAL STATION SHOWN.

Density of Small-Customer Business Fosters Good Will Between Company and Public.

The experiences of the Sandusky (O.) Gas & Electric Company in regard to small-residence business were outlined at the recent new-business convention at Springfield, O., in a paper by G. A. Lowther, from which the following data are taken. In considering the value of residential business to the central-station company, three main classifications are suggested: (1) The value for revenue; (2) The educational value; and (3) The value from the investor's standpoint.

The value of revenue consists of the value in dollars and cents. This varies very considerably in different locations and the individual revenue from each residence may seem small, but the total sum will be quite respectable. The residence revenue depends a great deal on the way the customer is started. If you can introduce heating devices when the residence is first connected, it will produce good revenue from the start. It is easier to do this than to try and build up the load later.

Many central stations have an idea that the only residences worth going after are the large ones in the best section of the city, but this is a mistake. Many of the smaller residences produce good revenue, and they are worth going after. Last year, the Sandusky Gas & Electric Company connected up a number of small cottages (mostly five and six rooms). The cost of wiring them was only a trifle over $30 each, and in most cases, this included fixtures and lamps.

When the company started to go after this business, the wiremen made sarcastic remarks about holding the shacks together with their wires—the linemen evidently thought it was waste of time and material to run services, and the metermen felt certain that they would not need to read the meters because they would never use more than the minimum (50 cents per month). A recent check of 100 of these cottages disclosed the fact that they were using an average of more than 16 kilowatt-hours each per month, and many were consuming more than 25 kilowatt-hours per month, some more than 30 kilowatt-hours per month.

These results are attributed to the fact that an electric iron was included with every wiring contract, so that they got started off all right.

In the case of residences which have been connected up for some time, it is very necessary to use means to build up the load, especially as the lighting load is constantly becoming less important. It is surprising how many such ways there are in which the residence load may be increased, in addition to the ordinary heating devices, vacuumn cleaners and other machines which are dependent on the use of small motors. There is the electric range and fireless cooker, which is making great headway, and the electric incubator for hatching chickens, and the further use of electric current in the poultry business. There are a large number of people in every community who have small poultry farms in their back yards, and it has been proved that the use of electric light in the chicken house on dark mornings greatly stimulates the production of eggs. One case recently reported from a Western state, claims an increase of 40 per cent.

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Another point which must be remembered in considering the cash value of the residential business, is the fact that every new consumer means a new customer of electrical merchandise, appliances, lamps, etc., if the company handles such merchandise and sells it at a profit, it means a further source from such sales. If the company does not handle electrical merchandise it still means helping the local contractor or dealer in electrical supplies, and this means helping the whole business from the manufacturer downwards.

The Educational Value.

When a new residence customer is connected, it means the electrical education of a whole family.

It may be that it starts the head of the family thinking of ways to use electric service in his business, or it may be that it starts other members of the family thinking, along electric lines, and it may lead to the introduction of electric service in places where they work, and it nearly always leads to further electrical development in the neighborhood or among the friends of the family.

Most important of all, the children are brought up to regard the service as a necessity and not as a luxury, so that when they have houses of their own, they will never be without electric service.

Also, if the central station has a large number of residence customers who are getting good service it will promote a feeling of good will towards the company, which is a most important asset for the company when it needs friends, because those who are not using electric service will appreciate the work of the company, and they will often go out of their way to boost its business.

The Value from the Investor's Point of View.

It is almost always true that the central station which has a large residential load finds that it is considerably easier to get money from bankers and investors in public utility securities than that the central station which can only show a large power load.

The inference is that the residence load sticks no matter what happens, whereas the power load is uncertain, being dependent on business conditions and liable to be lost at any time. The residence load in a small city is much easier to handle than the commercial lighting load, the residence load coming on gradually and staying on until a late hour, and then dropping off gradually, whereas the commercial lighting load serving the stores and offices in a small city comes on abruptly and drops off abruptly, owing to the fact that the stores close at 5:30. This means creating an undesirable peak and therefore an extra investment in plant equipment which is not profitable. Not only is it an undesirable peak but it is a winter peak—and in the summer time it disappears as a load entirely.

For all these reasons it will pay central stations especially in the smaller cities, to devote more attention to developing the residential load. It costs very little for extra equipment, the poles, lines and transformers are usually there; it means only running an extra service and setting a meter.

Increase in Battery-Exchange Service in Boston.

Eleven more electric trucks, operated by six different firms, have recently been added to the Boston Edison Company's battery exchange service, of which Charles H. Miles is in charge. Six of the trucks are of 3.5-ton capacity each, and are to be operated by a contractor in street sprinkling and flushing and oiling for the City of Boston. The tanks for these purposes are to be removable and dumping bodies substituted for the collection of city ashes during the winter, the vehicles thus serving a double purpose.

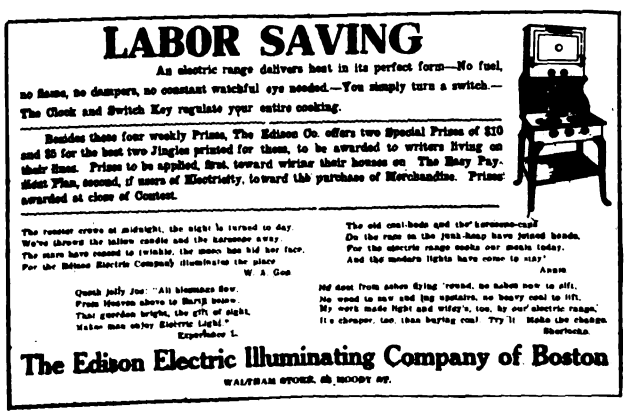
Other vehicles signed up for Edison service are four two-ton and one 1,000-pound wagons, which are owned by a metal-working concern, a spring water company, a Newton market-man, and a leading Boston coffee wholesaling house. The chassis are of General Vehicle Company manufacture, the batteries are the Exide Ironclad of the Electric Storage Battery Company of Philadelphia, and the charging, and in some cases the garaging, is provided by the Boston Edison Company at its Atlantic Avenue electric garage, the rates being based on mileage rather than on current furnished.

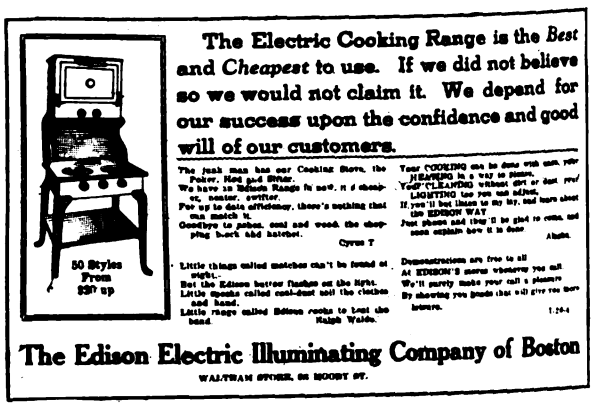
Northern States Power Service Extends to Two More Towns.

The Northern States Power Company has been granted franchises in the villages of West Concord and Pine Island, Minn., for electric service. A street-lighting contract has also been secured in the village of West Concord, which has a population of 800 and is situated about ten miles south of Kenyon, which is now served by the Faribault division of the Northern States Company. In addition 50 residence customers and about 50 horsepower in motors will be secured in this community. Pine Island has a population of 1,000, and is situated about seven miles from Zumbrota. Street-lighting revenue from this village will amount to $1,000 per year. Other business includes water pumping for the village water system and a considerable commercial and residential lighting load.

Returns from Central-Station Advertising in Waltham.

Advertisements of the Boston Edison Company occupy the central position in a special weekly advertising feature page of the Waltham (Mass.) *Evening News*. Each week the *News* awards $15 in prizes for the best rhymes in connection with each of the businesses utilizing advertising space, and the Edison company is favored with a liberal number of jingles which set forth the satisfaction its customers have found in Edison service. The electric range is a favorite theme for these rhymsters, but lighting, power, cleaning apparatus and other domestic uses come in for their share of laudation.





Two Advertisements Used with Success by Boston Edison Company in Range Campaign.

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ELECTRIC VEHICLES

A SAFETY DEVICE FOR ELECTRIC VEHICLES.

By H. E. Ackerly.

Despite the care exercised by trained drivers, the switch on an electric truck is occasionally thrown in while the controller

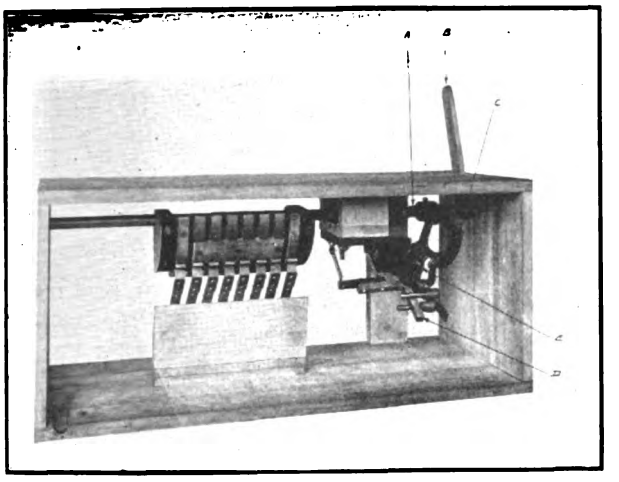

Fig. 1.—Main Switch Open and Pawl Disengaged.

is off the neutral point. This act has caused not only property damage, but frequently personal injuries and occasionally death.

The fact that this accident hazard existed led the Eastman Kodak Company, which operates a fleet of electric trucks, to develop a safety device to prevent such an accident. The mechanical engineering department of the Kodak company has just completed the installation of the device on its trucks. With this mechanism, the switch cannot be operated when the controller is off the neutral point. The device has not been patented, as the designers wished any one caring to do so to take advantage of it, either in building new trucks or in equipping those now in use.

The accompanying illustrations show one of the devices mounted in a box similar to a driver's seat in the rough. The photographs are taken from the front. The driver sits at the

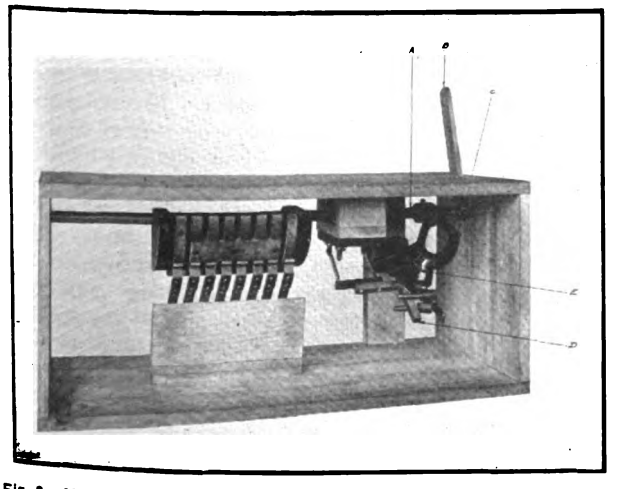

Fig. 2.—Main Switch Open, Switch Arm Partly Disengaged, Sector Not at Neutral Position.

left-hand side of the box, operating the control lever (B) shown in Fig. 1, with his left hand. The rheostat selector shaft (A), to which the controller lever (B) is attached, also carries a sector (C) which prevents the operator from engaging the switch except when the selector is at the neutral point. A lever (D) has been attached to the main switch from which the handle has been removed. This lever has a pawl (E). There is a slot in the sector (C) through which the pawl (E) on the lever actuating the switch must pass in order to close the switch. The sector (C) is so located that when the switch is closed, the rheostat selectors are all at the neutral point. As the pawl (E) is held forward by a pressure spring, the switch lever can disengage the switch at any position of the selector.

Electric Tractors in Lumber Mills Show Economy.

The Industrial Lumber Company has found that the three electric tractors they are now using have displaced 16 mules and 20 men, and are performing the same work with far greater efficiency. In addition they are affecting an unusualy large saving annually by the adoption of "electric mules." It is estimated that the total operating costs for 16 mules, including feed, shoeing, stable help, labor and repairs to tramways is approximately $22,890 per year. Operating expenses of the three tractors, including renewals of batteries (every year), renewals of tires(every year), renewals of chains, gears, etc., labor and repairs to tramways amount to $9,717. No current has been figured in the operating costs of the three tractors, as the amount used is not considered of any great consequence. Assuming that a mill were to buy current at four cents per kilowatt-hour the cost would not average $200 per tractor per year. The total cost per year of mule equipment, including the entire investment, fixed charges and operating costs, are $24,358. For the electric tractors the total costs are $11,115 per year. This shows a saving of $13,243 per year by using electric equipment.

The Electric Vehicle Association of America, which has for some time past been collecting data on the application of electric tractors in this field, has been informed that the Bodcaw Lumber Company, of Stamps, Ark., has recently given up animal haulage entirely for electric tractor equipment. This mill purchased three electrics about a year ago, displacing 15 mules and 15 drivers. They later found, however, that the same work could be done by two tractors, and they used the third tractor to haul finished lumber from the sheds to the cars, which had previously required 6 mules and 6 drivers. This makes a total of 21 mules and 21 drivers that are now being supplanted by the three electric tractors and three drivers and a helper. It is estimated that the expense for ownership, upkeep, depreciation, insurance and operation of one of these tractors when working a little less strenuously than the Bodcaw Mills work theirs, is approximately $6.00 per day or less, but crowded to its full capacity by performing the work of 7 mules, the cost increases to about $7.50 per day, as the Bodcaw people figure it. This company stated that there is little or no expense attached to the upkeep of the machines. It takes about ten minutes each day to oil them, and they are charged at night, which takes about four hours, and as the charging plant is automatically arranged, there is no necessity for employing a night mechanic.

The G. W. Gale Lumber Company, of Boston, Mass., has been using 5 electric lumber tractors for about three years, which are doing much more than the work of 40 horses which they previously used. The vice-president of this company has a problem that he occasionally propounds to his friends, and it is the result of the work of three electric tractors for 189 days, during which time the machines were driven 16,748 miles and carried 9,650,000 feet of lumber, that averaged 1.5 pounds to the square foot. He maintains that a horse can transport 15,000 square feet of lumber one mile a day, and he has asked his friends to determine how many horses would be necessary to accomplish the work of the tractors.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

CENTRAL-STATION POWER EFFECTS SAVING IN CANDY FACTORY.

Details of a Power Analysis Made by Toledo Company in Changing the Service.

By H. C. Riggs.

Some rather unusual circumstances were encountered in changing over and completing the central-station power installation of the Smith, Kirch Candy Company, at Toledo, O.

For reasons of expediency and betterment of the service, it was decided by the local power company to change over and discontinue all 500-volt street-railway power service. It was anticipated that there would be considerable expense to be borne by the company in accomplishing this desired end, but the new-business department took the matter in hand and in less than a year changed over practically every installation in the city without a cent of cost to the company, so far as the customers' end of the installation was concerned. Among the first changed over was that of the candy company in question.

This same matter had previously been broached to the customer by the company on several occasions, but in such a vague, apologetic manner as to lend weight to the belief that they wanted to "put something over" on the customer, and he had even refused to consider an offer to stand one-half of the cost.

In taking this matter up, the newer power sales organization, first stated the company purpose and position frankly. Several obvious general reasons were mentioned in support of the same, and permission was readily gained to make a survey or check up of the physical facts, so that the advantages to be gained by the customer from the change could be shown in definite form, as considered against the cost of making it.

The following is the survey made in detail:

Four electric service connections, contacts, and rates.

(1) 500-volt power for freight elevator.

(2) 500-volt power for general factory purposes.

(3) Single-phase, 60-cycle power for general lighting.

(4) Single-phase, 60-cycle power for electric chocolate melting.

The plant used a 40-horsepower Springfield gas engine to drive a 12-ton ammonia compressor, operating from 5:30 a. m. to 5:00 p. m. daily, March 1, to November 1; which was idle the other four months. This equipment was used for cooling packing rooms to 65 degrees Fahrenheit. Natural gas of 850 British thermal units was used, at 35 cents per 1,000 cubic feet. The engine was four years old, and frequently gave trouble by shut downs. The gas bills for the engine totaled $313.18 for the eight-months period. With electric power to replace, 25,357.5 kilowatt-hours would be required annually. There are about 100 lighting outlets at present, totalling five kilowatts connected load. The following conditions were found: poor installation of drop lights; some carbon lamps; open wiring, in bad shape, dirty lamps, no shades, etc.; motor installation only in fair condition; open wiring; not much motor or service trouble; application fair. The following was the motor installation:

Size, Horsepower.	Speed, R.P.M.	Drive.	Application.	Load Horsepower.
5	1,065	belted	Deep-well pump	4.15
5	1,065	group	Peanut roasters	3.5
2	1,190	group	Chocolate enrobers	1.43
2	1,190	belted	Mixing vats blower	1.4
5	1,200	group	Mixing vats	2.11
10	975	direct-connected	2,000-pound, 40-foot elevator	6.0
2	1,190	group	Candy rolls	1.03
5	1,065	belted	Mogul candy machine	2.06
10	880	group	Cream department	4.86
5	1,065	belted	Pulling machine	4.5
5	1,065	belted	Blower	3.8
56	11			

These motors were in salable condition.

The firm's ideas and desires were embodied in changes noted in part. The loads given were tests. In addition there is a five-kilowatt electric heating load, divided among 15 hand-dip chocolate tanks.

Operating records and costs for a year follow:

	General power Kilowatt-hours.	Elevator Kilowatt-hours.	Heating Kilowatt-hours.	Lighting Kilowatt-hours.
August	690	155	62	276
September	696	135	93	275
October	2,488	145	85	355
November	2,491	165	100	386
December	2,168	140	71	527
January	1,355	95	34	371
February	1,663	110	48	354
March	2,035	125	73	345
April	1,767	115	56	268
May	1,836	130	39	229
June	2,006	145	39	237
July	1,466	105	20	204
Total	20,661	1,565	720	3,827
Average	1,721¾	130.4	60	319
Cost	$564.66	$39.13	$42.32	$267.89

Grand totals, 26,773 kilowatt-hours; $914; average rate 3.41 cents. Overall, three-minute demand 13.6 kilowatts taken in November. Demand-factor 26.15 per cent of 52 kilowatts connected load. Load-factor, 17.3 for 8,760 hours per year. Load-factor, 73 per cent for 2,700 operating hours per year (nine hours per day, 300 days per year). Plant building, 80 feet by 120 feet, three stories and basement, 38,400 square feet floor space. The annual energy consumption for lighting per square foot of floor space is 0.1 kilowatt-hour and for power 0.59 kilowatt-hour, making a total consumption per year per square foot of floor space of 0.69 kilowatt-hour.

The factory was equipped with a private boiler plant, containing one 60-horsepower horizontal tubular boiler operating at 15 pounds pressure, used for building heat in season and for candy kettles, chocolate melting vats, spinning and warming tables the year round. The coal consumption amounted to 327 tons at $2.75 per ton delivered, or $899.25 annually. One licensed attendant at $75 per month was required. No other plant labor was needed. The state law required a licensed man in charge of boilers 30-horsepower and over, or carrying 30 pounds or more of steam, so it became apparent that no economies could be effected in this direction, and no further check was made.

The rated plant capacity is 10 tons of candy per day, the actual output, 5 tons per day average or 1,500 tons per year. This is 2.55 kilowatt-hours lighting per ton of output; 15.23 kilowatt-hours power per ton of output; or

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a total consumption of 17.78 kilowatt-hours per ton of output. With the ice machine included, as previously determined, the figures revised are: 16.9 kilowatt-hours refrigeration power per ton of output; 32.14 kilowatt-hours total power per ton; and 34.68 kilowatt-hours overall per ton of output.

The analysis of this survey developed the following points:

Present demand	13.6 kilowatts
Ice-machine demand	13.5 kilowatts
Total	27.1 kilowatts
17 per cent diversity	4.6 kilowatts
Actual demand	22.5 kilowatts

This demand occurred in midsummer, instead of in midwinter. The winter demand would remain the same. The demand and load-factor on 70.75 kilowatts connected and 52,130.5 kilowatt-hours annual consumption, would be as follows:

31.8 per cent demand-factor.

26.4 per cent load-factor, 8,760 hours per year.

63.4 per cent load-factor, 3,654.5 operating hours. This increase in annual load-factor is 9.1 per cent.

A brief simple report was made to the candy company in the form of a one-page letter, detailing the consumption of energy and the cost of the same for a one-year period, on the existing rates and service connections, and adding thereto the various operating costs of the gas engine, which latter included the loss occasioned by shut downs. It was shown that at a new rate which was based on load-factor, and the blanketing of all energy used on one service then being purchased, would buy enough additional service at the new rate to operate the ice machine as required. The gas engine costs thus eliminated were sufficient to pay over 30 per cent on the cost of the improvement, constituting ample inducement, as it developed, to get the change made. It was also noticed that the improved drives and more efficient motors and installations, would easily result in an overall increase in efficiency of not less than 10 per cent. Co-operation in the broadest sense was given by the power sales department in writing specifications for the installation complete, closing the installation contract, and following the execution of the actual work, which was done with the factory in operation.

One unique drive was on the ice machine. The customer, with his past power failure on the engine in mind, decided to allow the gas engine to remain as emergency power for this important machine. The 25-horsepower slip-ring, high-torque motor was belted to a countershaft over the gas engine, so located that the drive belt to the compressor could be rolled off of the overhung countershaft pulley, and the belt be the right length to roll onto the gas engine pulley. The gas engine is still dead and the motor on the job every day.

Another drive was replacing the 10-horsepower directly connected elevator motor and control. The nearest speed available in a high-resistance end-ring alternating-current elevator motor was about 100 revolutions faster, so an 11-horsepower motor was used to compensate for the increased travel speed. All the local elevator men backed down on the control which had to throw the double-throw starting switch, and operate the mechanical brake at the some time. This was accomplished by using a drum-type reversing switch with a U-grooved pulley on the shaft, of just the right size, to give the proper hand starting cable travel in throwing the switch out or in to set or release the brake at the same time. The two were interlocked on the one cable.

The first full month's operation with the complete new installation operative, showed 3,270 kilowatt-hours used.

Refrigeration Campaign in Philadelphia.

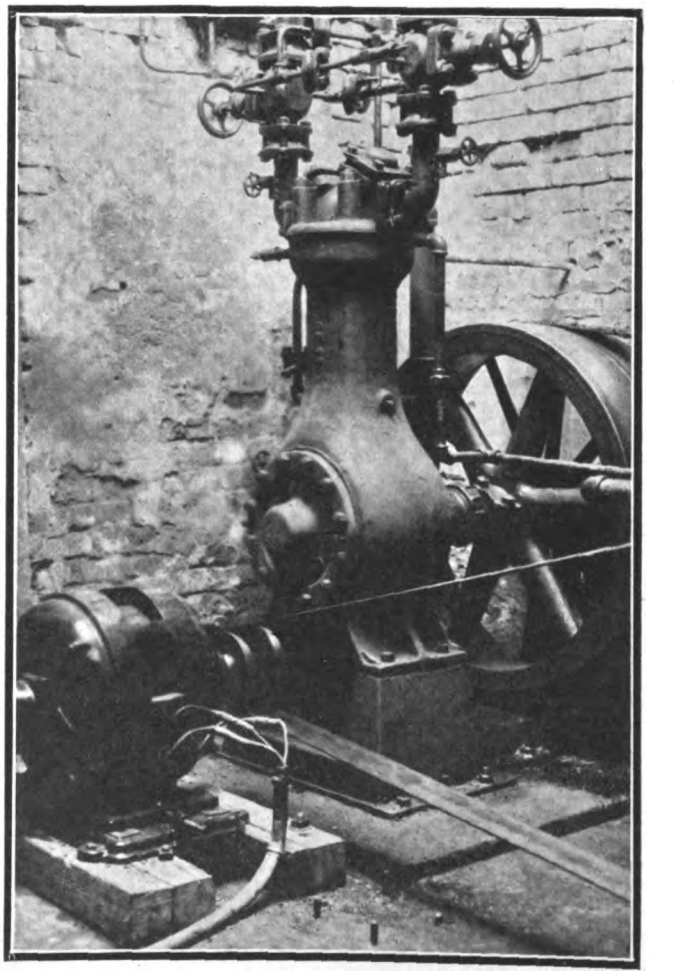
In a folder appropriately headed "Cold Facts," the Philadelphia (Pa.) Electric Company is presenting a number of advantages of electrical refrigeration for meat markets, florists, ice cream manufacturers and other establishments using ice. The advantages enumerated for electric process are:

(1) Lower and more consistent temperatures can be obtained; (2) a marked absence of dirt and all unsanitary conditions; (3) refrigerator air is kept dry because all water vapor is condensed on pipes as frost; (4) any desired temperature can be obtained and just as easily maintained; (5) show windows and cases can be readily connected, thus permitting the exhibition of perishable goods.

It is stated that while the saving in the cost of operating the small sizes of electric refrigerating machines may be slightly less, the main advantages are experienced in better conditions, both hygienic and in temperature. In the medium and large sizes, however, in addition to these advantages there is also a substantial saving in the cost of operation.

Power Company Anticipates Trouble with Gas-Engine Drive and Has Motor Ready.

A motor can be connected to practically any kind of a machine in some way, no matter whether the machine was put in to be driven by a motor or whether it was to be driven by some slow-speed machine. The illustration shows a 7.5-horsepower motor connected through a jack shaft to a small ammonia compressor used in a market. This compressor was driven by a gas engine for a long while. The Texas Power & Light Company knowing that trouble would result some day had a motor on hand ready and when the accident occurred the motor was installed on short order.



Ammonia Compressor Driven by a 7.5-Horsepower Motor. This Installation Made Few Hours After Failure of Gasoline Engine.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL INSTALLATION IN A LARGE MODERN CLUB HOUSE.

Wiring for Power, Lighting and Signaling Purposes in New Club House of South Shore Country Club, Chicago.

It is to be expected that the building of a large metropolitan club, with almost unlimited means back of the organization, will be very liberally equipped electrically. The installation of such equipment affords the electrical contractor unusual opportunities in work differing from the ordinary contracts for lighting and power in residences and industrial establishments.

The new building of the South Shore Country Club, whose electrical equipment is described in this article, is one of the imposing structures recently completed in Chicago. This club has a membership of about 2,000 members and owns a tract of ground about 65 acres in extent very favorably situated directly southeast of Jackson Park on the shore of Lake Michigan. The new club house, which was formally opened on January 20, occupies the site of the former building which was outgrown some time ago. The old club house was removed to the lake shore and is being equipped for a bath house, golf lockers and beach casino. The southeast wing of the old club house, which was used as a ballroom, was left in place, however, and remodeled so as to fit in with the new quarters. The new building is four stories in height and covers a ground area of about 90,000 square feet. The ballroom is the southeastern wing and the dining room the northwestern wing. Facing the northeast is another wing known as the solarium. The first floor of the structure is occupied by promenades, breakfast and card rooms, besides the main dining room, solarium and ballroom already referred to. The mezzanine floor has a number of offices, parlors, small meeting rooms, card rooms, etc. The two upper floors are occupied by special guests' rooms. All

Fig. 1.—View in the Solarium of the South Shore Country Club; Promenade and Main Entrance in the Background.

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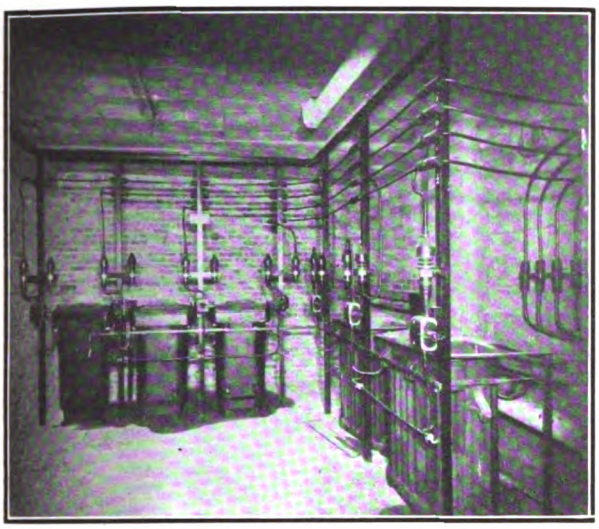

Fig. 2.—Power and Lighting Service Transformers.

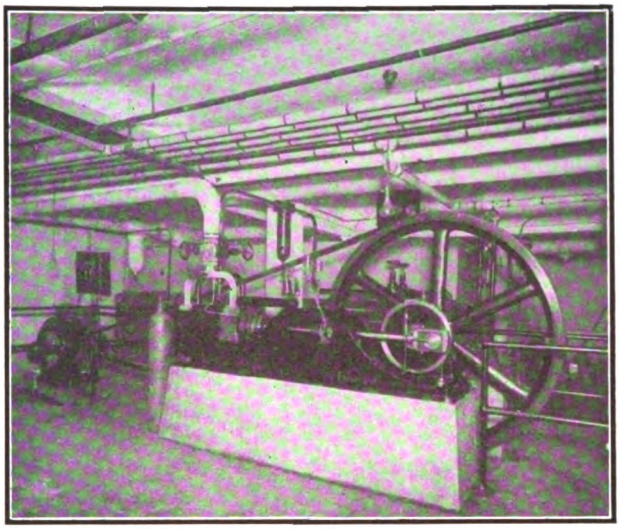

Fig. 3.—Electrically Driven Refrigerating Machine.

of the service equipment is in the basement. The building throughout is very artistically finished and decorated; particularly on the ground floor the principal rooms are very spacious and contain beautiful mural decorations and other luxurious furnishings to harmonize therewith. A good idea of the character of the interior is shown in Fig. 1, which is a view in the solarium, and also shows in the background the middle portion of the main promenade and the main entrance doorways. The cost of the new building was about $450,000.

Service Lines and Transformer Room.

All of the electricity used in the main club house and in the other buildings of the club is supplied by the Commonwealth Edison Company. To the main building this service is run in underground conduit, terminating in a specially built, fireproof, locked transformer room in the middle of the basement. The service enters as a 4,000-2,300-volt, four-wire, three-phase line whose entrance into the transformer room can be seen at the extreme right of Fig. 2. These cables are supported on an angle-iron framework and run over the two banks of transformers. Of these banks the one at the left consists of three 50-kilowatt General Electric transformers that are Y-connected on the primary side and step down from 2,300 volts to the 220-volt delta-connected secondaries. All of the power circuits in the building, from which these transformers are supplied, are 220-volt, three-phase circuits. The two transformers at the right are 50-kilowatt lighting transformers tapped in between one phase and the neutral and step down to 220-110-volt, three-wire lighting circuits. The primary cutouts for these transformers are clearly shown directly above the different units. The secondaries lead back from the transformers through the wall to the various cabinets to be described below. A heavy copper busbar connects the cases of all the transformers and is thoroughly grounded. Substantial grounding for the neutrals is also provided.

Main Service and Distributing Cabinets.

The secondary leads from the transformers terminate in special cabinets shown in Figs. 4 and 5. In the former view the first of these cabinets at the left is a distributing cabinet for the lighting circuits in the casino building located on the driveway between the entrance to the grounds and the main building; this cabinet also controls some circuits for special display lighting in the grounds. The cable running down in conduit from this cabinet connects to the casino building as an underground line. The second cabinet in Fig. 4 is the main service and distributing cabinet for the lighting circuits. The secondary cables from the lighting transformers enter the service switch at the bottom and from the top of this switch two heavy quadrupled cables pass to a junction box to the right, directly above which are two current transformers for the watthour meter. This measures all of the regular lighting load. From the meter the leads run back to the upper portion of the cabinet just referred to and from the busbars there shown the main lighting feeders are branched off to the various sections of the building. To the right

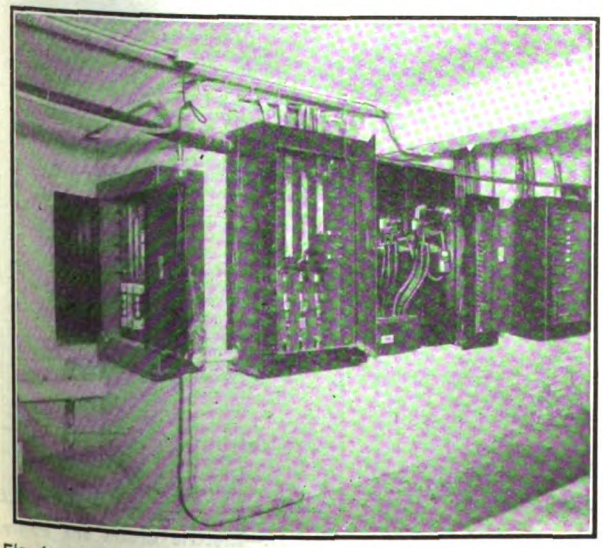

Fig. 4.—Lighting Service and Distributing Cabinets and Meters.

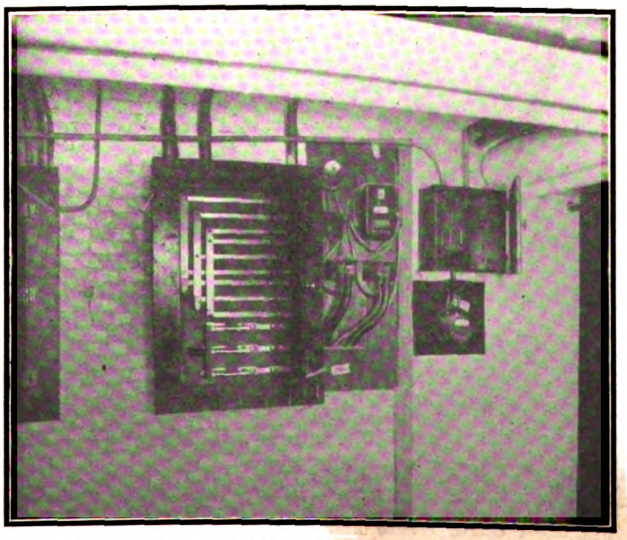

Fig. 5.—Power and Emergency-Lighting Cabinets and Meters.

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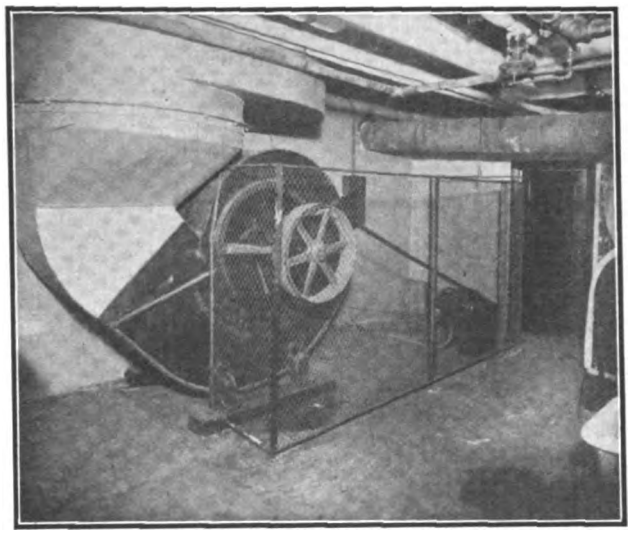

Fig. 6.—Large Motor-Driven Kitchen-Exhaust Fan.

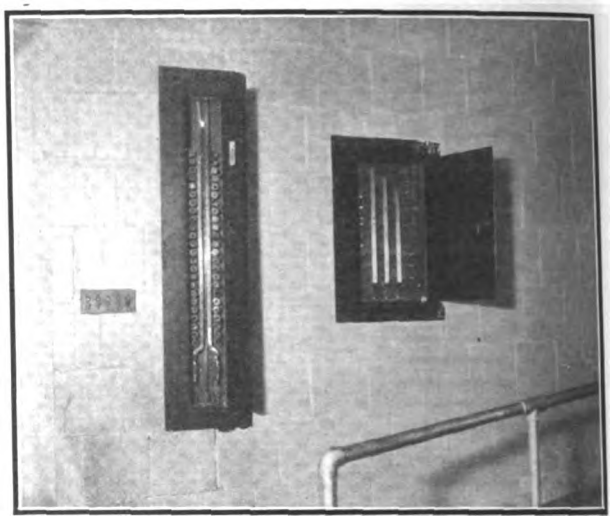

Fig. 7.—Typical Lighting and Power Cutout Cabinets.

of the watthour meter is the narrow high cabinet which controls part of the lighting circuits of the basement.

The cabinet shown prominently in Fig. 5, and rather indistinctly at the right edge of Fig. 4, is the main service and distributing cabinet for the power circuits. The manner of connecting the service switch directly from the secondaries of the power transformers, then through the current transformers and watthour meter and back to the distributing busbars in this cabinet is similar to that for the lighting circuits. In this case the demand indicator is shown to the left of the watthour meter.

Entirely distinct at the right of Fig. 5 is a separate cabinet for emergency lighting. This includes a simple double-pole service switch and connection to a separate meter. The circuits running from the emergency lighting cabinets are entirely distinct from the regular lighting circuits and are so distributed throughout the building as to provide a small number of lamps in each of the principal rooms and on all of the floors, thus taking care of the remote possibility of complete breakdown of the regular lighting circuits. All of the cabinets described are equipped with liberal wireways or gutters, and are provided with spring-hinge doors. When the photographs were taken these doors were especially held open to show the interior arrangement.

Engine and Pump Room.

As there is considerable need for refrigeration in the club house, a special refrigerating machine, electrically driven, has been installed. This is shown in Fig. 3. It is a carbon-dioxide compressor with cylinder 3.5 inches in diameter and 14-inch stroke. The carbon-dioxide system was used instead of an ammonia system on account of its greater safety in case of damage to any of the piping. This machine was furnished by the American Carbonic Machinery Company. It is belt-driven by a 25-horsepower, 220-volt, three-phase General Electric induction motor of the slip-ring type. At the time the photograph was taken the special secondary resistances for obtaining variable speed had not yet been installed, but they have since been put in near to the control cabinet shown directly above the motor.

As an auxiliary to this refrigerating set there is a centrifugal brine agitator or circulating pump which is driven by a two-horsepower motor. The brine from the refrigerating equipment is circulated in special piping to 16 refrigerators located principally in the main kitchen; the drinking water is also cooled and filtered, and there is also connected with the refrigerating system a large chamber in the kitchen for the cooling of plates and dishes on which ice cream and ices are to be served.

In this room there is also an electrically driven water supply and fire pump driven by a five-horsepower Jenney induction motor with automatic release circuit-breaker and float control. This supplies a large tank located in one of the elevator pent houses corresponding to the fifth floor of the building. The control for this is entirely automatic. This pump set is shown in Fig. 8. There are also in dif-

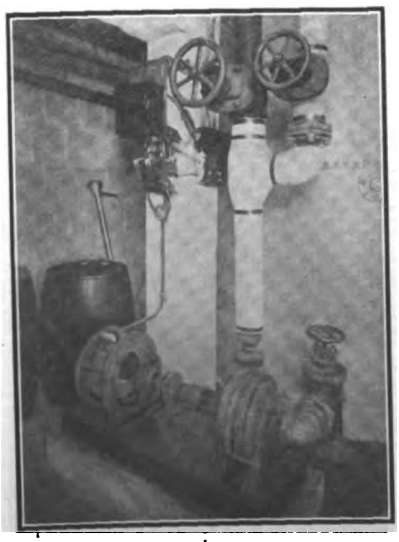

Fig. 8.—Electric House and Fire Pump.

Fig. 9.—Electric Sewage Pump.

Fig. 10.—Fire-Alarm Apparatus.

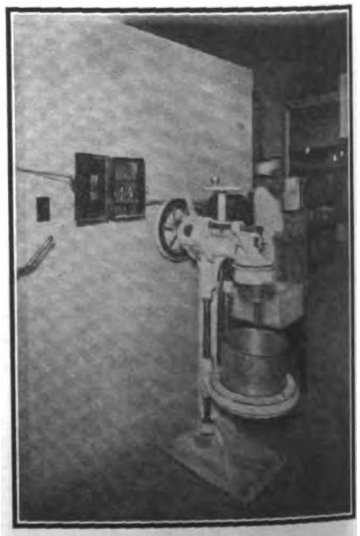

Fig. 11.—Electric Cream and Pastry Whipper.

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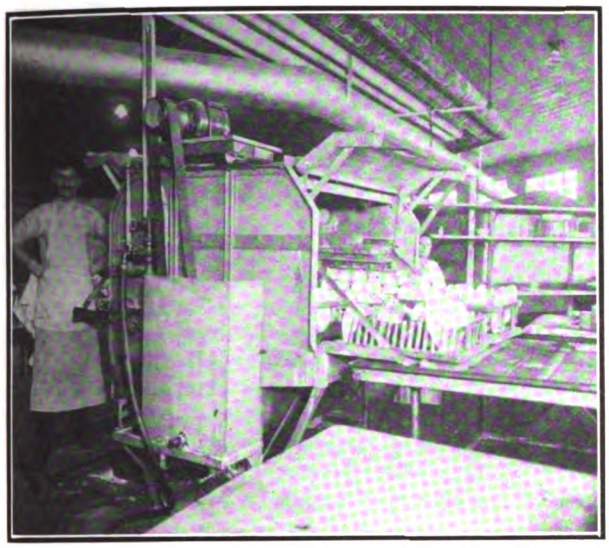

Fig. 12.—Electric Dish Washer in Main Kitchen.

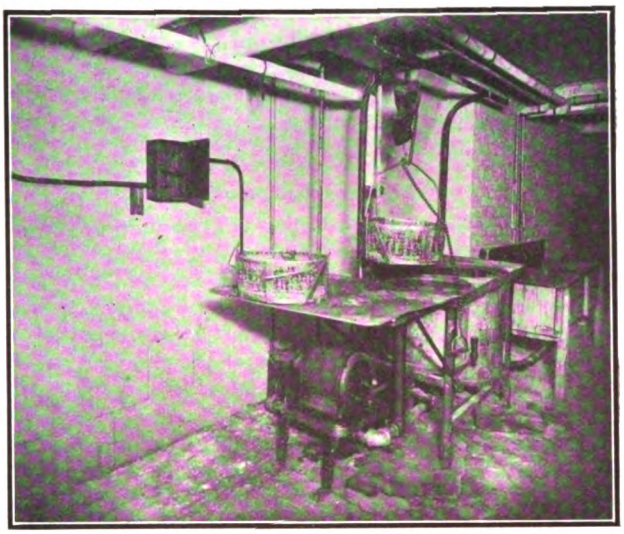

Fig. 13.—Dish Washer in Auxiliary Kitchen.

ferent portions of the basement two sewage ejector pumps, which likewise are automatically controlled. One of these is shown in Fig. 9. This is a vertical pump mounted directly over the impeller which it drives. Since the club grounds are quite near the lake, it is necessary to use these pumps to raise the sewage from the sump to the higher level of the city sewer system. Three of these pumps are located in different portions of the grounds.

Just outside of the kitchen is a large ventilating set driven by a 7.5-horsepower induction motor. A view of this is shown in Fig. 6. It acts as an exhaust fan for the kitchen in general and has special flues running over the large ranges and other places where excessive heat or gases are found. There is also a small motor-driven ventilating set mounted over the center of the main dining room. The larger set referred to also has a duct connected with some wall registers in this dining room.

There are two electric elevators in the building, one for passenger service and the other for freight. These were installed by the Otis Elevator Company and are operated by the standard alternating-current control and motor equipment furnished by the company. The motors and controllers are installed in the pent houses over the respective shafts. These pent houses form an attractive cupola-like effect on the sky line of the building and serve to enhance its architectural appearance.

In the laundry of the club house there are installed two large electrically driven washing machines and a motor-driven mangle. Numerous electric flatirons are used in the tailoring and sewing rooms, for which special outlets are provided.

Electric Equipment in Kitchen.

The main kitchen, which is located directly below the main dining room, is provided with the most modern facilities for efficient and sanitary preparation of the food, and for washing the dishes returned from the dining room. Located in the kitchen proper are a number of electrically operated appliances, including a coffee grinder, meat chopper, potato peeler and a cream and pastry whipping machine. A view of the latter is shown in Fig. 11. The main dish washer in one corner of the kitchen is shown in Fig. 12. This is driven by a 0.5-horsepower motor and is of the Crescent type furnished by the Bromeley-Merseles Company, Chicago. This machine is the one in active use every day. Fig. 13 shows a special dish washer driven by a 0.5-horsepower motor. This is installed in an auxiliary or overflow kitchen, which is used when exceptionally large parties are to be served. This dish washer was furnished by G. S. Blakeslee & Company. The magnitude of the demands upon the entire kitchen equipment can be shown when it is stated that on one occasion 2,360 persons were fed in one evening.

As an auxiliary to the kitchen is a room in which there is installed an ice-cream freezer, an ice crusher, an ice-cubing machine and an ice shaver. All these four machines are driven from a line shaft, which in turn is operated by a two-horsepower motor. At the present time this motor is a single-phase Century induction motor, which was one of

Fig. 14.—Lighting Fixtures in Main Dining Room.

Fig. 15.—Operating Dial for Dance Announcer in Ball Room.

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the machines retained from the old club house. It is expected, however, that a three-phase motor will be installed in place of this. These machines take care of the ice used for drinking water and such ice as is needed in the freezer and for other miscellaneous purposes.

Lighting Equipment.

Special pains were taken in the design and installation of all of the lighting equipment. Taking up the lights in that portion of the building just described, namely, the kitchen, mention must be made of the use of individual lamps housed in vaporproof fittings in the various refrigerators. Over the row of ranges in the kitchen there is also installed a long row of about 20 lamps mounted directly on conduit. These are placed in a hood above the ranges, the hood serving not only to carry off steam and vapors but also to screen the direct light of the lamps from the eyes of the chefs.

For the lighting of the main and other floors special consideration was given. In the case of the solarium shown in Fig. 1, it will be observed that conspicuous in the center of the picture is a large ornamental pedestal surmouned by an urn. Within this urn are four 500-watt lamps equipped with individual reflectors which provide for the indirect illumination of the beautiful ceiling of this room. By this arrangement the ceiling is left entirely unobstructed by fixtures so that its artistic design may be freely studied and appreciated. In the side wings of this room there are a few ceiling fixtures, but for the most part it is planned to use floor and table lamps, providing both direct and indirect illumination. For this purpose a considerable number of floor receptacles have been installed.

The main dining room is illuminated by means of two pendent crystal fixtures of very ornate design. These include a large number of small lamps. In the center of this room is another ornamental pedestal surmounted by an urn in which are six 500-watt lamps, providing indirect illumination for the center of the ceiling which has a special decorative pattern not very well shown in the view of the dining room in Fig. 14. In the main promenade running the full length of the building on the main floor there are also some very handsome fixtures, together with two equipments of the pedestal indirect type, these containing smaller lamps than in the solarium and dining room, however. In the ballroom the illumination is from the indirect fixtures that were originally installed when the old club house was completed.

The control cabinets for the lighting circuits are of special compact type, of which one is shown at the left of Fig. 7. These cabinets include a three-inch wiring pocket or gutter all around and in the back.

Signaling Circuits.

Installed throughout the main building is a special fire-alarm system comprising 10 boxes or stations. Each of these is equipped with an electromechanical gong which sounds when the box is pulled, at the same time indicating in the engine room where this system centers. A view of this special fire-alarm equipment is shown in Fig. 10. Mounted on a panel are special tell-tale and other relays and back of it are 24 Edison cells for supplying the set with current. This system gives an instant signal to the engineer, who is always on duty in this room, and he immediately starts the fire pump and sends in an alarm to the city fire department. Holtzer-Cabot apparatus was used in this installation.

Throughout the building there are a large number of telephones which terminate in a private branch exchange on the main floor. This exchange is connected through an underground duct line with the nearest pole lines of the Chicago Telephone Company.

An ingenious special signaling system has been installed in connection with the ballroom. The idea of it is to enable the leader of the orchestra to flash a signal in various portions of the large building when a new dance number is to be begun. The operating station of this system is in the form of a compact dial placed for the purpose of photographing on the railing of the stage of the ballroom, as shown in Fig. 15. This is connected by two cables with floor receptacles directly back of the footlights. One of these cables controls a special lighting circuit and the other controls the indicating circuit of the various indicators installed. One of these is shown near the center of Fig. 1 directly to the right of the large urn. Each of these stations consists of a dial about 18 inches in diameter, in the upper portion of which is a small window. Some of these dials, such as the one shown in Fig. 1, are double-faced. Within the dial is a relay which operates to advance step by step a light wheel framework near the circumference of which are numbers running up to 20. When the button at the top of the sending station shown in Fig. 15 is depressed, each of the dials is advanced one position and at the same time is illuminated, thus attracting the attention of persons in that portion of the building. This apparatus was furnished by Walker Brothers & Haviland.

All of the wiring throughout the building is in conduit, even the wires for the various low-voltage signaling systems described and for the elevator annunciators, etc.

The architects of the building were Marshall & Fox, Chicago, Ill. The entire electrical equipment, with the exception of telephones, electric elevators and the installation in the transformer room, was installed by the White City Electric Company, Chicago, Ill. The electrical and mechanical equipment in the building is in direct charge of A. M. Petersen, who is superintendent of buildings and grounds for the club.

Motors on Interurban Service Lines.

With the rapid extension of interurban railways through rural communities there are resulting an increased number of isolated motor drives operating upon the 550-volt direct current obtained from trolley feeders. This service is particularly severe in some respects. High-voltage motors are prone to give trouble from sparking and, due to the grounded circuits, there is an additional strain upon the insulation. Added to these difficulties is that of fluctuating voltage, a variation of 100 volts from normal being not infrequent.

Ordinary shunt-wound motors placed on this service are likely to prove unsatisfactory. The use of interpoles on 550-volt motors is now common and is particularly recommended for this service. This will tend to improve commutation.

Due to the fluctuations in voltage the speed of motors in this service usually varies materially. To overcome this trouble the use of compound wound motors is recommended. When the voltage increases and brings up the speed, an increase of load will generally result. This increased load strengthens the series field and reduces the speed, hence a more uniform rotation results. The effect of this strengthened field is also beneficial to commutation. It is difficult to anticipate the amount of compounding that will be most effective. A standard 20 per cent compound motor usually has sufficient series winding. By shunting the series winding with German silver a ratio can be obtained by trial which will give excellent results.

Gordon Fox.

M. A. Shadley has opened headquarters for electrical construction and repair work, under the firm name of Shadley Electric Company, 704 Wyandotte Street, Kansas City, Mo. Mr. Shadley was with the Squire Electric & Construction Company for a number of years.

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A JOB-COST SYSTEM FOR CONTRACTORS.

By A. R. Schmidt.

As supplementing the article by George W. Hill, published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for March 18, 1916, describing a "Direct-Method Job-Cost System" for electrical contractors, it may be of interest to describe the system in use by the A. R. Schmidt Electric Company, of Milwaukee, Wis.

About 1901, when this company started in the contracting, manufacturing and repair business a job-cost system was inaugurated which is very similar to the one shown in the issue of March 18 and we are using it today, and would not do without it, as it shows, at a glance, how much we lost and gained on each particular job, and further, in disputes of bills it is a perfect record. We not only can trace when material was delivered, by whom it was received, but the party can be brought up as a witness, if necessary.

As stated above our job-cost system sheet is similar to the one shown, but somewhat larger in size. We have been trying to eliminate certain columns in order to make the sheet smaller, but we have been unable to find a way whereby we could combine these columns, as all seem so essential as they appear at present.

With reference to Mr. Hill's job-cost sheet there is shown in the first column (No. 29) estimated quantities of material. This column is not included on our record sheet, but in order to have a record of how the actual material used compares with the estimate, a duplicate sheet of the original estimate is fastened to the job-cost record.

The second column of Mr. Hill's sheet is the same as that used by the Schmidt company, both specifying the kind of material issued. The third and fourth columns of Mr. Hill's sheet, termed Nos. 31 and 32, are the same as on the sheet of the A. R. Schmidt Electric Company, with the exception that in the latter the dates when material is taken out of the store and when returned are given.

We show the cost of material, cost of labor and total cost, each in a separate column and have the sheet large enough to make out an itemized bill.

There was a time when our company thought that this cost system took up too much time, but when consulting with expert accountants we were advised that this was the soul of our business and that they could not improve on it.

The accompanying illustration shows one of the job-cost sheets now in use. It differs with the one adopted in 1901 only in that the latter was subdivided with horizontal red lines for smaller jobs. Omitting the red lines is considered an improvement, as we now will not put more than one job on a sheet, no matter how small. The reason for this is that when a bill is paid these sheets are stamped showing the date when paid and check number and then filed away. If one or more jobs were put on the same sheet, say for instance three, and one was not paid this sheet would have to be kept on file and would become cumbersome. If only one job is put on a sheet and is paid then the sheet is filed away in alphabetical order with all the necessary repair orders, workman time slips, store-room orders, city inspection fees and permits, Underwriters' correspondence, if any, etc. In fact, anything pertaining to this work is filed with this sheet, so if desired for reference the whole job can be looked up at a moment's notice.

REPAIR ORDER

A. R. SCHMIDT ELECTRIC CO.

COR. E. WATER AND BUFFALO

Name_____

Address_____

Order Received_____ 19_____ M_____

Material used_____

Remarks_____

Repaired by_____ Hours_____ Min._____

Repairs Satisfactorily Completed_____ 19_____

VOID IF NOT SIGNED BY CUSTOMER

TIME AND MATERIAL USED MUST BOTH BE SIGNED FOR

Repair Order Showing Material and Time.

With reference to workman time slips, also shown, they are signed every night and must be O. K.'d every week before the workmen receive their pay. This is the way we have been running our business since 1901.

It may appear to some of the more modern contractors old fashioned, but we have found it serves our purpose and we are glad after 16 years' experience that other contractors have thought so.

Opposes Use of Emergency Switches.

In a recent message to the City Council of Portland, Ore., City Electrical Inspector Dunlop recommended that the section of the building code requiring emergency electric light and power switches in buildings be amended to do away with this requirement. Mr. Dunlop stated this practice is not only very expensive but unnecessary. The law requires a switch placed in halls, so that the power can be turned off quickly in case of fire or accident.

A. R. SCHMIDT ELECTRIC CO.

Date Order Taken____ Description____ No.____

Date Promised____

Date Completed____

Name____ Address____

DESCRIPTION OF WORK	DATE	LABOR	Hours	Rate per Hour	Date	MATERIAL	Quantity Issued	Date	Quantity Returned	Quantity Used	Cost per Unit	Cost of Material	Cost of Labor	Total Cost	CHARGES ITEMIZED

Job-Cost Record Used by A. R. Schmidt Electric Company.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

How the Dealer Can Tie In on "Wire-Your-Home" Campaign.

The merchandiser, as a general rule, is not in a position to conduct an individual house-wiring campaign to parallel the nation-wide "Wire-Your-Home-Month" campaign instituted by the Society for Electrical Development for the period from March 15 to April 15, but he is in a position to profit by the sale of appliances, because the list of prospective users is sure to be greater as a result of this campaign. If the dealer takes wiring contracts he may be in a position to also secure some profitable business as a direct result of the campaign.

Since the movement cannot be of anything else but benefit to the dealer, a few pertinent suggestions regarding ways in which he may aid will not be out of place at this time.

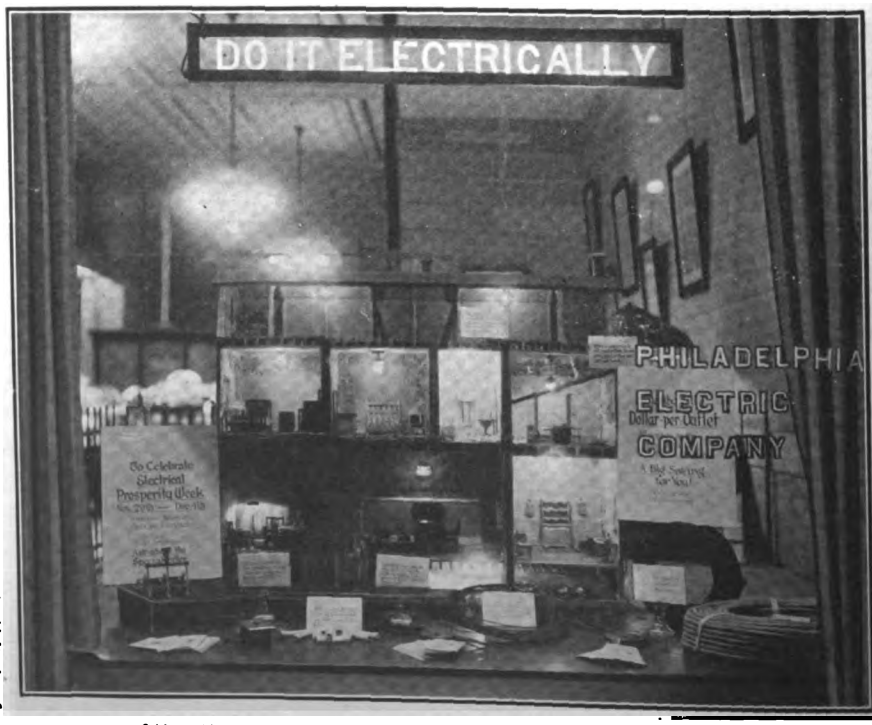
First, realizing his chances for profit, the merchandiser surely is in a position to lend his moral support to the movement. The dealer who can capitalize on the movement cannot afford to sit calmly by and wait for returns which are the result of the work of his co-workers in the electrical industry, the central-station interests and manufacturers. The latter cannot be expected to assume all the burdens even though they share in the profits. If the central station adds a customer as a result of the campaign it is well and good, for it reaps in the form of additional load. But manufacturers and dealers will profit indirectly, and by reason of this they should lend their moral and actual support. The manufacturers are co-operating with the Society in the movement, and many of them are doing more than their full share toward its support. The merchandiser, as a form of moral support, should become imbued with the idea of doing all he can think of to aid the movement, and then find some aids he did not think of.

Besides "boosting" the house-wiring campaign to the best of his ability the merchandiser is in a position to lend material aid in two ways. The first is by means of his window displays. He may install the standard window display distributed by the Society for Electrical Development, and he may alternate that display with some of his own design. If he did not receive the standard display, certainly some mention of the campaign should be made in his windows. This may be done by window displays showing special-sale articles offered as special inducements to those installing wiring in old houses, but the special sales or any other announcements should unquestionably be linked to the house-wiring movement.

As an instance of this kind of display the accompanying illustration shows a window which is very opportune during the house-wiring campaign. This window was maintained by the Philadelphia Electric Company during Electrical Prosperity Week. It shows a miniature dwelling, about four feet long by two feet wide and five feet high. No attempt was made to make it a specimen of architecture, but efforts were made to have it a replica of the problems met with by an electrician in the wiring of old houses and the means used to solve these problems without damage to the house. The miniature house showed six rooms and a bath, each room furnished completely and with electrical service. No attempt was made to minimize the facts of the case. Where it was necessary to take up a board or open a wall for wiring this was done. Explanations were made to show the new way in which electricians try to do their work in old houses, by making an installation with the least dirt and muss possible. The window was notable for the decided effort made to clearly portray the advantages of electricity so that the favorable impression created was one that was made to last. The window display described elicited over 900 inquiries during one week.

If it is not possible for dealer to make as elaborate a display as that of the Philadelphia Company, he may simulate the idea in a window display of less pretentious design. Two miniature houses may be shown, one lighted with a modern tungsten lamp and the other with a dim light, serving to show a comparison of houses lighted with electricity and less-modern methods. Cards may state that the spectators whose homes are not lighted with electricity should compare their own lighting with that of an electrically lighted home.

The average man knows very little about electricity; especially those who do not have service in their own homes. The dealer may educate those who do not have electric service, as well as in his own business, by showing a



Attractive Window Display of Philadelphia Electric Company.

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few specimens of switches, panelboards, outlets, lamps, fuse boxes, batteries, etc., explaining their uses. Such displays are bound to create interest and eventually create business.

There is another opportunity for the merchandiser to aid the house-wiring campaign. This is by the insertion of advertisements in local papers.

The purpose of the Society for Electrical Development is first to get the industry interested in the movement and then to back it in its endeavor along its lines. It is impossible for the Society to reach the individual public thoroughly. This must be left to those of the electrical industry in the numerous communities. This is the reason why advertisements in local newspapers will do much to appraise the public of the fact that there is a house-wiring campaign and that the public has an opportunity to benefit by reason of the endeavor of the electrical industry to increase the use of electricity and educate people to the benefits to be derived therefrom.

The merchandiser should hitch his advertisements to "Wire-Your-Home Month." The manufacturers have been very far-seeing in their efforts to further the movement to aid the efforts of the Society for Electrical Development. Vast amounts of literature containing wide experience and selling ideas have been prepared and distributed by the manufacturers, and have been placed at the dealers' disposal. Excellent and appropriate electrotype cuts of advertisements may be secured from a number of the most prominent manufacturers, and these cuts can be used to the very best advantage by merchandisers in any city in the country. It is only necessary for the merchandiser to express his interest in the campaign and he will be assisted in every manner possible.

The merchandiser can possibly do more legitimate "boosting" by means of local advertisements than in any other way. The returns to him will be reflected back by his efforts and the effect they will have on his co-operation with other factors in the movement.

Results Obtained from Window Displays.

A considerable share of the prosperity of the Midland Electric Company, of Mason City, Iowa, is justly attributed to the attention given the matter of window dressing and general appearance of the store of this organization. Manager Zahm is a firm believer in the advertising value of an attractive window and every effort is made to instil timeliness and dignity into the display.

Through the courtesy of the *Northwestern Buzzer*, published by the Northwestern Electrical Equipment Company, St. Paul, Minn., we are enabled to show a particularly attractive display of the Midland company which has attracted considerable attention. Eveready goods are shown exclusively. This idea of displaying one company's line is followed quite frequently by the company.

Window of Midland Electric Company.

A FEW POINTERS FOR BUILDING UP AN ELECTRICAL SUPPLY BUSINESS.

Details of an Interesting Sale of an Electric Washing Machine—Other Notes for the Merchandiser.

By J. S. Vogel.

If you, Mr. Electrical Dealer, could turn every inquiry into an order your business would soon double itself. Is there any reason why you should not be able to turn inquiries into orders? When a person enters your store to look at a certain article have you any methods by which you can make a customer of this person?

Suppose a lady came to your store and asked to look at an electric washer, just how would you handle a prospective customer of this kind? If you are an average dealer the chances are you would simply show her the washer, explain how it works, and let it go at that. But this method is erroneous, because it does not produce the maximum number of sales—and you are in business for the purpose of making all the sales you can. Your profit depends upon the number of sales you make, and not upon the number of people who come to your store to look at merchandise, and then leave without buying.

A Chicago housewife recently bought an electric washing machine, and the story of how she bought it should be interesting to electrical dealers, because it points out why the average dealer does not make more sales of this class of merchandise.

The lady went from one electrical shop to another, simply to investigate the claims made for the various makes of washers. All told, she visited six dealers. The first five dealers she called on were courteous in every respect. They showed her the washer, and explained how it worked. But when the lady explained that she wished to examine the different makes before buying the salesman lost interest, and made no special effort to make a sale. Not one of the first five dealers asked for her name and address.

At the sixth place the man who showed her the machine was a real salesman. He explained the washer to her, its operation, desirable features and many advantages over old style washers. At the conclusion of this explanation, the salesman asked for her name and address, saying that he wished to send her a catalog. This was agreeable, and the lady left the store feeling that the salesman had made a special effort to please her.

The salesman did not forget about the prospective buyer the moment she left the store. In fact, he realized his work had only started. The promised catalog was delivered by a messenger on the same day, this method of delivery being more impressive than if it had been delivered by mail. Two days later the salesman called in person. He called during the evening, because he also wanted to meet the husband, knowing that when an article costing something like a hundred dollars was to be purchased the consent of husband, as well as wife, would be required before the sale could finally be made.

At the home of the prospective buyer, the salesman's entire argument was one of service. He paid very little attention to explaining what materials the washer was made of, as practically his entire argument was based on what the washer would do. The saving of time and expense, and the convenience of the washer formed his most important arguments. To still further impress these facts upon the minds of the buyers he explained that they had a number of washers in stock, and asked permission to install one of the washers in the home, to be left there for one week's use, without in the least obligating the prospect to buy. This offer was so liberal that it was accepted. The washer proved satisfactory, and the sale was made.

During the interview at the home the salesman found that

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the housewife was using a gas iron to do her ironing. On the day the washer was used in its demonstration trial, the salesman sent a boy with an electric iron to the housewife, asking that she use the iron for the one washing, so as to make electricity do as much of the week's work as possible. The electric iron remained with the washer.

One of the most important things in selling electrical specialties is to get them into the home. The housewife who has been doing her washing with the old-style washer does not realize the great advantages of an electric machine over all others. She has never used one, and has no correct way of judging its real value.

It is the same with other electrical specialties. Housewives do not know to what extent electricity can be made to shorten their hours of work, and to do it better than would otherwise be possible. The housewife knows the value of electric light, because she has used it, but she does not know the enjoyment she would get from a good table or reading lamp, because she has never used one, and for that reason cannot properly make comparisons.

It is safe to say that there is not a home in which electricity is used but what some electric specialty could be sold if the housewife knew its real value or convenience. The dealer should make a specialty of finding out just what electrical supplies could best be used by his customers, and then do his level best to place these specialties in every home where electricity is used.

How many homes are there with an electric toaster, a percolator, or even a table lamp? Very few, when compared to the enormous number of homes where electricity is used. Electric irons are popular, because the housewife has been educated to their use by extensive advertising. Nearly every home that has an electric iron should have an electric washing machine. To bring this about will require hard work and hustling by electrical dealers. But in the present day of keen competition, the dealer who does the most hustling is sure to make the most sales.

People are interested in electrical appliances. This is proved by the number of prospective buyers who daily enter electrical stores—even if they do not buy. It is up to the dealer to turn inquiries into sales. The mere fact that people take the trouble to come to your store to look at various articles is proof in itself that they are interested, and that a sale can be made, if the dealer only takes the trouble of going after this business—and going after it hard.

Your advertising alone will not make sales. Advertising brings people to your store, but that is as much as you can expect it to do. After a prospective buyer is in your store it is up to you to make the sale. If you cannot make it while the customer is in your store do not take it for granted that he is not interested. Get his name and address, and then keep after him until the sale has been made.

If you advertise to get people to come to your store then you are paying out real money for the privilege of showing your goods to these people. Whether your advertising pays, or does not pay, depends entirely upon the amount of sales you make. If you can make customers of those who are only casually interested your business will soon increase, and your work will be well paid for in the way of added profits derived from such sales.

Electricity is one of the liveliest things in existence. To live up to its reputation one must be a live wire. The dealer should do the things he thinks any live-wire dealer would do. He should not remain in the store all the time, expecting people to come there. It is necessary to go out after customers once in a while. The sale that's worth while is usually worth going after.

Lamp Window Display.

The pleasing effects that can be obtained in window dressing by utilizing the equipment furnished by the manufacturers is shown in the accompanying view of an electrical dealer's window in Iowa. It is interesting to note that many direct sales were traced to this display, although the population of the town is less than 800.

Lamp Window Display in Town of 800 Inhabitants.

One Dealer Selling 624 Irons Per Month in Louisville.

An example of what can be done in training salesmen is shown in the report of a Louisville electric appliance dealer who started an electric flat-iron campaign February 1, using untrained solicitors in a house-to-house canvass. More than 200 replies were received in response to an advertisement for canvassers—out of which number 10 were selected to carry on the work. During the first two weeks of the effort, which was devoted to placing the irons on trial, practically no irons were sold, and the advisability of dropping the plan was considered. Robert Montgomery, commercial manager of the Louisville Gas & Electric Company, was appealed to, however, and he immediately sensed the trouble. He found that the salesmen, although experienced in other lines, knew very little of the psychology of salesmanship. He devoted some time to training and instructing them in the proper approach of a prospect with the result that sales immediately began to increase wonderfully and are now at the rate of 624 per month. Since the start of the campaign February 1, a total of 876 flat irons have been sold by the one dealer and the campaign is being persistently prosecuted with greatly increased vigor.

Window-Display Contest for House-Wiring Week.

Prizes of $25, $15 and $10 will be given during the week of April 3, by the Cincinnati Electrical Show Company for the best window displays featuring electricity. This was decided upon last week at a meeting of members of the company which handled the great electrical display in connection with the celebration of Electrical Prosperity Week last fall. A week of educational newspaper advertising will also be conducted, devoted especially to the use of electricity for domestic purposes.

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National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

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A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
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Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Secretary's Message.

The secretary recently received a letter from W. A. Oswald, the secretary of the British Columbia Section. After hoping that I had not concluded the Section was defunct, he went on to say that they had been pretty hard hit. A year ago the Section had on my list 18 members and Brother Oswald states that they have six members now in the military service of the Empire; that is 33 per cent. Further, that several of the departments have had to work with reduced staffs.

He then goes on to say that on March 10 they held their annual meeting and enthusiastically resolved to keep the light burning and try during the coming year to enlarge the membership and scope.

The following officers were elected: President, C. H. Fletcher, city electrician, Vancouver (re-elected); vice-president, T. C. Duncan, city electrical superintendent, Prince Rupert, B. C.; secretary-treasurer, W. A. Oswald, Vancouver (re-elected); J. C. Digby, chief electrical inspector of New Westminster, was elected to represent the Section on the Executive Committee of the National Association, in place of Mr. Hubbard, retired.

I feel sure that under the circumstances no one could criticize our brothers of British Columbia for inactivity. We all realize and sympathize with them in the difficulties under which they labor and I am sure that we all should like to be near enough to encourage the members of Section No. 1 personally.

I wish to remind the section secretaries that the annual fees are now due, and the members at large that their dues for 1916 are due April 1.

I intend to write the section secretaries shortly, and should have before this had it not been for a rather severe trouble with my eyes which is only just beginning to clear away.

As to the two questions published herewith, it may be noted that Question 320 came from New England, and Question 321 from west of the Mississippi. Question 321 was received last November and Question 320 in January.

I was just going to print Question 321 when Question 320 came in, and as the latter part of this was closely related in subject matter I decided to wait and print the two together.

I desire particularly to call the members' attention to Answer 11 to Question 320. It was the result of considerable thought and study on the writer's part, who at my suggestion amplified his original reply and looked into the matter quite carefully.

Rules on Grounding.

Question 320. Please interpret the exact meaning of Rule 12*f*, third paragraph, on page 24 of 1915 Code, under various combinations of possible ground sizes.

Also, what size of ground wire should be used for grounding an 800,000-circular-mil cable to a 1.5-inch galvanized-iron water pipe?

Answer 1(P)*. The rule says nothing about grounding sizes. The service conduit must be effectively insulated or grounded; if the latter it must have its own ground wire installed as prescribed. Rule 15*d* gives the sizes of ground wires under different conditions.

(Secretary's note: It is obvious that the writer has failed to notice that the gentleman who sent in this question really embodied in one question two distinct matters. It will be noticed that several others have made the same slip.)

Answer (2S)*. Rule 12*f*, sixth paragraph states that the conduit ground must be at least No. 6 wire. The third paragraph of this rule states that this ground wire is to be independent of and in addition to any other ground wire on metal conduit, etc. Conduit systems, other than the service conduit, should be grounded as required by the rules for such systems. See Rules 27*c*, 28*f* and 29*d*.

If the secondary is not to be grounded, the above will ground the conduit systems as required by the Code. If there is a secondary ground required and same is installed according to Rule 15, the service-conduit ground wire may be connected to the secondary ground wire and one ground wire is all that is required for both. Do not overlook the fine-print note under Rule 12*f*, which states that the ground on the conduit system is not to be considered as a ground for the secondary system.

Answer 3(B)*. The portion of Rule 12*f* referred to in this question plainly states that ground wire must be of copper, at least No. 6 B.&S. gauge (where largest wire in conduit is not larger than No. 0 B.&S.) and need not

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be larger than No. 4 B.&S. where the largest wire in the conduit is larger than No. 0. It would therefore appear plain that a No. 4 wire under the rule would be satisfactory for the grounding of a service pipe within which was an 800,000-circular-mil cable.

Answer 4(F and G). Our interpretation of Rule 12*f* is that the service conduit, i. e., "that portion of conduit between the outside source of supply and the first cutout inside the building," should not be in metallic contact with any other metal work or piping in or on the building, or if in contact therewith should have a *separate, independent* ground to water or gas piping or other suitable ground.

A ground wire attached to metal piping need not be of greater capacity than that of the pipe to which it is attached. If the piping is not of sufficient size to protect the installation properly, then other suitable grounds should be provided. The 1.5-inch galvanized pipe mentioned would have a carrying capacity about equal to that of a No. 0000 B.&S. gauge wire of copper. This latter would require about 4,500 amperes to fuse it, therefore it would appear to be of ample size to protect an 800,000-circular-mil cable properly.

Answer 5(B)*. Where a larger ground wire than can be suitably handled by an approved ground clamp is used, the matter should be left to the inspector's discretion. If the water pipe is the only available ground, the correct procedure would be to use a ground wire equivalent to the safe carrying capacity of the pipe. This might be estimated approximately in this case as a 350,000-circular-mil ground wire.

Answer 6(D). Part 1. Use No. 6 B.&S. Part 2. Use No. 4 B.&S.

Answer 7(H)*. Use No. 6 B.&S., if wire in pipe is No. 0 or smaller. Use No. 4 B.&S., if pipe contains anything larger than No. 0. I should find a larger ground. I do not believe ordinary galvanized 1.5-inch water pipe would carry sufficient proportion of current for which 800,000-circular-mil copper would be used.

Answer 8(O). The only portion of Rule 12*f* which might need interpretation seems to be the sixth paragraph, referring to sizes of ground wire. The intent of this paragraph, as I understand it, is so to fix the size of the ground wire that it may not be smaller in any case than No. 6. B.&S., and will be a No. 4 or larger in case the largest wire in the conduit is greater than No. 0. However, the expression used "need not be greater than No. 4" does not prohibit a No. 6, although I think said prohibition was intended where there is a service wire in the conduit larger than No. 0.

In answer to the second part of the question, if the cable is part of an alternating-current system, the ground wire should not be less than No. 6, which applies also if the cable is the neutral of a direct-current system and the ground is not at a central station. If it is a direct-current neutral at a central station, the ground wire must, according to Rule 15*d*, be 800,000 circular mils.

Answer 9(T). By referring to Rule 12*f*, sixth paragraph, one will find the required ground-wire sizes; according to this the ground-wire size would be No. 4 B.&S. gauge.

Answer 10(N)*. The first part of this question is really comparatively simple. We may have:

A. Service conduit entering building underground through basement wall, ending in an iron box containing service fuse and switch; thence conduit running to an iron cabinet containing meter, and from this sub-mains in conduit running to several distribution centers.

B. Service conduit entering service cutout box as above, but the wires then running exposed to meter board and then entering the building conduit running to the distribution centers.

C. Service conduit running up to the meter, meter exposed, conduit beginning again on house side of meter.

D. All wiring in building beyond the service cutout, knob and tube or exposed, etc.

A^1, B^1, C^1, D^1, which are duplicates of the first four, except that the service conduit begins somewhere near the eaves, comes down the face of the building and enters near the sill.

Case A and A^1: service conduit must be grounded.

Case B and B^1: service conduit *need* not be grounded.

Case C and C^1: service conduit must be grounded because it extends beyond the service cutout box and this latter portion is building conduit.

Case D and D^1: service conduit need *not* be grounded.

It should be noted that Rule 12*f*, third paragraph, makes no exception as to whether the service conduit enters via a trench or from overhead. This I presume is because dry earth about the pipe could not be trusted as a ground in such a case, as running through ordinary fill alongside a house, a made lawn, across sidewalk and up the pole on the street side of walk.

Suppose now that in Cases B^1 and D^1, both of which do not require grounds normally, the conduit should touch copper piazza roofing, metallic gutter about a bay window, metallic rain conductor at corner; in any of these cases we *must* ground the conduit. The same would be true in case the service conduit touches any metallic work of any kind inside the building. Note also case where open service cutout is looped round by a bridging conduit ground wire.

As to the size of this ground wire it is given in section 6. In the suggested change presented at New York last March in the "Report of Committee on Grounding of Conduit" the wording was "Ground wires must be of copper, at least No. 10 B.&S. gauge, etc." My notes contain the statement that this was changed to "at least No. 6, etc." with the names of several gentlemen who spoke on the matter and a precis of their remarks.

As to the second part of the question; there are two cases where the ground wire would have to be 800,000-circular-mil copper; namely:

A. Where the cable was the neutral of a direct-current system at a station.

B. Where it was one leg of a three-phase system.

In other cases there is implied a considerable leeway, the only specification being a definite *lower* limit of No. 6 B.&S.

The 1.5-inch pipe is almost exactly the equivalent in area of a No. 0000 copper wire.

The specific heat of iron is about 20 per cent higher than that of copper.

By the data in "Herrick's Handbook" it appears that 0.6 ampere will cause 1 millivolt drop in 8 feet of 1.5-inch iron pipe (wrought-iron welded).

No. 0000 copper requires 2.6 amperes to give a similar drop, and is allowed, rubber-covered, 225 amperes.

The 800,000 circular mil is allowed 550 amperes.

The allowed current will give in 8 feet of the copper No. 0000 a drop of 87 millivolts; watts developed, 19.6.

In the iron pipe this same current will give a drop of 275 millivolts and the watts developed will be 84.4; on account of the specific heats however we should take the ratio as 19.6:67.5.

Further, the heat is radiated from a surface in the case

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of the wire proportional to 1.78, and in case of the pipe to 6.08.

That is, the heat in the case of the iron to be gotten rid of is 3.44 times that in the case of the copper and the radiating surface is 3.41 times as much. This is practically the same and since the iron will be in cool close-packed earth and most of the time contain water in circulation it is perfectly safe to conclude that it will handle anything which a ground wire up to the capacity of this cable will demand.

We must, of course, consider the potential drop which might run up to 1 volt in 10 feet (550 amperes allowed on 800,000-circular-mil cable) which it is conceivable might sometimes, somewhere, be a cause of difficulty.

The above has been figured on the supposition of direct-current working. If, however, it is an alternating-current circuit, we must consider "skin effect." The thickness of the pipe wall is 0.37 centimeter Cohen states:

"For iron conductors, even for comparatively low frequencies, the current flow is limited to very thin surface layers," and he gives depth of penetration for a frequency of 50 cycles as being 0.07 centimeter, while for copper it is practically 10 times as great, even at 100 cycles. Thus it is obvious that the resistance under alternating-current at 60 cycles would be much increased, for whereas the whole cross-section of the metal pipe wall is 0.80 inch, the effective alternating-current area is but 0.20, one-quarter as great.

Hence, the watts would be increased about from 84 to 336, and the millivolts drop also in the same proportion. Questions of reactance drop have not been considered.

I feel that the whole matter of the carrying capacity of pipes leading into buildings needs inquiring into and very much doubt the premises we are accustomed to go upon; that is, in the case of large services.

Answer 11(E). There are two questions included, the first of which should not be answered, or even considered, without the open book, the National Electrical Code, before us. Should either of my answers appear to be wrong, I do hope someone will rise up in open meeting and, through this Question Box, say so, as I have a large and active territory and a wrong interpretation of a rule, on my part, will react on a number of installing contractors. If you feel that I am wrong, please help the contractors who may suffer.

The first question concerns the use of conduit for the service wires and the various combinations possible and ground-wire sizes.

May I call attention to the wording of the first sentence in the third paragraph of Rule 12*f*? Here we will find that we must either insulate the service conduit from all metal in or on the building, or we must ground the service conduit. Suppose we should have an installation in a frame building. Suppose again, that the service wires from the pole line were attached to insulators secured to the building at the second or third floors and that the service wires, from the insulators, were in conduit and the conduit entered the first floor, then we should find that the service conduit would be insulated from everything and it would not be necessary to ground it. If, however, under the above described conditions, the conduit should enter the frame building in the cellar, I would suggest that the conduit be grounded because of our inability to keep away from ground should the conduit be grasped by a human hand, the person standing on the earth, and the conduit being one side of the system because of a breakdown of the insulation on one of the conductors.

As concerning the application of the suggestions contained in the sixth paragraph of Rule 12*f* some have thought that the requirements of No. 6 B.&S. gauge wire, as a ground wire for the service conduit, is a misprint. A reference to the *Bulletin*, considered at the last open sessions of the Electrical Committee of the National Fire Protection Association, will show two suggestions for a change in this rule, one for the use of No. 10 wire and the other for No. 6 wire. The notes of the writer show that the rule as it now appears in the Code is correct. During the discussion it was brought out that the wires in the conduit were without protection, other than the primary fuses and that No. 10 wire might not be large enough to properly care for the possible inrush of a great current. Should the largest wire in the conduit be larger than No. 0, then we should urge the use of No. 4 B. and S. gauge as a ground wire.

Following this paragraph is a fine-print note which I fear, has confounded some. We should bear in mind that fine-print notes are not rules. (See first paragraph of General Suggestions.) This fine-print note does not say that the ground wire for the service conduit cannot be connected to the ground wire of the secondary system, but it does say, in the form of a suggestion, that the ground on the conduit system is not to be considered as a ground for the secondary system. So, if it be necessary to ground the service conduit, it must be independent of the ground for the conduit, armored-cable or metal-molding system, but may be attached to the ground wire for the secondary system.

The second part of the question, concerning the size of conductor to be used in grounding an 800,000-circular-mil cable, is somewhat indefinite in that it does not state the character of the installation or system. If it was a single-phase or a two-phase system we would suggest that use of No. 6 B. & S. gauge. If, however, it was a three-phase system we would then suggest a wire as great in size as the largest wire in the system. I have been asked a question somewhat similar to this when the water piping, into the building, was not comparable in size and conductivity to the largest wire in the system. My answer to such a condition was to provide a suitable ground should the suggestions found in section *f* and *g*, Rule 15, prove inadequate.

Size of Ground Wire.

Question 221. Rule 15d, second paragraph, is causing me difficulty. I have a 2,500,000-circular-mil cable and the only available pipe is equivalent to about 1,000,000 circular mils; should a 2,500,000-circular-mil ground wire still be required?

Answer 1(U). Use the 2,500,000-circular-mil wire and provide a ground of sufficient size.

Answer 2(R)*. Provided the pipe (equivalent to 1,000,000 circular mils) is the *only* available ground, the additional 1,500,000 circular mils in ground wire is useless.

Answer 3(S)*. Yes. If the pipe is not of proper size, the ground should be reinforced with a ground plate, as called for in Rule 15*g*.

Answer 4(F and G). It would be of no value to use a ground wire in excess of the carrying capacity of the pipe.

Answer 5(A)*. Rule 15*d* reads very clearly and I can see no reason why the size of the wire should be changed.

Answer 6(O). According to the literal construction of Rule 15*d*, second paragraph, the ground wire *must* be of the same size as the circuit wire. In cases where, owing

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to the large conductors in use, it is impracticable to install a ground wire of the same size as the conductors, I should judge the same result should be obtained by installing a number of ground wires connected to different grounds, the aggregate current carrying capacity of the ground wires being equivalent to that of the conductor.

Answer 7(T). Yes, if full compliance with the intent of this rule is contemplated.

Answer 8(M). If the size of the circuit wire is 2,500,000 circular mils, the size of the ground wire must be the equivalent in size of the same (or within a reasonably narrow margin).

Answer 9(N)*. The rule and section quoted allow no alternative, hence the ground wire must be 2,500,000 circular mils. This will throw the whole burden upon the pipe.

I judge the circuit would be allowed about 1,500 amperes. It might be 25 cycles or 60 cycles; nothing is said and the question is indefinite to this extent. If the pipe is the equivalent of about 1,000,000-circular-mil copper (allowed say 1,000 amperes) the pipe might take somewhere from one-fourth to one-half as much. If the pipe lacked water flow I think the allowed line current might destroy it, not possibly if close-packed with damp earth, but if the trench fill had settled away from it somewhere.

I feel that the pipe should be reinforced with several well separated, carefully made grounds.

The whole matter of secondary grounds on water pipes in the case of large-capacity circuits, especially polyphase power circuits as this presumably is, is I feel a matter about which there is little or no reliable information, and which might well repay careful research, as would also the whole subject of conductivity of conduit installations in buildings. I suspect we are really pretty much in the dark and taking some things altogether too much for granted.

Testing Underground Cables with Direct Current.

During the second week in February the Institution of Electrical Engineers, both at the London (England) meeting, and at three of the provincial sections, considered a paper by O. L. Record, on the testing of underground cables with direct current. He explained the object of testing cables after laying, submitting them to a high-tension test, not to verify the dielectric qualities of the insulation, such qualities having been amply proved by the test at the factory during manufacture, but to insure that the cable and the boxes, when laid, are in good condition. This high-tension test becomes of so much the more, and a low-tension test of so much the less value, as the working voltage at which the cable will operate is raised.

As a rule, after having been laid, the cable is tested at double the working voltage. Up to the present, for the want of static apparatus of sufficient power for this test, transformers have been used, or occasionally alternators connected direct to the cable. This, said Mr. Record, is easy, when it is merely a question of testing a short network having a length of one to two miles, for example, to work at a pressure of, say 5,000 volts or less, when the corresponding test pressure will not exceed 10,000 volts. The charging current at a frequency of 50 cycles only reaches two or three amperes, and a transformer rated at about 20 kilowatts will be sufficient.

The question becomes complicated when it is a matter of testing, for example, at 40,000 volts, a network extending to something like 12 miles. The charging current might then reach as much as 27 amperes, corresponding to a power of 1,000 kilovolt-amperes. The dimensions of such a transformer can be imagined.

Mr. Record reviewed the difficulties in testing with alternating current, after laying, and the advantages of the direct-current test. By means of the latter electric supply authorities can as often as desired repeat their tests without raising the opposition of the cable manufacturers, and they can test at one and the same time, if not their whole network, the total insulation of which might be too low, at least all the feeders. In virtue of the maxim, "Necessity is the mother of invention," there have been produced in the course of the last few years various types of apparatus of a practical nature for carrying out such direct-current tests. One type of apparatus—the Delon revolving contact maker—of the Société Française des Cables Electriques, was described in some detail, and a brief account was given of the Abraham-Villard electrostatic voltmeter for measuring directly the difference of potential.

The Electric Locomotive.

F. W. Carter read a paper before the London Institution of Civil Engineers on January 11, entitled "The Electric Locomotive. Mr. Carter said that the electric locomotive for use on main-line railroads had already reached a high state of development in countries where conditions were favorable to electrical operation. The number of distinct types that had been developed was large and it was somewhat difficult to classify them simply and satisfactorily. Development had taken place along two lines, one based on tramway experience and the other on steam locomotive practice. Electric locomotives suitably controlled were capable of making very efficient use of their adhesive weight for developing drawbar pull and on this account electrical operation often showed to advantage where gradients were long and steep. Where such conditions prevailed the question of the return of energy to the source by using the motors regeneratively became of interest.

Electric locomotives admit of a primary division into two groups, those in which the axles are driven independently and those in which they are coupled and driven collectively. With a few exceptions these two groups correspond with the continuous-current and the alternating-current systems of operation respectively. With the exception of the Pennsylvania Railroad locomotives, all important side-rod locomotives had been designed for alternating-current systems. With the exception of the Norfolk & Western locomotives, all driving through jack shafts had been designed to use single-phase commutator motors; with the exception of the later Lötschberg locomotives, all driving through Scotch yokes employed polyphase motors.

Two methods were used for driving the axles independently, the geared and the gearless; unless the driving was arranged to be effected through a spring-supported quill both methods added to the dead weight carried by the axle; the amount of the additional weight was of interest from its bearing on the maintenance of the parts. Collective driving through side rods assumed several forms, but all resulted in considerable strains in the structure. Where the locomotive was driven by motors of uniform torque the main driving forces caused alternating stresses of low frequency in the structure, but where the driving torque was impulsive the resultant frequency became comparable with the natural frequencies of vibration of some of the parts and at certain speeds destructive vibrations were liable to be set up from resonance between the frequency of the main driving torque and the natural frequency of vibration of some part or parts.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Lee Electric Water-Heater.

The unity load-factor so keenly sought by central stations is one of the primary features achieved in the design of the Lee electric water-heater recently placed on the market. The undesirable load feature and operating cost of the instantaneous water-heater has been entirely overcome by the advent of this continuous-use domestic appliance.

The most popular sizes in use are the single-heat elements of 500 and 750 watts, although the line is completed with 1,500 and 2,000-watt sizes with three-heat control.

Electric Water-Heater

Inasmuch as these are insert water-heaters and are practically of 100 per cent efficiency, the most desirable results are obtained. All the energy supplied to the unit is dissipated in the water in the form of heat without loss. A number of tests made by various laboratories show that water can be had at various hours, ranging in temperature from 110 to 185 degrees Fahrenheit, or approximately 45 gallons every 24 hours at a temperature of 115 degrees (bath temperature), which is more than enough for the average household.

In construction the water-heater is like a pipe or rod 1.25 inches in diameter, 56.5 inches long, and threaded for one inch at the top, so that it is only necessary to insert this unit through the standard opening in the top of any ordinary range tank. This rod is filled with an insulating, non-oxidizing fluid in which is submerged the open resistance coil or heating element, a construction similar to that of Lee electric radiators, which were described in these columns not long ago.

The Lee Electric Radiator Company, Peoples Gas Building, Chicago, Ill., furnishes this device complete with a special heat-resisting cover for the tank. This retains and conserves the heat, so that every heat unit supplied by the electric current continuously is stored in the water and made available when necessary.

Another 15,000-Horsepower Motor for a Reversing Rolling Mill.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has sold to the National Tube Company the electrical equipment to drive a new 40-inch reversing rolling mill which it is about to install in its plant at Lorain, O.

This rolling mill, when completed, will be one of the largest in the country. The reversing motor will develop 15,000 horsepower and will run at a maximum speed of about 120 revolutions per minute. The power for this reversing motor will be supplied by a flywheel-motor-generator set which will be so controlled that the load on the power plant will be limited to approximately 3,000 kilowatts.

One of the novel features of this equipment is the arrangement made to allow the reversing motor to be turned over slowly for setting up the mill without running the flywheel-motor-generator set.

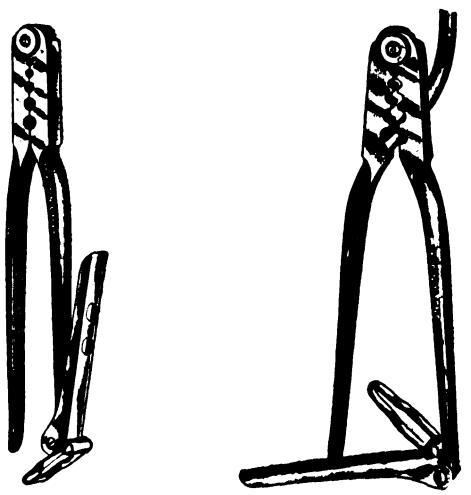
A sale of a similar equipment has been made to the Indiana Steel Company, which has purchased Westinghouse electrical equipment to drive and control a new 40-inch reversing blooming mill that is to be installed in its plant at Gary, Ind. The capacity of the reversing motor will be 15,000 horsepower and it will be supplied with power by a flywheel-motor-generator set.

In addition to these two units the Westinghouse company is at present building the electrical equipment for four other reversing mills, two of which are approximately the same size as those mentioned above. One of these was briefly described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 22, 1916.

The Leverlink, an Attachment for Splicing Clamps.

A unique attachment for splicing clamps, known as the "Leverlink" is being marketed by Mathias Klein & Sons, Chicago, Ill. It is in the nature of a very desirable improvement which will undoubtedly prove a welcome addition to the "Connector" family. Its function is to clamp the handles, once the jaws are in place over the wire, which is thus held securely during the operation of splicing. The "Leverlink" has a universal adaptation, being made for attachment to any standard size of clamp. It is riveted to one handle of the clamp in such a manner as to allow the link to slip over the other handle. (See Fig. 1.) Pressing down on the lever locks the link in place and holds the handles of the clamp securely together, causing the jaws to grip the sleeve or wire like a vise.

Another method of using the "Leverlink" is illustrated



Figs. 1 and 2.—Two Methods of Using the Leverlink Attachment for Splicing Clamps.

in Fig. 2. The lever may be thrown around to the position usually occupied by the link. It is provided with a series of holes, and after the wire has been gripped, the lower handle is slipped through one of these holes, thus locking the grip and holding the wire securely, as before.

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Universal Generating Set for Isolated Service.

For use in places remote from the lines of electric power companies, small self-contained generating sets are frequently required. A set of this type, upon the perfection of which a great deal of time and effort have been spent, is that made by the Universal Motor Company, Oshkosh, Wis. This company has been in the business of manufacturing internal-combustion engines and generating plants

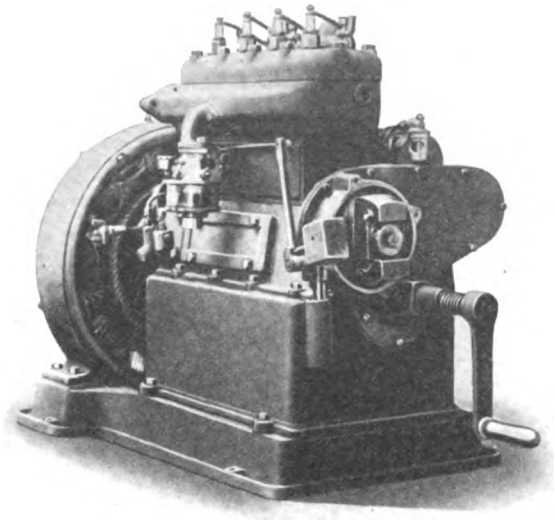

Fig. 1.—Universal Four-Kilowatt Generating Set.

for some 20 years, and the plant illustrated and described herewith is the result of long and fruitful experience. The engine is of the gasoline type and is direct-connected to the generator, the rating of the set being four kilowatts. The design of the engine is very compact and incorporates many features especially developed for use in a set of this type. The engine is a four-cylinder machine, thus giving a very uniform torque, which is evident from the fact that no flywheel is necessary, the armature of the generator being the only rotating mass. The set is very steady in

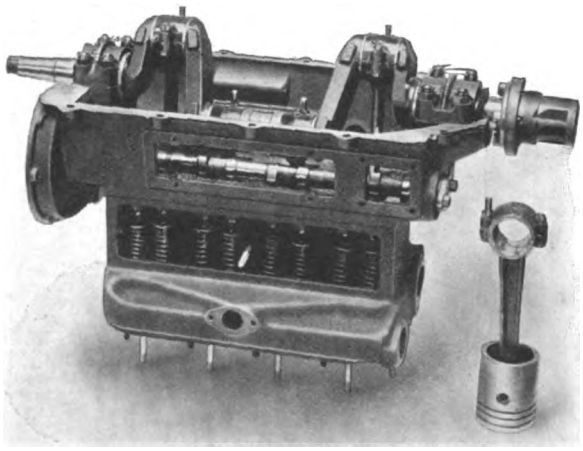

Fig. 2.—View of Engine Partly Assembled.

operation, due to three principal causes: the balanced four-cylinder design, the sensitive oil-bathed governor and the dashpot control. The engine is well housed in and is exceptionally quiet running.

A view of the complete set is shown in Fig. 1, which gives a good idea of the sturdiness and compactness of the general design. Fig. 2 is a view into the interior of the engine which for this purpose before complete assembling has been inverted to disclose the arrangement of the crankshaft and other internal parts. The engine is provided with a starting crank, but an automatic starter can be furnished if storage batteries are used as auxiliary.

The generator is a direct-current machine and designed for whatever voltage is best suited for the conditions. In most cases 32 or 64-volt sets are employed, but for some purposes 110 volts is preferred. This set is also made with flywheel arranged as a pulley for belt driving to the generator, or to any other machine in which mechanical power is to be used directly. As a rule no storage batteries are used with these sets, although they may be installed as an auxiliary, if desired. The size chosen (four kilowatts) has been determined as being the one best suited for average requirements.

Among the uses for which these sets are employed are country-house and summer-resort lighting, lighting of club houses, current supply for motion-picture theaters, lighting of yachts and large motor boats, searchlight work, wireless-telegraph equipments, vehicle charging and miscellaneous battery charging in garages.

Practical Tests of Insulators.

The accompanying illustration (Fig. 1) shows an Ohio Brass Company's three-piece, 35,000-volt, pin-type insulator as it was flashing over on 150,000 volts. This is an example of a practical test made with a high-frequency oscillator.

The oscillator used has an output of 160,000 volts at 200,000 cycles, with an input of 110 volts at 60 cycles, and

Fig. 1.—Flashover Test on Insulator.

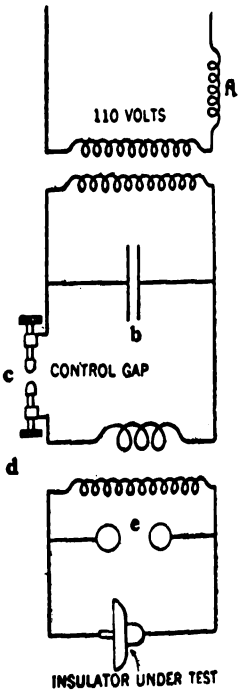

Fig. 2.—Test Circuit.

consists, as shown in Fig. 2, of a 60-cycle, step-up transformer, a condenser, *b*, shunted across the terminals of high-tension winding of this transformer; an adjustable spark gap, *c*, an oscillation or coreless transformer, *d*, the low-tension winding of which is in series with the high-tension winding of the first transformer and adjustable spark gap.

The condenser is charged, and is in turn discharged through the gap, and the coreless transformer, setting up high-frequency wave trains very similar to those experienced in actual transmission under operating conditions. By duplicating line surges and lightning discharges, insulators are subjected to the same stresses they will have in service. The insulator to be tested is placed in series with the high-tension winding on the coreless transformer and the voltage at this point is measured by means of an adjustable sphere gap shown at *e*

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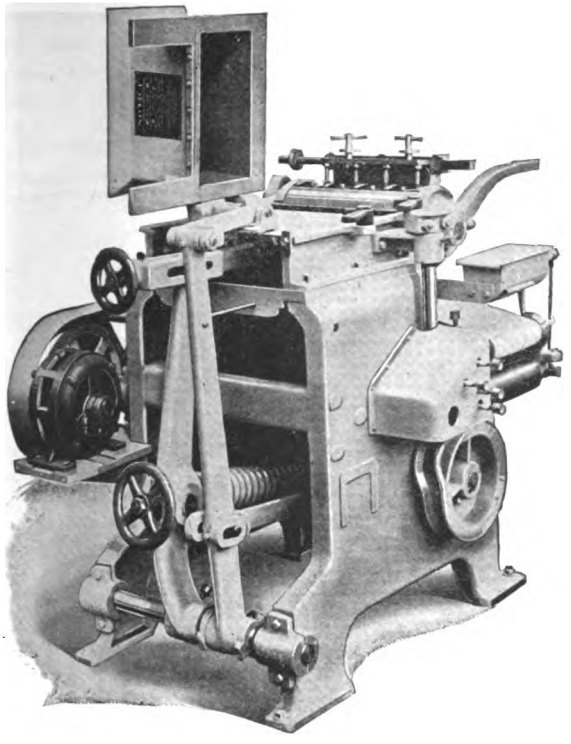
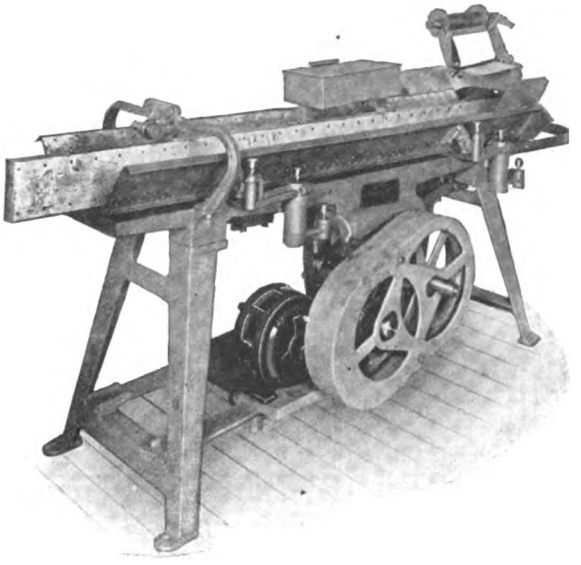


Motor-Driven Dough Divider.

The dough is placed in the hopper at the top of the divider, from where it falls into a square box. It is then forced into a cylinder where a knife blade cuts it into loaves. This mechanism can be set to cut loaves of any size. After the cutting operation, the cylinder revolves through a half turn and when in the downward position



Motor-Driven Dough Rounder.

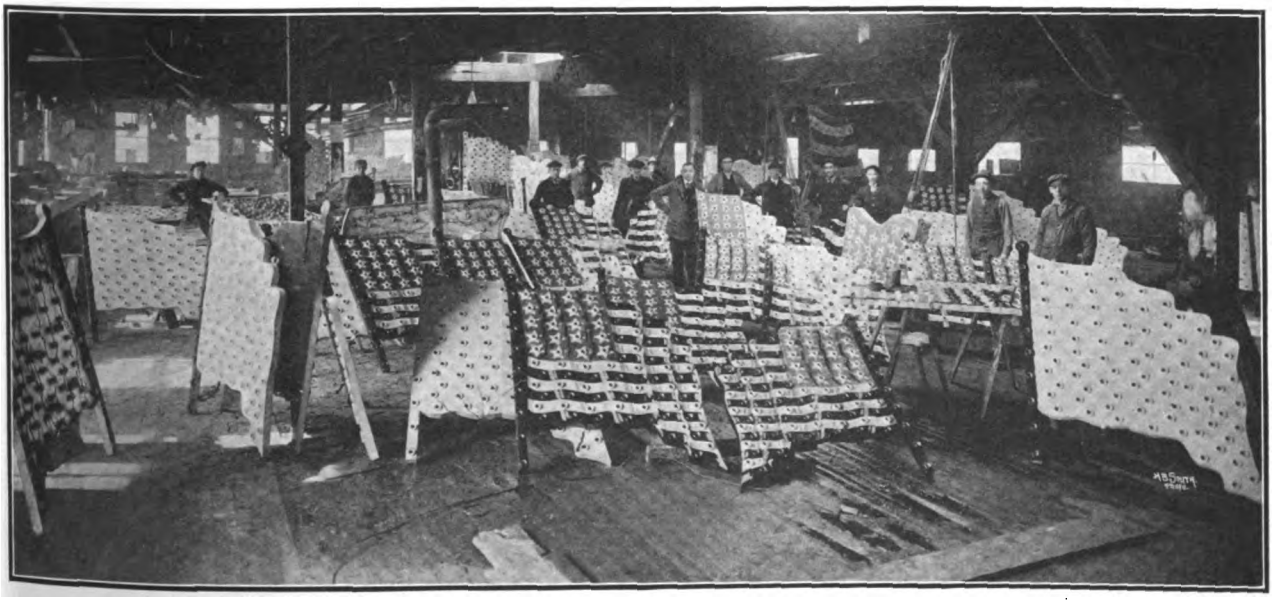
Electrically Operated Bakers' Machinery.

The cleanliness of electric drive adapts it admirably for service in the bakery which makes any pretense at meeting the modern demand for sanitary methods.

A complete line of electrically driven bakers' machinery has recently been developed by the American Bakers Machinery Company, St. Louis, Mo. Two of these machines, the dough divider and rounder, are shown in the accompanying illustrations.

the loaves fall onto an automatic conveyor which carries them to the rounder, where the loaves are shaped up ready for the oven. The divided is made in capacities of 1,800, 2,700 and 3,600 loaves per hour, thus meeting the needs of even the largest bakeries.

Both machines are equipped with Robbins & Myers motors, which are connected through gears. Both the divider and rounder are so constructed that all parts which come in contact with the dough may be easily removed for cleaning.



A View in the Valentine Electric Sign Factory Showing Old Glory Signs.

The Valentine Electric Sign Company, of Atlantic City, N. J., writes as follows regarding electric flag signs: "Our orders for this sign have now reached the thousand mark, coming from every part of the United States, more particularly from the smaller cities than the larger ones and from our inquiries we judge there will be far more sold in the next two or three months than have been heretofore. The flags are made of heavy galvanized sheet steel over angle-iron frames, in exactly the same manner and same equipment as other electric signs. Our flags are all finished in hard enamel colors, the great advantage of which is that even after exposure to the elements, soot, street dirt, etc., they can be wiped off with a damp cloth. The flags sold by ourselves and other manufacturers already represent an entirely new market for hundreds of thousands of lamps, to say nothing of renewals and at the same time being a steady revenue producer for the electric lighting companies. They have been installed in every kind of conceivable place, including public buildings, churches, lodge and meeting rooms of all sorts, factories, picture and legitimate theaters, gymnasiums, in corridors of office buildings and even in private homes. In several different cities public-spirited men and women have bought one or more flags and donated them to public schools, homes of various kinds, women's clubs, etc. There is practically no limit to the sale of these flags and every flag sold aids in the sale of another one."

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INDUSTRY ACTIVITIES

George Cutter Company, South Bend, Ind., has issued Catalog No. 13, a 64-page illustrated booklet on street and industrial lighting fixtures.

Crouse-Hinds Company, Syracuse, N. Y. has issued Condulet Bulletin No. 1000F, on fused service-entrance condulets, list prices and discounts being given.

Benjamin Electric Manufacturing Company, Chicago, Ill., has issued a discount sheet applying to its catalog B-21 and subsequent circulars, and effective March 27, 1916.

Main Electric Manufacturing Company, Pittsburgh, Pa., has prepared an illustrated folder showing illustrations of some of its installations of isolated electric lighting and power plants.

Gantz & Leist Electric Company, Cincinnati, O., has issued catalog sheets showing low-speed motors and generators, and high-current motor-generator sets and generators for the deposition of metals.

Schweitzer & Conrad, Chicago, Ill., has issued Bulletin 1A, on extra-high-potential fuses; Bulletin 4, on high-capacity primary cutouts, and Bulletin 5, on type "H" automatic resistance horn arresters.

The Crocker-Wheeler Company, Ampere, N. J., has awarded a contract for the erection of a three-story, reinforced-concrete addition to its plant, about 80 by 100 feet in size, to the American Concrete-Steel Company, Newark, N. J. The structure will cost about $60,000.

The Electric Storage Battery Company, will move its branch office in St. Louis, Mo., April 1, from the Fullerton Building to 1508 Federal Reserve Bank Building. The change is necessitated because of business increases in that territory, which demand larger quarters.

L. O. Beard, an expert watch and clock maker, who for 10 years was connected with one of the largest factories in the United States specializing in electric clocks, will soon open a factory of his own in Lancaster, Pa., for the manufacture of an accurate electrically operated timepiece, perfected by himself.

Minneapolis Electric & Construction Company, Minneapolis, Minn., manufacturer of electrical appliances, is experiencing an increasing demand for its products. Inquiries have been received recently from Odessa, Russia; England, New Zealand and other foreign countries for its patented wire-measuring machine.

Carroll Electric Company, jobbers of electrical supplies and machinery, Washington, D. C., has moved its offices, retail store, and warehouses to the company's new building at 714 Twelfth Street, N. W. The new retail supply store is complete in its appointments, and represents in equipment the result of years of experience in the electrical jobbing business. The company carries a complete stock of supplies, machinery and machine supplies, and does business throughout the South.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued catalog section IP45, on modifications of standard type CS motors, involving motors adapted for conduit wiring, idler pulley, back gearing and other changes; 20-page folder, on installations of Westinghouse switchboards, showing some switchboard, control-desk and switching equipment in recent power developments.

Bright Star Battery Company, manufacturers of Mars-Bright flashlight batteries and the Watchlite, 430 West Fourteenth Street, New York City, has established a branch office in San Francisco, Cal., with Nicholas Abrams as representative. A stock will be carried there to care for the requirements of the trade in that part of the country, placing the company in a position to give the same prompt and efficient service given in the main office in New York City and the branch in Chicago.

Holtzer-Cabot Electric Company, Boston, Mass., is distributing an attractive booklet containing the history of the company since its origin in 1875. The growth of the company during the intervening years has necessitated frequent removals to larger quarters and in 1915 the company moved into its new factory at Roxbury, a six-story reinforced concrete structure containing 148,000 square feet of floor space. The extent of the property is sufficient to allow for additional buildings many times greater than the one just completed, so it is felt that so far as the present generation is concerned, the future expansion of the company is amply provided for.

Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill., manufacturer of "Violetta" high-frequency generators, has prepared a booklet, which will be sent to all interested, dealing in a clear, understandable manner with the history of violet-ray high-frequency electricity for medical purposes. A considerable portion of the text is devoted to specific instructions for treating various ailments, illustrations being included wherever possible. Testimonials from physicians and users indicate a wide popularity for the Violetta which is now being exhibited in display rooms of a number of central stations. Included in the booklet are descriptions and prices of various combinations of electrodes for treating the scalp, face, throat, body, etc.

Hemming Manufacturing Company, Garfield, N. J., manufacturer of heat-resisting molded insulation, has ready for distribution a very attractive booklet which is of particular interest as it not only deals with the well known products of the company but embodies a pictorial description of the manufacturing processes involved in the production of molded insulation. The plant of this company, which is devoted exclusively to the manufacture of heat-resisting molded insulation, contains 40,000 square feet of floor space and from the views shown in the booklet it is evident that every facility has been provided for efficient and economical operation. An engineering department and a research laboratory are important features of the plant. A rather complete line of connector plugs, sockets, receptacles, heating-device parts, etc., are illustrated, as well as other molded insulation not strictly for electrical use.

Norton & Bird, engineers, have taken into partnership Ezra B. Whitman, of Baltimore, Md., and in addition to their office at 111 West Monroe Street, Chicago, will open offices in the Munsey Building, Baltimore, Md., on April 1, under the firm name of Norton, Bird & Whitman. The firm of Norton & Bird is well known throughout the country, having been engaged in many important electric rate cases. The firm has also just completed a valuation of both the gas and electric properties of the Union Gas & Electric Company, Cincinnati, O., and among the important rate cases are those of the Commonwealth Edison Company, Chicago; New York Edison case on the behalf of the Merchants' Association of the City of New York; Indiana & Michigan Electric Company, South Bend, Ind., and the Indianapolis (Ind.) Light & Heat Company. The new firm will specialize in valuation and rate work.

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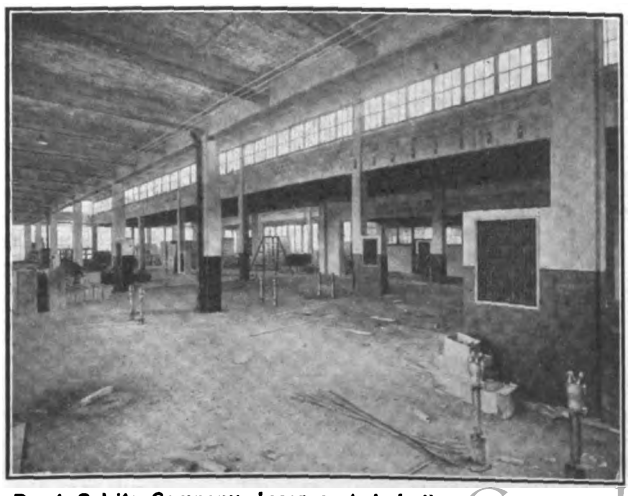
Mica Insulator Company, 68 Church Street, New York City, has issued a booklet on its Conducell method of insulating the cable joints in underground transmission systems. Each conductor is separately incased and thoroughly protected. The simple method of making the joints is explained and illustrated. The company also has published a booklet on Conduline, a compound of high insulating qualities for filling the joints of cables. It is particularly adapted for use with Conducell insulation.

Electric Machinery Company, Minneapolis, Minn., has orders on hand for more business than at any other time in the company's history. Among the larger contracts recently closed is one for two 625-kilowatt alternators, exciters and switchboard equipment for the Northwest Paper Company, Brainerd, Minn.; two 450-kilowatt alternators, one 40-kilowatt generator and accessories for the Kimberly-Clark Company's Paper Mill, Neenah, Wis.; three 6,600-volt synchronous motors for driving 250-horsepower air compressors at the Illinois Steel Company's plant, Joliet, Ill., and generating equipment for the municipal plant at Three Rivers, Mich.

Domestic Engineering Company.—The field to be covered by the Domestic Engineering Company, of Dayton, O., recently organized as a part of the Dayton Engineering Laboratories Company, was explained in detail by R. H. Grant, general manager of the new company, at a Jovian meeting in Dayton recently. Mr. Grant pointed out that there are 6,000,000 farm families in the United States, and, including them, about 70,000,000 people who are not reached by the lines of any electric company. The electric generator set manufactured by the Domestic Engineering Company is intended to meet the needs of these people. It consists of an air-cooled gas engine, direct-connected to a generator, of a size to meet the needs of farmers and others for limited power and lighting purposes. Mr. Grant stated that the company will also market electrical appliances for domestic use, such as irons, washing machines, vacuum cleaners, and the like, at least for the present, for the purpose of making its service as nearly complete as possible. As the company's business will come from persons not now accessible to the ordinary light and power company, he pointed out that it will not in any sense compete with any other concern, but will develop an entirely new field.

The Wagner Electric Manufacturing Company has begun construction on two new buildings adding to its present factory group on Plymouth Avenue, St. Louis, Mo. One building is to be 140 by 90 feet, with a 50-foot open bay spanned by an electric traveling crane, and galleries 20 feet in width on either side of the bay. The building, which will be used for punch-press operations, will be structural steel with all-metal roof and longitudinal skylight down the center. The other building will be 160 by 90 feet, of reinforced concrete fireproof construction. It will be used for various operations involving the production of small parts, including small punch-press work. The new buildings will be connected by a tunnel with the main section of the company's No. 1 plant. Contracts call for the completion of the first building by April 21 and the second by June 2. The Condron Company, Chicago, Ill., designed both buildings, and the reinforced concrete floors of the second building will be of the patented "Acme System" of that company. Nearly all the exterior wall area of both buildings is glass, which insures excellent daylight working conditions on every floor.

Prest-O-Lite Company, Incorporated, Indianapolis, Ind., has practically completed its new storage-battery building. It is 400 feet long by 100 feet wide and is the second largest building of the present factory group. It has excellent facilities for a large output and when placed in operation a production of 1,200 batteries a day will be possible; the present output of Prest-O-Lite batteries is 400 a day. Plenty of provision has been made for future expansion, although for the present every foot of floor space will be utilized to the highest degree. The building in general is one story in height with a monitor roof. There are, however, two rooms on the second floor, each 50 by 50 feet in size, one of which will be used for a welfare room, containing shower baths, lockers and lunch rooms. The other will be used for shop office and laboratory. The construction throughout is reinforced concrete. Floors in half the buildings are of concrete and the other half of brick and asphalt which are not affected by the action of acids; the roof is of reinforced concrete with a layer of rock cork under the roofing as an insulation against sun heat. Plenty of daylight is provided for, 70 per cent of the wall space being windows. At one side of the building there is a shipping platform of concrete, 12 feet wide and 400 feet long; side-track connections with two railroads are provided. On the roof of the new building there is a fan room containing a fan, air washer and steam heating coils. From this a shaft connects with a tunnel running lengthwise through the building under the floor. This is the main distributing tunnel for supplying washed, filtered and warmed or cooled air to the various parts of the building. In addition to the ample supply of washed air supplied to these rooms, exhaust fans will be installed to perfect the ventilation. Floor drains have been located at intervals of about 20 feet and numerous hose outlets are provided so that the floors can be entirely washed down every day. Wash sinks will be located at frequent intervals throughout the building and provided with mixing faucets so arranged that employees will be forced to wash in warm running water; many drinking fountains will be located about the building, supplied with cooled waters from a well 450 feet deep.



Two Interior Views in the New Storage-Battery Plant of the Prest-O-Lite Company, Incorporated, Indianapolis, Ind.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless.—Russell & Stoll Company, 48 Cliff Street, New York, N. Y.

Russell & Stoll connector, 15 amperes, 250 volts, catalog No. 95.

Listed February 16, 1916.

BOXES, Floor Outlet.—M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill.

Cast-iron, water-tight floor outlet boxes, with Hubbell receptacles and with floor plates and nozzles.

"A" 10 amperes, 250 volts, catalog Nos. 100 and 1100.

Listed February 9, 1916.

BUSHINGS, Outlet.—M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill.

Malleable cast-iron bushings, type A.

Listed February 11, 1916.

CONDUIT BOXES.—W. A. Bonnell Company, 132 Church Street, New York, N. Y.

Cast-iron boxes for armored cables and flexible steel conduits. Types A, B, C and D.

Listed February 14, 1916.

GROUND CLAMPS.—W. A. Bonnell Company, 132 Church Street, New York, N. Y.

Ground clamp, consisting of a punched copper strap, with formed soldering lug, a bolt, and two specially formed cast clamping pieces. Sizes up to 6 inches. Catalog Nos. 815, 820, 825, 830, 835, 840.

Listed February 16, 1916.

HEATERS, Electric—The Dover Manufacturing Company, Canal Dover, O.

Electric flat irons, 550 watts, 95-125 volts, two types.

Dover 6-D, with separable cord.

VEA, with attached cord. Old style.

Supplied with sheet-steel stands.

Listed February 16, 1916.

INCUBATORS AND BROODERS, Electrically Heated.—Lo-Glo Electric Incubator Company, Incorporated, 76 Greenwich Street, New York, N. Y.

Lo-Glo electric incubators and hovers. Incubators; maximum watts, 180; maximum volts, 250; catalog Nos. 500, 650, 850, 1200, 1600, 2100, 3100 and 4200. Hovers; maximum watts, 90; maximum volts, 250; catalog Nos. 200, 201 and 202.

Listed February 18, 1916.

PANELBOARDS. — Metropolitan Electric Company, 324 First Avenue South, Seattle, Wash.

Panelboards shown by tests and examinations by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached. Laboratories.

Listed February 9, 1916.

RECEPTACLES, Standard. — The Connecticut Electric Manufacturing Company, Bridgeport, Conn.

Porcelain shell, C. E. M. Co. Keyless, 660 watts, 250 volts, catalog No. 11035.

Brass shell. Key, 660 watts, 250 volts, catalog No. 12025. Keyless, 660 watts 250 volts catalog No. 12026.

Listed February 15, 1916.

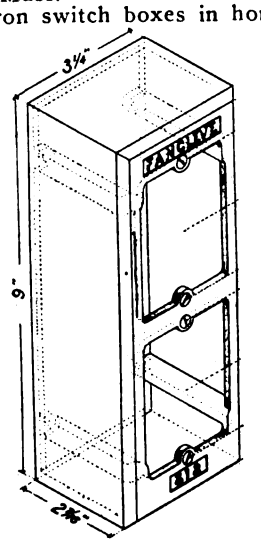
SWITCH BOXES.—M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill.

Single and sectional gang, Austin, catalog Nos. 1000-1004 inclusive.

Listed February 12, 1916.

SWITCH BOXES.—Fancleve Specialty Company, Jamaica Plain Station, Boston, Mass.

Cast-iron switch boxes in horizontal



Switch Box.—Fancleve Specialty Company.

and vertical tandem styles, Fancleve. Catalog Nos. 512-14, inclusive; 571-97, inclusive.

Listed December 31, 1915.

SWITCHES, Combination Cutout.—Connecticut Electric Manufacturing Company, Bridgeport, Conn.

C. E. M. Co. Branch-circuit panel switches, 30 amperes, 250 volts, catalog Nos. 20030 and 20130.

Knife switches with clips for 30-ampere, cartridge-inclosed fuses, so arranged that fuses lie under switch blades, connection being made through straps sealed in under side of base.

Listed February 15, 1916.

SWITCHES, Fixture.—Weber Electric Company, Schenectady, N. Y.

1 ampere, 250 volts; 3 amperes, 125 volts; with key and pull-socket mechanisms.

Brass shell. Key, catalog Nos. UA101-UA103, UA105-UA109, UA111-UA115. Candle, key, catalog Nos. UD101-UD103, UD105-UD109, UD111-UD115, UD117-18, ED201-ED203, ED205-ED209, ED211-ED215. Pull, catalog Nos. UB101-UB103, UB105-UB109, UB111-UB115, EC201-EC203, EC205-EC209, EC211-EC215, UF101-UF103, UF105-UF109, UF111-UF115, Candle, pull, catalog Nos. UE101-UE103, UE105-UE109, UE111-UE115, UE117-UE118, EE201-EE203, EE205-EE209, EE211-EE215.

Porcelain shell. Key, catalog Nos. PA301-PA304, PA309-PA310. Pull, catalog Nos. PC301-PC304, PC309-PC310, PF301-PF304, PF309-PF310.

Listed January 31, 1916.

SWITCHES, Pendant Snap.—Weber Electric Company, Schenectady, N. Y.

1 ampere, 250 volts; 3 amperes, 125 volts; with key and pull-socket mechanisms.

Brass shell. Key, catalog Nos. UA117-18. Pull, catalog Nos. UB117-18, UC117-18, through type UF117-18.

Porcelain shell. Key, catalog Nos. PA117-18. Pull, catalog Nos. PB117-18, PC117-18, through type PF117-18.

Listed January 29, 1916.

SWITCHES, Surface Snap.—Weber Electric Company, Schenectady, N. Y.

1 ampere, 250 volts; 3 amperes, 125 volts, with key and pull socket mechanisms.

Brass shell. Key, catalog Nos. UA212-UA139, UD212-UD139. Pull, catalog Nos. UB121-UB139, UE121-UE139.

Porcelain shell. Key, catalog Nos. PA321-PA334, PA337, PA339. Pull, catalog Nos. PB321-PB334, PB337, PB339.

Listed January 31, 1916.

SWITCHES, Surface Snap.—Weber Electric Company, Schenectady, N. Y.

Ceiling switches (pull type). With metal covers. Single pole, 1 ampere, 250 volts; 3 amperes, 125 volts; catalog Nos. UC121-UC139.

With porcelain covers. Single pole, 1 ampere, 250 volts 3 amperes, 125 volts; catalog Nos. PC321-PC334, PC337, PC339.

Listed January 29, 1916.

WIRES, Slow-Burning. — American Insulated Wire & Cable Company, Twenty-first and Morgan Streets, Chicago, Ill.

Tag on coil to read: "National Electrical Code Standard."

Marker: One red and one green thread *crossing* in intermediate layer of braid.

Listed February 15, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. F. O. GODFREY, formerly with Sanderson & Porter, consulting engineers, Chicago, Ill., has joined the staff of the testing department of the Public Service Company of Northern Illinois.

MR. F. W. BUCK, who has been associated with the Union Electric Company, Pittsburgh, Pa., during the past eight years, serving in the capacities of chief clerk, purchasing agent and advertising manager, has accepted a position with the Hurley Machine Company, of Chicago, Ill., and will represent that company in the Pittsburgh territory. Mr. Buck assumed his new duties April 1.

MR. C. H. UTTER, manager of the Grinnell (Iowa) Electric Light & Heating Company, has been elected a member of the board of directors and made western manager of the Iowa Light, Heat & Power Company, recently incorporated in Iowa, with headquarters at Grinnell. The latter company is the owner of 23 district electric utility companies in Iowa, including the Grinnell company, and is capitalized at $1,000,000.

MR. FRANK S. WASHBURN has resigned as chairman of the board of directors of the Alabama Power Company, Birmingham, Ala., and as a director of the Alabama Traction, Light & Power Company, the Muscle Shoals Hydro-Electric Power Company, the Alabama Interstate Power Company and other subsidiaries. It is understood Mr. Washburn will devote his time to the American Cyanamid Company, of Niagara Falls, N. Y., of which company he is president.

MR. C. S. HARRIMAN has entered the employ of the Wagner Electric Manufacturing Company in its branch office in Kansas City, Mo. Mr. Harriman was with the Home Telephone Company and the Kansas City Electric Light Company until 1913 when he was placed in charge of the contract department of the newly established municipal lighting plant of Kansas City, Kans. Since that time he has been instrumental in promoting the large industrial use of electricity in that city.

MR. ARTHUR C. KING has resigned his position as deputy commissioner of gas and electricity of the city of Chicago and has opened a consulting-engineering office in the Hartford Building, Chicago. Mr. King is a native of New York State. He was graduated from the mechanical engineering department of the University of Wisconsin in 1901, and later obtained from it also the degree of E. E. Until 1907 he was associated with the Northern Electric Company, of Madison, Wis., in various capacities, the last two years as assistant chief engineer. He then came to Chicago and represented some manufacturing interests and later took up consulting work on efficiency studies, valuations and reports. In 1911 he was associated with Mr. Ray Palmer on an electrolysis investigation in Chicago and in the next year on the Commonwealth Edison rate question. In 1913 he became deputy commissioner of gas and electricity under Mr. Palmer. During the last few years he has also made valuations of the plants of the Illinois Telephone & Telegraph Company, Chicago, and the Union Gas & Electric Company, Cincinnati.

MR. LUDWIG KEMPER, who was elected president of the Minnesota Electrical Association at its annual convention last week, is secretary-treasurer and manager of the Minnesota Gas & Electric Company, of Albert Lea, Minn. Mr. Kemper was born in 1877 in Rotterdam, Holland. He was graduated as mechanical engineer from the University of Delft, Holland, and later took post-graduate work in electrical engineering at the University of Karlsruhe, Germany. After working as an industrial engineer, in Europe two years, he came to the United States in 1902, accepting a position in the engineering department of the Pullman Company, being identified with work on electric car lighting. In 1903 he

Ludwig Kemper.

was appointed assistant electrical engineer for the Baltimore & Ohio Railroad, continuing with that company until 1905, when he became general manager of the Minnesota Gas & Electric Company. Mr. Kemper was secretary of the Minnesota Electrical Association during 1908 and president during 1911.

MR. SYDNEY O. SWENSON, formerly electrical engineer for the Kansas City (Mo.) Terminal Railway Company, has become a member of the engineering offices of Putnam A. Bates, 2 Rector Street, New York City. Mr. Swenson received his early education in the grammer and manual-training schools of Chicago, Ill., and was graduated from the University of Illinois in 1899. From the time of his graduation until 1905 he was in the engineering department of the Commonwealth Edison Company and was engaged in the general engineering work in connection with the expansion of the company during that period. From 1905 to 1907 Mr. Swenson was employed by the New York Central & Hudson River Railroad Company in the electrification of that company's road in New York City. From 1907 to 1911 he was assistant electrical engineer of the Detroit River Tunnel Company and was engaged in the engineering work in connection with the electrification of the Michigan Central Railroad at Detroit, Mich., and Windsor, Ont. In 1911 Mr. Swenson was appointed electrical engineer for the Kansas City Terminal Company and had charge of the electrical work pertaining to the new Union Station and terminal facilities at Kansas City. Mr. Swenson assumed his new position March 15, and his wide experience will undoubtedly prove a very valuable asset in the engineering offices of Mr. Bates.

OBITUARY.

MR. JOHN L. BOROUGHS, district plant chief of the Southern Bell Telephone Company, died recently at Birmingham, Ala., from injuries received in an automobile accident. Mr. Boroughs had been connected with the Southern Bell Company for 22 years.

MRS. MARY L. THOMSON, wife of Prof. Elihu Thomson, died March 19 at her home in Swampscott, Mass., aged 60 years. She was married in 1884 to Professor Thomson, who, with four sons, survives her. Stuart and Roland Thomson are connected with the General Electric Company at Schenectady, N. Y.; Malcolm Morrison is engaged in electrical work in Lowell, Mass., and Donald Thomson is a student living at Swampscott.

MR. OSCAR F. GUNZ, a well known patent lawyer of New York City, died at his home in Rutherford, N. J., aged 62 years. Mr. Gunz was born in New York City and received his education at College of the City of New York and at Hanover University in Germany. He was one of the engineers who planned the Sixth Avenue "L" stations in New York City. He was employed in the United States Patent Office for several years.

DR. C. J. H. WOODBURY, a widely known engineer, lecturer and historian, died at his home in Lynn, Mass., March 20. He was born in that city in 1851, was graduated from Massachusetts Institute of Technology in 1873, became an engineer and later vice-president of the Manufacturers' Mutual Fire Insurance Company. He was active in the affairs of the National Electric Light Association in its first decade, and made exhaustive studies of electric lighting, lubricating oils, and measures for fire prevention, during which time he was a regular contributor to this journal. In 1894 he became assistant engineer for the American Bell Telephone Company, continuing with that company until 1907. Among other organizations, Dr. Woodbury was a member of the American Institute of Electrical Engineers. For the preparation of insurance rules on electric lighting he received the John Scott medal. He held honorary degrees from Tufts, Union and Dartsmouth Colleges.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

LISBON, ME.—City officials here are considering a plan to erect a municipal power plant. While no definite plans have been made, there is talk of making a hydroelectric development on the Androscoggin or the Sabattus River.

NEW LONDON, N. H.—The Sunapee Electric Light & Power Company has installed street lighting in this town. A considerable amount of house and commercial wiring is being done.

LONGMEADOW, MASS.—This town has voted to have its streets lighted by electricity and has appropriated $3,100 for the purpose. About 210 incandescent lamps will be installed, the United Electric Light Company of Springfield furnishing the service.

NEWBURYPORT, MASS.—The Newburyport Gas & Electric Company is doing the preliminary work necessary for the construction of a large power plant to be built in the near future.

WEBSTER, MASS.—An appropriation of about $2,000 will probably be made by the Town Council. It is proposed to install 31 luminous arc lamps on ornamental posts.

PROVIDENCE, R. I.—The city's new contract for street lighting calls for the placing of all wires underground. The work will be begun in the early spring. Three miles of street wiring in the southern and southwestern part of the city will be placed underground as the first installment.

WESTERLY, R. I.—The Westerly Light & Power Company has made application to the State Legislature for authority to increase its capital stock from $700,000 to $1,000,000. Extensions are planned.

TORRINGTON, CONN. — An electric line, in which A. J. Patton & Company, of Waterbury, is interested, will be constructed during the summer between this place and Waterbury, via Litchfield, Bantam, Morris and Watertown, 22 miles, at an estimated cost of $1,000,000.

FULTON, N. Y.—The third and last waterwheel of the Oswego Falls Pulp & Paper Company's new hydroelectric plant has recently been installed. Two of the three 2,200-horsepower vertical-type waterwheels have been in operation for several weeks. The American Woolen Company is making preparations to install another waterwheel in its plant on the other side of the river.

NEW YORK, N. Y.—The Interborough Rapid Transit Company will build a one-story substation, 60 by 100 feet, on River Avenue near 162nd Street, to cost about $40,000. Plans are on file with George H. Pegram, architect, New York City.

PARKSVILLE, N. Y.—An electric generator will be installed in the new commercial building to be erected on Main Street by Edwin A. Cammen. M. J. Nadel, Newark, N. J., is the architect.

SILVER CREEK, N. Y.—The Peoples Electric Light & Power Company has submitted to the Council a proposition to furnish energy for street lighting here.

TONAWANDA, N. Y.—Application for a franchise to furnish electric service here has been received by the Town Board from the Buffalo General Electric Company.

WATERTOWN, N. Y.—An ornamental lighting system is proposed for Factory Street by property owners and businessmen.

BUTLER, N. J.—The Pompton Township Committee has granted the Butler municipal electric lighting plant a 20-year franchise to install and operate a system in the township.

HIGHTSTOWN, N. J.—The Hightstown Electric Light & Power Company is planning improvements and extensions in its system.

HOBOKEN, N. J.—The Public Service Electric Company is negotiating with the Board of City Commissioners for the installation of an underground conduit system along River Street.

NEWARK, N. J.—The Common Council has approved plans for the installation of a new semi-direct electric lighting system in the city hall. Hooper & Company are the architects.

TRENTON, N. J.—The Board of Freeholders is planning for the installation of a new electric lighting system in the county court house.

TRENTON, N. J.—Governor Fielder has signed a bill authorizing the establishment of a new white way lighting system in Trenton.

HIGHSPIRE, PA.—The Council is collecting data concerning the installation of a street lighting system in the borough.

MARION, PA.—D. S. Martin and others have applied for charters granting permission to serve this township with energy for power and lighting. Another charter for Tulpehocken township has been applied for by Mr. Martin and associates.

NEW BRIGHTON, PA.—Plans for a white way and rearrangement of the borough lighting system, which were prepared by H. O. Swoboda, consulting engineer, Pittsburgh, Pa., are being considered by the Council.

NEW OXFORD, PA.—The Town Council has granted a franchise to the Hanover (Pa.) Light, Heat & Power Company for supplying electrical energy for street lighting.

SWATARA, PA.—The Swatara Electric Company has made application to the Public Service Commission for a charter to operate here.

TOPTON, PA.—The Topton Electric Company has been organized by Laurence B. Myers for the purpose of furnishing electric service to this borough.

WASHINGTONBORO, PA.—The City Council is considering an ordinance providing for the establishment of an electric lighting and power plant here.

WAYNESBORO, PA.—A white way system on Main Street is being advocated by business men of the city.

DOVER, DEL.—The Town Council is considering an expenditure of about $10,000 for the municipal power plant. A 200-kilowatt, engine-driven generator may be purchased.

HAGERSTOWN, MD.—Plans for a white way here are being considered by city officials.

RISING SUN, MD.—A bill providing for a bond issue to pay for the construction of an electric lighting plant has passed the senate.

BELPRE, W. VA.—A proposition by the Kanawha Traction & Electric Company, P. P. Crafts, general manager, to furnish energy for street lighting and commercial purposes is being considered here.

ORANGEBURG, S. C.—The Parr Shoals Electric Power Company is planning to extend its lines to this city. Plans have been nearly completed for a municipal plant on a site near the Edisto River, but may be abandoned if satisfactory arrangements can be made with the power company.

CORDELE, GA.—C. F. Wagner, city engineer, is preparing plans for the construction of a municipal electric lighting and waterworks plant, to cost about $50,000.

JUNCTION CITY, GA.—The city is contemplating the construction of an electric lighting plant.

RINGGOLD, GA.—D. Ferriss will improve and enlarge the electric lighting plant here, which he purchased from M. L. Harris.

BROOKSVILLE, FLA.—The Brooksville Electric Light & Water Company has been granted a franchise for furnishing electric service here.

ST. PETERSBURG, FLA.—The St. Petersburg Lighting Company, G. W. Wilson, manager, will spend about $75,000 for improvements to its electric lighting plant.

WEBSTER, FLA.—Welborn, Zeller & Welborn, of Detroit, Mich., have been granted a franchise to establish an electric lighting plant here.

NORTH CENTRAL STATES.

AKRON, O.—By the decision of the United States Supreme Court affirming the rights of the Cuyahoga River Power Company to the use of the river for power purposes, as against the city, the way has been cleared for the company to proceed with its plans for the construction of a large hydroelectric plant.

CANTON, O.—The lighting committee of the City Council, Ralph Staley, chairman, expects that bids will be asked on side lighting in the downtown district within a week. Bids on electric and gas side lights of various types will be received.

GALLIPOLIS, O.—New construction is planned by the Gallipolis Light & Power Company, recently incorporated by John P. Phillips and others with a capital stock of $25,000.

LONDON, O.—The inadequacy of the city lighting plant will make necessary either a considerable amount of remodeling work, estimated at from $17,000 to $20,000, or other arrangements for securing service. The Ohio Electric Railway Company has made a proposal to sell energy to the city at a low rate, and to erect a substation with the necessary equipment in connection with the distributing system. The City Council is considering these plans, as well as offers from several sources to buy the city plant and bring it up to date.

MASSILLON, O.—Plans for a new street-lighting system are being considered by W. C. Koons, chairman of the light committee of the City Council, and by T. O. Kennedy, general manager of the Massillon Electric & Gas Company.

MT. ORAB, O.—A transmission line nine miles long and a local distributing plant will be constructed by the town, a bond issue of $4,000 having been approved for that purpose.

NEWTOWN, O.—The question of issuing $7,000 electric light bonds will be submitted to vote in April.

SPRINGFIELD, O.—It has been decided to call for bids, to be opened on April 13, for the construction of the city's new boulevard lighting system. The contract will be awarded about May 1.

TIFFIN, O.—The City Council has declared its intention of throwing open to bids proposals for private lighting in the city. This is in addition to the street lighting contract.

COLUMBUS, IND.—The Sanborn Electric Company, Indianapolis, has been awarded a contract for a new city electric light plant to be equipped and constructed at a cost of $16,000. The city is now lighting the streets and will enter the commercial field when the new plant is completed.

EVANSVILLE, IND.—Congressman C. B. Smith and a party of capitalists from Buffalo, N. Y., have been in conference with the Chamber of Commerce officials in regard to electrical service. They are interested in the project to establish a hydroelectric plant at Mt. Carmel, Ill., on the Wabash River.

UNION CITY, IND.—A new boulevard lighting system is being planned for Union City. According to plans, the white way district will include all of the business district and 60 ornamental posts are to be erected. Nitrogen lamps will be installed in the residence district.

WESTPORT, IND.—A bond issue of $5,000 has been voted for the establishment of a municipal electric lighting plant.

BLOOMINGTON, ILL.—The Bloomington & Normal Railway & Light Company, M. G. Linn, general superintendent, will build a 33,000-volt transmission line from Lexington to Chenoa, a distance of nine miles; install a substation in Lexington and rebuild the distribution system there, to operate at 2,300 volts, three-phase, stepped down to 110 and 220 volts. The company will also do some track work during the summer.

CHAMPAIGN, ILL.—The Urbana & Champaign Railway, Gas & Electric Com-

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pany, H. J. Pepper, general superintendent, is planning to install during the coming year a 2,500-kilowatt turbogenerator, 1,000 horsepower in boilers, and boiler feed pump.

CHICAGO, ILL.—Nine street car line extensions were recommended to the City Council by the committee on local transportation. These extensions probably will be ordered during the present year.

DIXON, ILL.—The Illinois Northern Utilities Company, E. D. Alexander, vice-president, has recently completed a transmission line from Capron to Poplar Grove, the plant at the latter place having been purchased by the company. A transmission line will be built during the early summer from Tampico to Walnut and Ohio to serve those cities.

GALESBURG, ILL. — Improvements to this city's municipal street lighting plant and system estimated to cost $25,018 are advocated in a report just completed by M. Ferry, a consulting electrical engineer of Chicago, and John Walsh, superintendent of water and electric lights.

GRANVILLE, ILL.—The Putnam County Electric Company has been incorporated with a capital of $30,000 by Sidney Whitaker, G. W. Hunt and others.

HOMER, ILL.—The Homer Electric Light & Power Company's holdings have been sold to the William B. McKinley interests, of Champaign. The local plant probably will be discontinued and power secured from the lines of the Illinois Traction Company.

MURRAYVILLE, ILL.—The Central Illinois Public Service Corporation has secured a franchise option for supplying electrical energy to this town.

ROCKFORD, ILL.—The Rockford Electric Company, Adam Gschwindt, general manager, will install during the coming year a 6,250-kilowatt turbogenerator, a 1,000-kilowatt motor-generator set, 1,000 horsepower in boiler capacity, additions to its water-softening plant, and will make extensions to its distribution lines costing about $50,000.

STREATOR, ILL.—An estimate for the installation of a fire and police-alarm system has been completed by H. G. Young, city electrician. The cost is $3,144.65.

WEST FRANKFORT, ILL.—All preliminaries pertaining to the construction of the new Schott electric line connecting Harrisburg, Marion, Johnston City, Benton and West Frankfort have been completed and work will commence soon after April 1.

DETROIT, MICH.—A $1,000,000 corporation, the stock of which has been fully subscribed by Robert Oakman, Mayor Oscar B. Marx, L. W. Tuller and a few others, will build a car line from Dearborn to Highland Park, with a view to connecting the Ford plants, the motor-car factory in Highland Park and the tractor factory planned for Dearborn, and to furnish car service between the Michigan, Grand River, Hamilton and Woodward lines.

LAWRENCE, MICH.—Following an estimate furnished by Engineer Dan P. Smith of Paw Paw, the Village Council has decided to submit to the voters the proposition of a municipal electric lighting plant. A special election will be held this week.

PONTIAC, MICH.—Plans are being made by the City Commission to extend the boulevard lights on several streets in the business section this spring. Commissioner McLintock of the department of public utilities, is aiding the work.

SAULT STE. MARIE, MICH.—The Great Lakes Power Company, which was recently incorporated, is understood to have acquired the hydroelectric plant of the Algoma Steel Company at Sault Ste. Marie, one of the subsidiaries of the Lake Superior Corporation, and also the street railway system in the Canadian Soo and the international ferry, controlled by the same interests. Plans of the new company include the expenditure of $3,000,000 on the properties and the development of 30,000 horsepower additional at the hydroelectric generating station.

LOMIRA, WIS.—The Lomira Electric Light & Power Company, A. E. Carpenter, engineer, is planning to remodel its power plant, to include the installation of new generating equipment.

NEW LONDON, WIS.—A contract has been signed by the Light Commission and Zerrenner Brothers for furnishing power at the latter's brick yards. The lines of the municipal plant will be extended to the yards at a cost of about $1,400.

OGEMA, WIS.—Plants are being considered for the installation of a municipal electric lighting system here.

WINTER, WIS.—James Feeley, of Fifield, and others are interested in a plan to establish an electric lighting plant here.

DATES AHEAD.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

NEWTON, IOWA.—The Des Moines Street Railway Company, Emil Schmidt, president, will extend its lines from Colfax to Newton this year.

ATCHISON, KANS.—Fire caused $4,000 damage to power plant of the Atchison Railway, Light & Power Company recently.

FOWLER, KANS.—The work of repairing the municipal electric lighting plant is nearing completion, and this city will again have adequate service.

GARDEN CITY, KANS. — The engine room of the Garden City Telephone, Light & Manufacturing Company, C. E. Marsh, manager, was destroyed by fire recently. Repairs are being made.

FLANDREAU, S. D.—The Dakota Light & Power Company, A. H. Savage, treasurer, is contemplating the installation of a 200-kilowatt generating unit, driven by a gas engine.

DODGEN, N. D.—Petitions are being circulated for the erection of an electric lighting plant here.

FOREST RIVER, N. D.—A plant is to be constructed to supply electrical energy to the city as well as the farms in Forest River, a stock company having been organized by Otto Bhend, H. G. Hager and others with a capital of $10,000.

LANSFORD, N. D.—The Northern Telephone Company is contemplating installing a new generating unit, consisting of a generator and an internal combustion engine.

PETERSBURG, N. D.—M. O. Topen has asked for a franchise to install and operate an electric lighting plant here. The Village Trustees probably will grant the request.

SHERWOOD, N. D.—E. T. Clark and J. Van de Eroe have purchased the local electric lighting plant from C. H. Budke. Improvements will be made.

SOUTH CENTRAL STATES.

BARBOURVILLE, KY.—The stock and equipment of the Barbourville Electric Company was damaged by fire recently.

ADAMS, TENN.—An ordinance granting a franchise to the South Kentucky Power Company to furnish lighting for the town has been passed by the Town Council.

ALEXANDRIA, TENN.—Work on the construction of the Nashville & Eastern Interurban Railroad, of which C. T. Edwards is president, is expected to begin within the next month. The road is to be built from Smithville to Lebanon.

DANDRIDGE, TENN.—Sale by the receiver of the Dandridge Power & Light Company's plant has been confirmed and the new owners, W. A. Lyle and Joseph Baker, will improve the property with a water power addition. A dam will be constructed on Felknor Creek three miles from town which will furnish ample power not only for the customers of the company but for various industries.

KINGSPORT, TENN.—The Oliver-Hill Construction Co., Knoxville, has been awarded a contract for excavating, concrete work and installing machinery at $30,000, part of the work to be on the power plant and pumping station to be erected here. Power will be supplied for a cement mill, dye plant, and other industries.

LIVINGSTON, TENN.—The Livingston Light & Power Company has been organized with S. O. Kennedy president, and will install a waterwheel and generating equipment at the falls at Crawford Mills.

MURFREESBORO, TENN. — Following the refusal of the city to ratify at a recent election the contract made with the Davis-Elam Electric Light Company for a ten-year franchise, the Murfreesboro Light & Power Company has begun plans to erect a plant. George Beesley, John M. Butler and others are the incorporators.

NEWPORT, TENN.—The city will install a lighting system to cost $5,000. Bonds have just been sold for that purpose.

NIOTA, TENN.—The Niota Water Company plans to install an electric lighting plant.

BIRMINGHAM, ALA. — The Southern States Electric Company has been organized with capitalization of $4,000 by W. C. Mitchell, F. H. Chamberlain and others.

DECATUR, ALA.—The Alabama Power Company will spend $10,000 in the enlargement of their plant in the Decaturs. The work on the enlargement will commence within the next 30 days. The plant at this time has a capacity of 750 horsepower, which will be increased to 1,000 horsepower.

NEW DECATUR, ALA.—Plans have been prepared for a municipal electric lighting plant. The City Council has already decided to erect the plant.

NEW DECATUR, ALA.—It is reported that the Louisville & Nashville Railroad Company will install electric drive in its shops in this city. The Alabama Power Company will furnish the energy.

OPELIKA, ALA.—An ornamental lighting system is being proposed for main streets in this city.

ARGENTA, ARK.—The city is planning to purchase additional street lighting equipment.

CRANE, ARK.—Residents here contemplate building a dam on Crane Creek and building an electric lighting plant.

TUCKERMAN, ARK. — The Citizens' Light & Power Company will build an electric lighting and power plant at this place.

CHECOTAH, OKLA.—The Checotah Water, Light & Ice Company, is planning to install a natural-gas engine to operate 75-kilowatt generator, belt-driven; pole-line equipment to change 3.5 miles of present line from 2,300 to 6,600 volts, with proper transformers to give from 100 to 150 horsepower at the end of the line, where power is used to pump city water.

BURLINGTON, TEX.—H. Henderson has closed a contract with this city for the erection of an electric lighting plant. The generating equipment has been ordered and work on the installation will begin in the near future.

TEXAS CITY, TEX.—The City Commissioners are planning to install 31 additional electric lamps. If satisfactory arrangements can be made with the light company, bids will be immediately asked for the installation of the lamps.

WESTERN STATES.

SHUMWAY, ARIZ.—R. C. Smith has applied for a certificate of convenience and necessity, proposing to install a power plant at Shumway to serve the towns of Shumway, Snowflake and Taylor.

OGDEN, UTAH.—The construction of a new electric line between Utah, Hot Springs and Brigham City will be the principal improvement work taken up by the Ogden, Logan & Idaho Railway Company for the coming summer, according to an announcement by P. D. Kline, general manager. It is planned to complete the work and have the new line in operation by August 1.

PROVO, UTAH.—Application has been filed for ten cubic feet of water per second from the north and south branches of the North Fork Creek in Utah County for power purposes by John R. Stewart, of Provo, Utah. The application sets forth that a dam and pipe line and water power plant will be installed for the purpose of supplying electrical energy for lighting and power purposes in Wasatch County.

RENO, NEV.—The City Council has decided to have an electrolier lighting system installed by the Reno Power, Light & Water Company.

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BANCROFT, IDAHO.—The proposition of constructing a municipal power plant is before the City Council, and it is reported a bond issue of $30,000 to provide funds for construction will be voted on at an early date.

HAILEY, IDAHO.—The City Council is negotiating with the Rockwell-White Electric Company and the Hailey Electric Light & Power Company for a new lighting contract which will require the immediate installation of a new lighting system costing about $7,000.

JULIAETTA, IDAHO.—Fred C. Holbrook of Culdesac, Idaho, has purchased the Juliaetta electric lighting plant and, according to reports, will make improvements to the plant and extensions to the local lines at an early date.

POCATELLO, IDAHO.—It is reported the City Council plans the installation of approximately 355 post lights, with single globe at the top, acorn shape. An ordinance providing for the improvement has passed its initial reading in the Council.

CENTRALIA, WASH.—The city is negotiating with the North Coast Power Company for the purchase of the company's electric equipment and business in Centralia. As an initial step, the city has requested the North Coast Power Company to set a price on its equipment and local business. At the present time practically all of the power company's transmission lines in the city are strung on poles belonging to the city.

PORT ANGELES, WASH.—The City Council will shortly call for bids for 80 light meters to fill the requirements for the next 12 months. The Council will also receive bids for a new contract to supply the city with electrical equipment as it is needed.

SEATTLE, WASH. — The Municipal Lighting Department, under the direction of Superintendent of Lighting J. D. Ross, has prepared plans for the construction of a 13,000-horsepower additional unit to the Lake Union steam auxiliary plant in Seattle. Cost of the unit, including machinery, is estimated at $250,000. The structure proper will be of reinforced concrete construction, and will be located north of the present structure. City Architect Daniel Huntington, has been commissioned to prepare plans for the building, which will cost about $20,000. Plans for the machinery installation will be prepared under the supervision of Superintendent Ross.

SPOKANE, WASH.—Plans for the installation of an ornamental lighting system on Sprague Avenue, from Bernard to Madison Street, to cost about $48,000, have been completed by Morton MacCartney, City Engineer. Reported bids for materials and installation of same will be called for at an early date.

SPOKANE, WASH.—Harry A. Flood, president of Merchants Central Heating Company of Spokane, which has under construction a central heating plant to supply business houses in Spokane with heat, reports his company will enter the local electric field and at this time is signing contracts calling for delivery of power about September 1. According to President Flood, the company has expended $275,000 for apparatus and construction to date. The total investment of the company in Spokane will approximate $1,000,000. The company will furnish meters for both steam and electric consumption without cost or deposit by the consumer. Free lamp renewals are provided for carbon lamps, and tungsten and nitrogen lamps of the latest type will be supplied at nominal prices. About 70 carloads of electrical equipment will be installed in the plant. In addition to the generating equipment, the company's service will be safeguarded by a large storage battery. The company's building is five stories high, 100 by 142 feet, of reinforced concrete, brick and steel.

MARSHFIELD, ORE. — The auxiliary plant of the Oregon Power Company at the Porter Mill was recently damaged by fire to the extent of about $4,000.

PORTLAND, ORE.—City Attorney La Roche has been instructed to prepare an ordinance requiring the replacement of the present overhead system of electric light and telephone lines in the Central East Side with underground lines. It has been suggested that the Pacific Telephone & Telegraph Company, the Home Telephone Company, the Portland Railway, Light & Power Company, and the Northwestern Electric Company, lay their wires and cables in common conduits, thereby reducing the cost of making the improvement.

BAKERSFIELD, CAL.—The County Supervisors have been petitioned to call an election for the organization of a public lighting district at McFarland.

BAKERSFIELD, CAL.—Plans are under consideration here for the installation of a lighting system similar to the electrolier system recently installed at Fresno.

CHICO, CAL.—The Pacific Gas & Electric Company is preparing to extend its service from De Sabla to the Paradise district.

LOS ANGELES, CAL.—The Board of Public Works has instructed a permit to be issued for the erection by the water department of a municipal power plant at St. John and Holly Streets. The building will be a three-story, concrete structure to cost about $60,000.

MERCED, CAL.—Voters at Atwater have submitted a petition to the County Board of Supervisors for the calling of an election for the formation of a lighting district.

POMONA, CAL.—Plans and specifications are being prepared for the proposed lighting system which Lincoln Park tract property owners have asked the Council to have installed. There will be 115 lamp posts in the proposed district.

RIVERSIDE, CAL.—The Southern Sierras Power Company has authorized the extension of its distributing system from Glenavon station north on Tyrolite Street to Mission Boulevard and one-half mile east on Mission Boulevard.

SAN BERNARDINO, CAL.—It is probable that the Santa Fe railroad will erect a private power plant in its local yards to supply power for its properties here.

YREKA, CAL.—The California-Oregon Power Company has secured a ten-year contract to supply power for the dredging operations of the Yukon Gold Company near Carrville, and is preparing to extend its service into Trinity County. The new power line will be built into Trinity by way of Lamoine. Construction work will be started soon and the line will be completed by next fall.

CORDOVA, ALASKA.—The Bureau of Yards and Docks, Navy Department, Washington, D. C., William M. Smith, acting chief of bureau, will receive bids until April 22, for the construction of two 300-foot steel towers at the radio station near Cordova.

Proposals

MOTOR-GENERATOR SET.—Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until April 22, for furnishing one 60-kilowatt three-machine motor-generator set and switchboard, at the naval station, New Orleans, La. Specifications, No. 3056, may be obtained on application to the Bureau of Yards and Docks or to the industrial manager of the naval station, New Orleans.

CONDUIT AND WIRING SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until April 20, for a conduit and wiring system, lighting fixtures, etc., in the United States postoffice, Martinsburg, W. Va. Drawings and specifications may be obtained on application to the custodian of the site at Martinsburg or to the Supervising Architect, Washington.

ELECTRIC LIGHTING EQUIPMENT.—Sealed proposals will be received by the South Park Commissioners, Fifty-seventh Street and Cottage Grove Avenue, Chicago, Ill., until April 12, for furnishing and delivering into the substation in Grant Park, electrical apparatus required for the production of lighting service for Grant Park west of the Illinois Central Railroad and north of Jackson Street. J. F. Neil, secretary of the South Park Commissioners.

ELECTRIC FREIGHT ELEVATOR.—The Port Commission, Seattle, Wash., will receive bids until April 12 for the construction of an electric freight elevator in the two-story frame Spokane Street transit shed, plans and specifications of which are on file in the office of the Port Commission. Bidders are invited to submit alternative bids upon designs of their own, each bid to be accompanied by a certified check, payable to the Port Commission for not less than 5 per cent of the amount bid. C. E. Remsberg, Secretary.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9439, Puget Sound, Wash., six motors; Schedule 9444, Philadelphia, Pa., 1,631 feet of three-conductor cable; Schedule 9445, Washington, D. C., three 35-kilowatt, oil-cooled transformers; Schedule 9445, Newport, R. I., 50,000 feet of two-conductor cable; Schedule 9452, Boston, Mass., 2,080 transmitting condensers and miscellaneous antenna wire; Schedule 9456, Mare Island, Cal., nine 0.25-horsepower ventilating sets. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

Financial Notes

Cleveland Telephone Company has increased its capital stock from $4,000,000 to $6,000,000.

The annual meeting of the General Electric Company will be held in Schenectady, N. Y., on May 9. Books close April 8 and reopen May 10.

General Gas & Electric Company has retired its three-year 6-per-cent secured notes, maturing April 1, 1918, and arrangements have been completed to pay off at maturity the three-year six-per-cent collateral notes maturing April 1, 1916.

Public Service Company of Northern Illinois has sold to N. W. Halsey & Company, Russell, Brewster & Company, Lee, Higginson & Company, and the Illinois Trust & Savings Bank $1,705,000 first and refunding-mortgage five-per-cent gold bonds.

Stockholders of American Power & Light Company subscribed to more than 85 per cent of the $6,984,300 six-per-cent 100-year gold debentures offered in the ration of 50 per cent of their stockholdings at 93, thus leaving less than 15 per cent to be taken by the underwriters.

The North Coast Power Company, maintaining head offices in Vancouver, Wash., formerly known as the Washington-Oregon Corporation, recently filed with the County Auditor at Chehalis, Wash., two mortgages, one in favor of the Germantown Trust Company for $917,000 and one in favor of the Commercial Trust Company for $675,000, both instruments securing bond issues of similar amounts. The mortgages cover all of the company's holdings in Washington and Oregon.

Pacific Gas & Electric Company has paid out of current funds $981,000 Oakland Gas Light & Heating Company five-per-cent first-mortgage bonds. The bonds were issued March 16, 1891. Pacific Gas & Electric will not at present make any capital issues against this capital expenditure. The retirement of these bonds leaves the California Gas & Electric general-mortgage and collateral-trust five-per-cent bonds a first lien on all the Pacific Gas & Electric properties in Alameda County, these properties being estimated to be worth $20,000,000 and the bonds outstanding under this mortgage being $4,517,000. As the $20,000,000 Califor-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Mar. 27	Mar. 20
American Tel. & Tel. (New York)	130¼	129½
Commonwealth Edison (Chicago)	146	143
Edison Electric Illuminating (Boston)	246½	248½
Electric Storage Battery common (Philadelphia)	61⅞	64
Electric Storage Battery preferred (Philadelphia)	61⅞	64
General Electric (New York)	167	169½
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	8	7
Massachusetts Electric preferred (Boston)	35½	37
National Carbon common (Chicago)	.....	183
National Carbon preferred (Chicago)	.....	136
New England Telephone (Boston)	137½	27⅝
Philadelphia Electric (Philadelphia)	27⅝	78
Postal Telegraph and Cables common (New York)	78	67
Postal Telegraph and Cables preferred (New York)	67½	91
Western Union (New York)	89½	68½
Westinghouse common (New York)	65¾	77
Westinghouse preferred (New York)	75	

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nia Gas & Electric unifying and refunding five-per-cent bonds are a first lien on all properties of the company outside San Francisco, they now have a secondary equity of more than $15,000,000 in the Alameda County properties alone.

Dividends.

	Term	Rate	Payable
Am. Pw. & Lt., pf	Q	1.5 %	Apr. 1
Am. Pub. Service, pf	Q	1.75 %	Apr. 1
Am. Tel. & Tel	Q	2 %	Apr. 15
Ark. Lt. & Pw., pf	Q	1.75 %	Apr. 1
Cen. & So. Am. Teleg	Q	1.5 %	Apr. 8
Cin., Newport & Cov., pf	Q	1.125%	Apr. 15
Cin., Newport & Cov., com.	Q	1.5 %	Apr. 15
Colo. Spgs. Lt., Ht. & Pow., pf	Q	1.5 %	Mar. 31
Detroit Edison	Q	2 %	Apr. 15
Duq. Lt., pf	Q	1.75 %	May 1
Elmira Water, Lt. & R. R., 7% pf	Q	1.75 %	Mar. 31
Elmira Water, Lt. & R. R., 5% pf	Q	1.25 %	Mar. 31
Gen. Gas & Elec., pf	Q	1.75 %	Apr. 1
Harrisburg Lt. & Pw., pf	Q	1.5 %	Mar. 31
Internat'l Trac., 7% pf	Q	1.75 %	Apr. 1
Internat'l Trac., 4% pf	Q	1 %	Apr. 1
Kellogg Sw. & Sup., st'k	—	50 %	———
Kellogg Sw. & Sup	Q	2 %	Apr. 29
Manchester T., L. & P	Q	$2	Apr. 15
Mexican Teleg	Q	2.5 %	Apr. 15
N. E. Tel. & Tel	Q	$1.75	Mar. 31
New Orleans Ry. & Lt. pf.	Q	1.25 %	Mar. 31
Pac. Tel. & Tel., pf	Q	1.5 %	Apr. 15
Porto Rico Rys., pf	Q	1.75 %	Apr. 1
Pub. Serv. Corp. of N. J	Q	1.75 %	Mar. 31
Rep. Ry. & Lt., pf	Q	1.75 %	Apr. 15
So. Cal. Edison, pf	Q	1.5 %	Apr. 15
Tex. Pw. & Lt., pf	Q	1.75 %	Apr. 1
Va. Ry. & Pw., com	S	1.5 %	Apr. 20
United Gas & Elec. Corp., first pf	Q	1.75 %	Apr. 1
Utah Pw. & Lt., pf	Q	1.75 %	Apr. 1
Wash. Water Pw	Q	$1.25	Apr. 1
W. Kootenay Pw	—	$1.66⅔	Apr. 1
W. Kootenay Pw., pf	Q	1.75 %	Apr. 1
West. E. & M	Q	1.5 %	Apr. 29
West. E. & M., pf	Q	1.75 %	Apr. 15

Reports of Earnings.

MONTANA POWER.

The report of the Montana Power Company for the year ended December 31, 1915, compares as follows:

	1915	1914
Gross	$4,359,408	$3,778,285
Net after taxes	3,167,504	2,639,239
Surplus after charges	1,978,342	1,575,625
Reserve for depreciation	300,000	.....
Surplus	1,678,342	1,575,625
Preferred dividends	677,026	677,026
Surplus	*1,001,316	898,599
Common dividends	604,283	536,636
Surplus	397,033	361,963

*Equal to 3.72 per cent earned on $26,907,500 common stock against 3.35 per cent on $26,831,800 stock previous year.

LOUISVILLE GAS & ELECTRIC COMPANY.

Net earnings for the year ended February 29, 1916, were 26.7 per cent greater than for the previous year. The increase in gross for this period was 12.2 per cent. Comparative figures are reported as follows:

	1916.	1915.
Gross earnings	$2,284,739	$2,035,504
Net earnings	1,331,303	1,050,277

ELECTRIC PROPERTIES.

The Electric Properties Corporation and Westinghouse, Church, Kerr & Company report for the year ended December 31, 1915, consolidate income account as follows:

	1915	1914
Income from operations	$785,802	$665,368
Operation, administration and general expenses	345,360	363,594
Bond interest	24,000	24,000
Surplus	416,442	277,774
Previous surplus	70,155	57,463
Preferred dividend	235,212	196,000
Capital adjustment	223,960	.....
Depreciation of securities	.....	69,073
Surplus	475,345	70,155

SOUTHERN BELL TELEPHONE.

The Southern Bell Telephone Company reports for the year ended December 31, 1915, compared as follows:

	1915	1914
Operating revenue	$6,712,745	$6,598,878
Expenses and taxes	4,959,675	4,744,760
Operating income	1,753,070	1,854,118
Other income	866,756	893,304
Total income	2,619,826	2,747,422
Charges	1,042,342	1,104,617
Surplus	1,577,484	1,642,805
Dividends	1,284,000	1,284,000
Surplus	293,484	358,805
Miscellaneous deductions	16,845	38,591
Surplus	276,639	320,214

New Publications

ELECTROLYSIS MITIGATION.—Technologic Papers Nos. 54 and 55 of the Bureau of Standards constitute special studies in electrolysis mitigation by Burton McCollum, G. H. Ahlborn and K. H. Logan. The first deals with conditions in Springfield, O., and the second with Elyria, O.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has published the "Results of Observations made at the Magnetic Observatory near Honolulu, 1913 and 1914," by Daniel L. Hazard. Hourly values are given of the components of the earth's magnetic field, with a record of earthquakes and magnetic storms.

METRIC SYSTEM.—At the request of the Secretary of the Treasury a report on the use of the Metric System in Export Trade was prepared by Director S. W. Stratton, of the United States Bureau of Standards. This report was submitted at the last meeting of the International High Commission on Uniformity of Laws on December 1 and was considered so complete and of such a useful character that Senator Fletcher recommended it being issued as a Senate Document. This has been done, and the document, printed in a booklet consisting of 80 pages, should be of intense interest to every manufacturer of electrical supplies, machinery, and machine tools who is in touch or desires to get in touch with foreign markets.

Foreign Trade Opportunities

[*Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D.C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.*]

NO. 20360. INCANDESCENT ELECTRIC LAMPS.—An American consular officer in France reports that a firm in his district desires to represent American manufacturers of incandescent electric lamps.

NO. 20385. COPPER WIRE AND INSULATING MATERIAL.—An American consular officer in Norway reports that a firm in his district desires to receive quotations on copper wire and insulating material. Correspondence may be in English. Reference is given.

NO. 20421. ELECTRIC LAMPS.—A firm in England writes that it desires to communicate with American manufacturers of electric lamps.

NO. 20435. INSULATING MATERIALS.—A firm in England writes that it desires to purchase insulating materials, such as press-spahn, varnished cambric, and vulcanized fiber.

NO. 20437. MICA.—A commercial agent of the Bureau reports that a firm in Brazil desires to communicate with American importers of mica.

NO. 20464. MACHINERY.—A firm in Spain informs an American consular officer that it desires to purchase steam and water turbines; gas, gasoline, and crude-oil motors; electric machinery of all kinds, including copper and aluminum cables, wires, meters, etc.; and pumps of all kinds. References are given. Correspondence may be in English.

New Incorporations

AKRON, O.—U. N. D. Electric Company. Capital, $15,000. Incorporators: F. A. Dussel, H. F. Uhl and others.

DAYTON, O.—Dayton Storage Battery Company. Capital, $10,000. Incorporators: R. M. Robeson, C. A. Lesh and others.

EAST CLEVELAND, O. — Windemere Electrical Construction & Fixture Company. Capital, $6,500. Incorporators: A. C. Day, A. L. Keifer, G. A. Metzger and others.

ALBANY, N. Y.—E. H. Bocian Company. Capital, $5,000. Electrical contracting. Incorporators: E. H. Bocian, J. J. O'Connor and E. J. O'Connell.

NEW YORK, N. Y.—Triangle Conduit Company. Capital, $30,000. Manufacture conduit and appliances. Incorporators: F. W. Russell, Brooklyn; J. M. Edelson and G. S. Wittson, New York.

NEW YORK, N. Y.—Wappler Electric Company. Capital, $750,000. Manufacture X-ray and high-frequency machines. Incorporators: Kurt Stoye and T. F. J. Dermody, New York; G. Zimmerman, Brooklyn.

Electrical Patents Issued March 21, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,175,954. **Process of Making Storage-Battery Electrodes.** H. C. Hubbell, Newark, N. J. Alternate layers of different metals are electro deposited and one of metals dissolved out.

1,175,976. **Time-Controlling Mechanism for Electric Thermostats.** A. P. Myer, assignor to Minneapolis Heat Regulator Co., Minneapolis, Minn. Details of device having clock-controlled shiftable posts.

1,175,977. **Cooling System for Electric Motors.** J. W. Nolan, assignor to Motor Cooling Apparatus Co. of Rhode Island, Pawtucket, R. I. Air circulation.

1,176,018. **Furnace.** T. F. Baily and F. T. Cope, assignors to The Electric Furnace Co., Alliance, O. Structural details of resistance-type electric furnace.

1,176,034. **Electric Cut-Out.** J. F. Conrad, Nanty Clo, Pa. Trolley-wire circuit-breaker.

1,176,035. **Electric System.** J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Jersey City, N. J. Regulation of storage-battery car-lighting system.

1,176,036. **Electric Brake for Automobiles.** D. M. Dailey, Gary, Ind. Electromagnetically operated brake mechanism.

1,176,037. **Journal-Bearing for Electric Machines.** C. L. Daun, Saginaw, Mich. Bushing structure.

1,176,045. **Telephone Prepay-Box.** F. L. Fisher, assignor to J. H. Ware, Chicago, Ill. Details of coin-controlled circuit connections.

1,176,057. **Automatic Signaling, Door-Closing and Operating System for Elevators.** B. Heinrich, San Francisco, Cal. Circuit arrangements.

1,176,102. **Means for Operating Switch Mechanism.** R. A. Schoenberg, assignor to I. D. Rosenheim, New York, N. Y. Lamp-socket switch operated by moving bulb in and out.

1,176,105. **Separator.** H. R. Swartley, Jr., assignor to The New Departure Mfg. Co., Bristol, Conn. For electrolytic cells.

1,176,111. **Collapsible Metal Pole.** O. Valenne, New York, N. Y. Sectional formation; for supporting conductors.

1,176,119. **Railway Signal and Stopping Mechanism.** F. C. Williams, assignor to The Safety Block Signal Co., Delaware. Semaphore circuits and gearing in block system.

1,176,137. **Insulator-Bracket.** C. G. Ette, assignor to St. Louis Malleable Casting Co., St. Louis, Mo. Pin and mounting of malleable iron.

1,176,147, 1,176,148 and 1,176,149. **Telegraphy.** E. Keen, assignor to Telegravure Co., New York, N. Y. First patent: sending apparatus for transmitting pictures. Second patent: method of transmitting pictures. Third patent: modification.

1,176,178. **Switching Device.** W. F. Straub, assignor to Electric Time Recorder Co., Chicago, Ill. Special snap-switch.

1,176,201. **Direction-Indicator.** E. Cerf and F. Jordan, San Francisco, Cal. For automobiles; socket at one end for lamp within adjustable, tubular structure.

1,176,202. **Circuit-Controlling Apparatus.** H. W. Cheney, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Electromagnetically controlled main switch, with indicator.

1,176,203. **Lamp-Socket Support.** G. W. Comer, Chicago, Ill. Adjustable arm with clamp for securing to head of bed, etc.

1,176,217. **Electric Cooking Range.** A. H.

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Happe and W. J. Keep, assignors to The Michigan Stove Co., Detroit, Mich. Has hinged top and is easily kept clean.

1,176,231. Resistance-Box. F. W. Magin, assignor to Independent Electric Mfg. Co., Milwaukee, Wis. Has screened openings permitting ventilation but preventing molten metal from coming out.

1,176,234. Cab Block-Signaling System. T. H. Millington, assignor to J. A. Cameron, Chicago, Ill. Signals visible in engineer's cab.

1,176,235. Process of Making Lamp Structures. C. Moru, assignor to The Badger Brass Mfg. Co., Kenosha, Wis. Manner of making head-light body, reflector, etc.

1,176,260. Automatic Telephone System. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Structure and arrangement of selector.

1,176,269. Telephone-Repeater. A. H. Blessing, assignor to Automatic Electric Co., Chicago, Ill. Automatic system has impulse repeater in trunk line.

1,176,282. Wireless Signaling. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Receiving apparatus.

1,176,288. Insulating Splice-Cover. J. B. Hamilton, Hoboken, N. J. Elastic cap.

1,176,316. High and Low-Pressure Continuous-Current System. W. J. Rickets, assignor to A. Graham & Co., and said W. J. Rickets, Brockley, London, Eng. Battery-charging arrangements.

1,176,320. Transmitting Apparatus for Wireless Telegraphy. L. Rouzet, Levallois-Perret, France. Has specially tuned charging circuit.

1,176,333. Insulator-Pin. J. Baker, Battle Creek, Iowa. Stamped from a single piece of semi-circular tubing.

1,176,339. Telephone-Call-Registering Device. T. J. Byrum, Chicago, Ill., assignor of one-half to J. T. Fossberg, Chicago, Ill. Structural details.

1,176,357. Automatic Train-Stop Device. J. H. Forssberg, Stephenson, Mich. Motor operating valve on one vehicle operated by dynamo on approaching vehicle when in connection with same track conductor.

1,176,362. Thermoelectric Thermometer. G. Gollmer, assignor to Siemens & Halske, A. G. Berlin, Germany. Structure comprising thermoelectric couple.

1,176,373. System of Supplying Electrical Energy on Special Tariffs. H. Landis, Zug, Switzerland. Control of meter gearing for multiple rates.

1,176,374. Electric-Lighted Level. E. G. Laplante, Marlboro, Mass. Has special arrangement of battery and lamp.

1,176,377. Gear-Shift for an Electric Motor. B. M. Leece, assignor to the Leece-Neville Co., Cleveland, O. Interlocked with control of motor circuit.

1,176,390. Electromagnetically Controlled Irrigating Headgate. C. E. Mercer, Denver, Colo. Electrically controlled lock.

1,176,396. Centrifugally Regulated Power Transmission System. W. Morrisson, Chicago, Ill. Dynamoelectric clutch.

1,176,413. Terminal for Electric Wires. J. M. White, Philadelphia, Pa. Bent plate structure for receiving bared end of insulated wire.

1,176,420. Electric Soldering Machine. A. A. Bacon, assignor to Standard Optical Co., Geneva, N. Y. Parts to be welded heated by resistance method to temperature below welding.

1,176,421 and 1,176,422. Magnetic Device. C. E. Beach, assignor to G. O. Knapp, New York, N. Y. First patent: anomalous magnet and armature. Second patent: modification.

1,176,440. Contact Device for Electric Traction Systems. H. S. Farquhar, Wayne, Pa. Third-rail shoe held in contact mechanically and by magnetic attraction.

1,176,459. Lighting-Fixture. W. R. Kahns, assignor to J. H. White Mfg. Co., Brooklyn, N. Y. Shade at tip end of bulb supported from socket.

1,176,460. Fire-Detector Apparatus. C. H. Kayser and W. H. Hampton, assignors to Ideal Fire Detector Co., Newark, N. J. Thermopneumatically controlled contacts.

1,176,466. Flicker Attachment for Photometers. E. F. Kingsbury, assignor to United Gas Improvement Co., Philadelphia, Pa. For equality-of-brightness photometers.

1,176,467 and 1,176,468. Flash-Light-Battery Container. H. M. Koretzky, New York, N. Y. First patent: adapted to be collapsed flat when empty. Second patent: modification.

1,176,470. Sender. J. A. Kropp, assignor to Western Electric Co., New York, N. Y. Mechanism of impulse call-device.

1,176,474. Magnetizer. C. C. McDonald, Chenoa, Ill. Arrangement of electro for forming permanent magnets.

1,176,475. Lighting Means for Auditoriums and Other Places. F. G. McPerson, assignor to Shado-Lite Mfg. Co., Beaver Falls, Pa. Arrangement of lamps and reflectors therefor in elongated opaque hood. (See cut.)

1,176,476. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Combination of dynamo and battery with common induction coil.

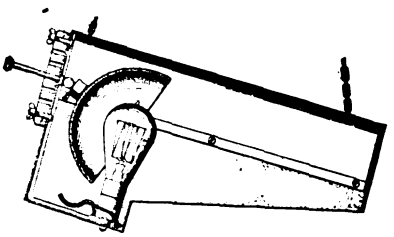
1,176,499. Fire Alarm Box. E. Tokarski, Pittsburgh, Pa. Details of call box.

1,176,502. Igniter Mechanism for Internal Combustion Engines. H. R. Van Deventer, assignor to Splitdorf Electrical Co. Combination of magneto and make-and-break igniter.

1,176,515. Electrcial Socket and Plug. C. H. Bissell and E. G. Smith, assignors to Crouse-Hinds Co., Syracuse, N. Y. Details of contacts, insulation, etc.

1,176,521. Burglar-Alarm. J. Chankin, New York, N. Y. Structure of tubular circuit closer.

1,176,522. Telephone System and Individual Transmitter Therefor. C. L. Chrisholm, assignor to Chrisholm Transmitter & Telephone Instruments Co., Marysville,



No. 1,176,475.—Lighting Means for Auditoriums and Other Places.

New Brunswick, Canada. Individual transmitter switched into circuit of instrument at will.

1,176,539. Indicating Device for Automobiles. A. E. Gaugh and J. Cawby, Lexington, Ky. Solenoid-operated direction-indicator.

1,176,540. Electrolytic Cell. A. E. Gibbs, assignor to Pennsylvania Salt Mfg. Co., Philadelphia, Pa. Circulation of electrolyte controlled to remove products of electrolysis from surface of cathode.

1,176,541. Process of Electrolysis. A. E. Gibbs, assignor to Pennsylvania Salt Mfg. Co. Related to above.

1,176,542. Motor Controller. M. M. Goldenstein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Driving units and their connection with driven units controlled from a station.

1,176,544. Protective Device. G. F. Gray, assignor to General Electric Co., Schenectady, N. Y. Spark-gap device for arresters, etc.

1,176,554. Electrical Connection. S. Herzig, New York, N. Y. Plug coupling.

1,176,559. Method of and Apparatus for Electrical Measurement. C. A. Hoxie, assignor to General Electric Co., Schenectady, N. Y. Method of measuring capacity and inductance by means of a bridge.

1,176,569. Contactor with Anti-Welding Device. M. K. Kjolseth, assignor to General Electric Co. Details of magnet-operated switch.

1,176,577. Sound-Transmitter. B. F. Lee,

No. 1,176,630.—Vapor Electric Device.

Schoolfield, Va. Incoming sound waves deflected outwardly, by cone on center of diaphragm and absorbed by felt lining.

1,176,583. Knife. T. J. McPhee, Spokane, Wash. For linemen.

1,176,584. Tool-Operating Machinery. J. F. Madgett, assignor to General Electric Co. Operating motor on horizontal arm turning on pedestal.

1,176,590. Protected Insulator. J. H. Mock, Jetmore, Kans. Enclosed split globe.

1,176,602. Metallic-Filament Electric Incandescent Lamp. H. C. G. Remane, assignor to General Electric Co. Filament support.

1,176,614. Welding Pressure Contact. A. M. Stanley, assignor to General Electric Co. Spot welding contact of tungsten.

1,176,616. Switch-Operating Mechanism. H. M. Stevens, assignor to General Electric Co. Lever mechanism for hand-operated switch.

1,176,618. Insulator. W. E. Swearingen, Montgomery City, Mo. Pin type: special wire securing means and protection from weather.

1,176,622. Electrical Attachment Plug. W. C. Tregoning, Cleveland, O. Wires are wedged against seats.

1,176,623. Spark-Gap Adjuster. L. Tronchon, assignor to Compagnie Generale Radiote Legraphique, Paris, France. Rotatable electrodes in frame which is deformable parallelogram.

1,176,625. Electric Brake. J. J. Tyson, Montgomery, Ala., assignor of one-half to J. Russell Tyson, Montgomery, Ala. Electromagnetically operated car brakes on multiple-unit principle.

1,176,629. Tree Insulator and Wire Supporter. W. H. Wallace, Roscommon, Mich. Holder and attacher for insulating tube.

1,176,630. Vapor Electric Device. E. Weintraub, assignor to General Electric Co. Contains tantalum chlorid and an anode superficially of platinum. (See cut.)

1,176,632. Electrical Machine. F. Werner, Hamilton, Ontario, Canada. Collector rings and short-circuiting device in collector type induction motor.

1,176,634. Time Element. A. Aichele, assignor to Aktiengesellschaft Brown Boveri and Cie, Baden, Switzerland. Electromagnetic device.

1,176,635. Push-Button Switch. J. M. S. Anderson, assignor to The Perkins Electric Switch Mfg. Co., Bridgeport, Conn. Details.

1,176,659. Attachment Plug. F. C. DeReamer, assignor to General Electric Co. Special structure having swiveled contact shell.

1,176,660. Electric Switch. F. C. DeReamer, assignor to General Electric Co. For mounting in end of handle.

1,176,661. Vapor Electric Device. P. K. Devers, assignor to General Electric Co. Method of operating device containing halogen compound.

1,176,668. System of Ship Propulsion. W. L. R. Emmet, assignor to General Electric Co. Arrangement for cooling secondary resistance of induction motor driving propeller.

1,176,698. Electric-Plant-Control Device. A. H. Brandon, assignor to B. Love, Jr., Toledo, O. Battery-charging arrangement.

1,176,715. Telephone-Exchange System. T. G. Martin, assignor to First Trust & Savings Bank, Chicago, Ill. Automatic.

1,176,716. Party-Line Automatic Telephone System. E. A. Mellinger, assignor to First Trust & Savings Bank. Special circuit arrangement.

1,176,725. Balanced Electrical Transmitter. E. H. Amet, Redondo Beach, Cal. Sensitiveness of variable resistance of microphone increased and automatically adjusted to temperature changes.

PATENTS EXPIRED.

The following United States electrical patents expired on March 28, 1916:

621,778. Electric-Lighting Gas-Burner. J. M. Auck, Philadelphia, Pa.

621,807. Insulating Compound. B. Ford, Johnstown, Pa.

621,827. System of Electrical Distribution. W. H. Knight, New York, N. Y.

621,848. Electric Railway. H. C. Reagan, Jr., Philadelphia, Pa.

621,854. Electric Hose-Signal System. H. Sargent, Cambridge, Mass.

621,855. Electric Arc Lamp. R. Schefbauer, Jersey City, N. J.

621,863. Printing Telegraph. S. J. Small, Seattle, Wash.

621,876. Electric Arc Lamp. E. P. Warner, Chicago, Ill.

621,907. Electrolytic Cell. H. H. Dow, Midland, Mich.

621,908. Porous Diaphragm for Electrolytic Cells and Method of Producing Same. H. H. Dow.

621,924. Means for Speed Reduction of Asynchronous Alternating Motors. K. E. F. Knauth, Charlottenburg, Germany.

621,963. Electric Action for Musical Instruments. W. B. Fleming, Detroit, Mich.

621,976. Overload Safety Device for Electric Circuits. L. G. Rowand, Camden, N. J.

621,984. Trolley-catcher. O. W. Whitehead, Dayton, O.

622,075. Protective Fuse. E. B. W. Reichel, Berlin, Germany.

622,078. Means for Generating Electricity from Machinery of Locomotives. H. F. Roach, St. Louis, Mo.

622,087. Filament for Incandescent Electric Lamps. C. H. Stearn, London, England.

622,116. Electric Switch. M. H. Caspari, New York, N. Y.

622,124. Secondary Battery. W. A. Crowdus, Chicago, Ill.

622,144. Electric Propulsion of Railroad Tramway or Other Similar Vehicles. J. J. Heilmann, Paris, France.

622,151. Electric Incandescent Lamp. C. Howard, London, England.

622,177. Electrical Knob. C. M. Brown, Newark, N. J.

622,186. Railway Advertising Apparatus. C. J. Feder, Paterson, N. J.

622,188. Keyless Switch Socket for Incandescent Lamps. M. Meyberg, Los Angeles, Cal.

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ELECTRICAL REVIEW

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EDITORIALS

STICKING TO A SPECIALTY.

Many electrical contractors doing a small local business in house-wiring have become familiar with every detail of this class of business, both in new and in already-built houses, and have wiremen who are also accustomed to handling this work expeditiously and well. Where the work is systematized, all material necessary for a job is sent in one haul to the premises and the installation proceeds without a hitch. Costs are kept at a low level by the elimination of unnecessary wastes and delays, and overhead expense is also kept at a minimum, although this element of cost is necessarily a larger percentage of small jobs than of large ones. A small concern is thus often able to handle small residence work at lower costs than larger competitors and can often bid under the latter on such contracts. This is sometimes attributed to deliberate price-cutting or ignorance of actual costs, when it may in reality be due to experience and efficiency in that particular line of work.

Other firms, again, may have specialized on office buildings, theaters, hotels or factory buildings. Each has special features which may require special planning or unusual work in execution. The organization which is habituated to meeting these special requirements can carry them through with less expense and less friction than any other. The contractor unused to such a job needs to figure a generous amount for contingencies in making his estimate. Failure to do so may bring him a contract which in the end means loss. The contractor who has been successful in one line of work is prone to venture into others without fully realizing the requirements. Profits may have been gradually piling up on small contracts only to be wiped out at one stroke in an attempt to handle a large contract in a slightly different field for which insufficient preparation was made, due to a lack of knowledge of all of the requirements.

Cultivating a specialty and then sticking to it as closely as seems feasible has great merit in electrical contracting, as well as in other lines of endeavor, and the man who travels the road indicated by this sign post has greater chances, other things being equal, of achieving success from both the financial point of view and that of actual accomplishment, than the man who aimlessly follows the path that haphazard circumstances may direct his steps to. Numerous examples will occur to the reader.

INSULATING JOINTS FOR FIXTURES.

There are certain points in electrical practice where the best construction for avoiding fire hazard seems to conflict with the provisions which would insure greatest personal safety or freedom from accident. In the minds of some, this statement applies to the grounding of the secondary circuit of transformers which supply a low-voltage load, as is evidenced by some of the correspondence which has appeared in recent issues.

Another instance of this kind is the use of an insulating joint in fixtures for electric lighting. A rule in the National Electrical Code prescribes such a joint between the fixture and the supporting pipe or other grounded metal structure. There is a provision, however, that it may be omitted with straight electric fixtures when the insulation of the conductors within the fixture reaches a specified standard which is higher than the minimum ordinarily required, and the socket is so designed that a porcelain or equivalent insulation is interposed between the live metal parts and the outer metal shell. The aim of this rule is evidently to provide against a short-circuit in case one of the fixture wires becomes grounded upon the fixture through a defect of the insulation. Since for fixture work, wires may be as small as No. 18 B. & S. gauge and the insulation may be as thin as one-sixty-fourth of an inch, it is realized that such accidental grounding may easily be caused. If such a ground is produced upon a combination gas and electric fixture, it is quite possible the spark or heat otherwise developed by a short-circuit may melt a hole in the gas pipe and ignite the gas and a destructive fire might possibly be kindled. There is also to be considered socket burnouts which occur when the ordinary brass-shell socket is installed in a grounded fixture. The fiber lining does not seem to be sufficient to prevent short-circuits when the inner or screw contact shell is connected with the ungrounded conductor of a grounded circuit. The requirement of an insulating joint in combination fixtures consequently seems to be a reasonable one from either standpoint.

In the case of straight electric fixtures, however, there is little inflammable material about a fixture which might start a conflagration. On the other hand, with the fixture insulated, contact with it of an ungrounded conductor will raise it to the same voltage as this conductor and any one touching it is likely to receive a shock which may occasionally be,

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even with voltages no higher than 150, fatal. Such a possibility would be obviated by having the fixture grounded and would seem with proper socket equipment to outweigh any fire hazard which might arise from having it grounded. The Code does not permit such grounding, however, if ordinary fixture wire and sockets have been used in the fixtures. It would seem wise to make such grounding not only permissible, but mandatory in all straight electric fixtures, even if this must be accompanied by a requirement for better insulation of the wiring and sockets in such fixtures. Straight electric fixtures do not present the same restrictions of available space for the electric conductors as are found in combination fixtures, and it would usually be possible to use conductors having insulation equal to that of the rest of the wiring system in fixtures of this class; but even if such better grade of wire is not required, it would seem better to require the grounding of the fixture wherever the hazard from illuminating gas is not present.

The wider introduction of wall switches and pendent switches, and the elimination of key sockets, make the liability of contact with live fixtures more remote, and where fixtures are placed out of reach, such liability is almost negligible. The bathroom, however, has proved to be one of the places of greatest danger, and it is here that key sockets and wall brackets most firmly persist. The question is consequently not one which will be immediately solved by changing conditions.

THE ATTITUDE OF METER READERS.

A central-station company is known to the public through its employees. Their attitude and behavior determine the impression of the company which is held by a majority of the community. One point of contact is in the office of the company. Another is through the meter reader, who comes into contact with every household using the service. Frequently this contact is with some other member of the household than the one who negotiated with the contract department for service. To many, then, the meter reader is the only employee of the company who is known, and this emphasizes the fact that he should be truly representative of the policies and attitude of the company.

Tact, common sense and courtesy upon the part of meter readers, especially if combined with a policy of giving all information which comes within their ken, can do much to forestall complaints and prevent dissatisfaction with the service. High bills can often be explained by a little observation of conditions existing in the home and the statements of servants as to the extent of evening entertainments carried on. Many consumers do not realize to what extent consumption for lighting varies at different seasons of the year, and a suggestion along this line may be enlightening. Suggestions for eliminating carbon lamps will also frequently be found timely, as the average layman does not yet properly appraise the difference in efficiency between the carbon and tungsten types. The carbon lamp will never be completely driven out until both types are supplied by the central-station company upon the same basis.

It is worth while for the manager of a central station to see that his metermen are prepared to talk intelligently along these lines and that they are disposed to be observing as well as polite and attentive while out upon their rounds. When complaints are received by metermen which they cannot satisfy, it should be the definite practice to report them at the office, so that when conditions warrant it a call may be made by another representative. Ignoring causes for dissatisfaction is a prolific breeder of the spirit of antagonism in the community which has so often been manifested toward public utility corporations.

FLEXIBLE STREET-LIGHTING AGREEMENTS.

Satisfactory lighting of streets in small towns handicapped for funds sufficient to install or maintain a comprehensive system is a good deal of a problem. In one instance, at Monson, Mass., where a new board of selectmen inherited this question, a working agreement has been entered into for the time being which promises reasonable satisfaction. After many interviews with residents of different neighborhoods, the problem became so difficult that the board could not decide upon a regular contract and devised the following tentative plan.

The public desired lighting at least one-half hour earlier in the evening than last year; that the service be continued each night until 12:30 or 1 a. m.; that the lamps be turned on mornings during December, January and February from 5:30 a. m. until daylight; and that there be no moonlight schedule. On account of the limited appropriation it was thought best to forego a contract. It was agreed with the local central station that the lamps should be turned on a half hour after sundown instead of an hour thereafter, and that they should be cut off at midnight unless there are entertainments, dances, etc., scheduled, when, if the selectmen are notified, the service will be continued until 12:30 or 1 a. m., as occasion demands. The early morning service is to be continued as in the past. To offset the extra hours called for by the agreement, and to enable the town to remain within the appropriation, the selectmen are to notify the lighting company on nights when the moon is full, when the weather is clear, and when there is no foliage on the trees, to turn off the lights. The company agrees to turn them on as soon as notified should the weather become cloudy, or should lamps be required for any other reason. Although the arrangement is a partial return to the usual moonlight schedule, it offers a partial solution of the local difficulties, and is likely to yield more satisfac-

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tion to the community than a cast-iron arrangement which would less readily conform to the conditions.

ECONOMY OF THE ELECTRIC TRUCK.

Operating expense and fixed charges should be carefully distinguished in considering the cost of transportation with motor trucks. Fixed charges are primarily associated with time, and their amount per ton-mile or per mile depend largely upon the distance covered. Total operating expense varies more nearly as the distance traversed, so that the unit cost is less variable. Depreciation charges contain two elements, one being dependent upon time and the other upon use (or abuse), so the allowance per unit of travel will vary differently with conditions from either of the above.

Other things being equal, fixed charges per unit of service are lower the more continuously the service can be rendered. Here is a point of advantage for the electric truck, which experience has shown to lose very few days out of service on account of necessary repairs or other attention—in marked contrast to its gasoline rival. This point deserves fully as much consideration in picking out the best vehicle in any given case as the first cost of the vehicle itself.

Operating expense in both cases includes repairs, renewal of tires, care and energy consumption. Repairs are notoriously more numerous and costly for the gasoline car, and tire expense points in the same direction. Energy in the one case is supplied in the form of electric current, in the other in the form of gasoline. Electric current has for years been diminishing in price and still shows the same tendency. There is no reason to anticipate any change in this situation. The purchaser of an electric truck can feel assured that the cost of energy for operating it will, throughout its life, be no greater than it is today, and the likelihood is that it will be less. Even in localities where the unit price of electric energy seems high, it must be remembered that the crux of the situation does not rest here. The energy charge is not more than one-quarter of the expense of operating an electric truck, and in many instances it is a great deal less than this. Consequently one cannot go very far astray in assuming that, for those types of service where electric transportation has been shown to be cheaper elsewhere, it will be cheaper also at home, regardless of the local rates for electric current.

The cost of gasoline, on the other hand, has shown an exceptional ability to increase, and while its future is very uncertain, there is no reason for believing that it will ever again reach a low level. This has already had the effect, it is claimed, of putting numbers of machines out of service. The price of gasoline has more than doubled in a very short time, and there is every prospect of a further advance. The one hope of checking this advance lies in the artificial production of larger quantities of the lighter oils from crude petroleum by the so-called cracking process. Recent experiments have indicated that this can be done far more successfully than had been anticipated from previous work. One method consists in an appropriate heat treatment of the heavier oils under pressure, which has the effect of breaking them up into more volatile forms. The most favorable conditions seem to be a temperature of about 550 degrees centigrade and a pressure close to 300 pounds per square inch. Another method subjects a mixture of heavy oils and natural gas to an electric discharge, with similar results. Such processes will greatly increase the supply of gasoline, but it is doubtful whether this will do more than arrest the rapid increase in price. The consumption has been increasing by leaps and bounds, and in 1915 reached 35,000,000 barrels in this country alone. This is an increase of about 25 per cent over the domestic consumption for 1914. Should demand continue to increase at this rate, there is little likelihood of relief from excessive prices.

This is the condition which confronts the purchaser of the gasoline car today, and it makes a strong talking point for the electric-vehicle salesman. Electric-vehicle manufacturers are experiencing an unprecedented demand for their output, and this condition may be expected to continue, keeping the factories running at full capacity. The advantages and economy of the electric truck are rapidly receiving general recognition.

IRRESPONSIBLE COMPLAINTS.

One phase of regulation of public service corporations by state utility commissions which has proven unsatisfactory to corporation officials is in connection with the complaints of irresponsible persons. Any individual is, of course, free to enter complaints against a utility corporation, but in many cases the complaints are made under a misapprehension or without inquiry into the facts of the case. If a hearing is arranged by the commission and the complainant attempts to gather evidence to support his complaint he discovers the lack of foundation for his case, and may fail to appear at the hearing. The case is then, of course, dismissed. In the meantime, the utility officials have gone to considerable trouble and possibly expense also, and may have neglected other duties in order to prepare a defense, all of which effort is found to be wasted.

It would relieve utility officials of an unnecessary burden if some way could be found to avoid placing such hearings upon the calendar. No case should be taken up formally unless it can be assured that the complainant has a *bona fide* case and intends to actually prosecute it. Perhaps the easiest solution of the difficulty would be for some member or employee of the commission to first take up cases informally in private conference, and find out whether any real ground exists for a formal hearing before one is scheduled. Many of the state commissions are already carrying out a practice which results in settling a large proportion of complaints without formal hearings, and if this procedure could be carried to the point of avoiding such instances as that cited above, it would prove an advantage to all concerned.

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Happenings in the Industry

Vehicle Program for N. E. L. A. Convention—Plans for American Institute Meeting at Washington—Artists to Compete for Electrical Week Design—Program of Northwest Electric Light and Power Association — Electrical Exports for January—Boston Street-Lighting Contract to Be Arbitrated — Miscellaneous News Notes

Electric Vehicle Day at N. E. L. A. Chicago Convention.

A conspicuous and important feature of the forthcoming convention of the National Electric Light Association at the Congress Hotel, Chicago, May 22 to 26, will be Electric-Vehicle Day under the auspices of the Electric Vehicle Section of that organization. The following is a partial list of papers arranged for presentation on Electric-Vehicle Day at the convention: "Central Station Assistance in Promoting Electric Vehicle Use," by W. P. Kennedy; "Exchange Battery Systems," by P. D. Wagoner, president, General Vehicle Company; "Passenger Vehicle Problems and Activities," by E. P. Chalfant, Anderson Electric Car Company; "Greater Garage Service," by Harry Salvat, Fashion Auto Garage, Chicago; "The Relation of Tires to Electric Vehicle Efficiency," by S. V. Norton, B. F. Goodrich Company; "Electric Truck Troubles and How to Minimize Them," by F. E. Whitney, Commercial Truck Company of America; "Industrial Truck Applications," by C. W. Squires, Jr., General Vehicle Company.

Arrangements for Washington Meeting of American Institute.

A meeting of the American Institute of Electrical Engineers will be held at Washington, D. C., on Wednesday, April 26, 1916, under the auspices of the Washington Section and the Committee on Development of Water Power. Headquarters will be at the New Willard Hotel.

Two sessions are to be held, the first beginning at 2:30 o'clock in the afternoon, and the second at 8:15 o'clock in the evening, both devoted to the specific question of water-power development as related to national industrial efficiency and preparedness.

The appointment by the president of the United States to the Naval Consulting Board of men nominated by the national engineering societies, and the president's subsequent invitation to those societies to co-operate by recommending engineers who should assist in making an inventory of national resources, indicate a broadened field of useful service to our country which engineers as a body can perform.

The forthcoming meeting has been suggested by the Committee on Development of Water Power, which sees a further opportunity for service to the nation by directing the attention of the public and of Congress to the fundamental engineering and economic principles that underly the water-power question and which must be taken into account if hydroelectric development is to be encouraged and stimulated, with a corresponding effect on the development of the great electrochemical and similar industries which are essential to the industrial independence of the nation.

At the present time Congress is considering the enactment of legislation intended to remove some of the legal obstructions which in the past have operated to deter capital from investment in hydroelectric enterprises, and it would therefore seem to be a peculiarly opportune moment for the institute to be of service. As will be noted from the program which follows, it has been sought to correlate several of those phases of hydroelectric development which are of peculiar and perhaps unusual importance at the present time, while the standing of the authors who have consented to prepare papers insures adequate presentation.

The program for this meeting, as at present arranged, is as follows: (1) Address by President John J. Carty; (2) "Electrochemical Industries and Their Interest in the Development of Water Power," by Lawrence Addicks; (3) "Water Power Development and the Food Problem," by Allerton S. Cushman; (4) "The Relation of Water Power to Increased Transportation," by L. B. Stillwell; (5) "The Relation of Water Power to the National Defense," by W. R. Whitney; (6) "The Water Power Situation, Including Its Financial Aspects," by Gano Dunn.

Artists to Compete in Creating Design for America's Electrical Week.

Electricity the unseen force, appropriately symbolized in picture as the pre-eminent power of today, is to be the theme of designs submitted in a poster competition which has been instituted by the Society for Electrical Development to secure an appropriate emblem for "America's Electrical Week," the nation-wide trade movement to be conducted this year by the united electrical interests from December 2 to 9.

The contest opened April 1 and will close June 1. Two thousand dollars in prizes are offered.

The design is to be reproduced upon posters, in press advertisements, in circulars, booklets, folders, on stamps and posterettes. It is the intention of the society to give as wide a circulation to the design as possible, in order that the Week and its purpose may be properly brought to the attention of the nation as a whole.

The popularity of the "Goddess Electra" design of the "Electrical Prosperity Week" celebration of last fall demonstrates the effectiveness of using an emblem for a widespread movement of this kind. The Electra emblem was reproduced hundreds of thousands of times and was highly instrumental in making the celebration the enormous success that it was. The design was not only used in connection with booklets, folders, posters and special literature, but was printed with hundreds of newspaper advertisements throughout the length and breadth of the country. In many instances, the papers devoted an entire page to it.

In "America's Electrical Week" it is planned to surpass the celebration of last fall in every particular. When the "Electrical Prosperity Week" campaign was launched, there existed in some quarters uncertainty over the outcome. There has never been a precedent of its kind, hence the boosters of the movement had little except initiative with which to work. The Week, in spite of skepticism, scored a big success and established a well-grounded prestige for national trade campaigns.

The prizes offered in the coming poster competition are as follows: *A* $1,000 Grand Prize, *B* $300 Second Prize, *C* $300 Public Choice Prize, *D* $200 Art Students' Prize, and *E* $200 School Prizes.

All artists, designers, instructors and persons engaged in

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the profession of graphic arts are eligible for the Grand, Second and Public Choice Prizes, provided they comply with the conditions of the competition.

The Art Students' Prize is open to students regularly attending any school of design, art academy or institution where poster art is a subject of instruction.

All designs entered for the Art Students' Prize will also be eligible for the Grand Prize, Second Prize and Public Choice Prize.

The School Prizes are divided into the following prizes: $1,00 for the first prize; $50 for the second prize; $25 for the third prize; $15 for the fourth prize and $10 for the fifth prize. These are open to pupils of high schools, public schools, private schools, parochial schools, seminaries or academies or to any pupil regularly attending any institution of learning which includes in its courses the art of drawing or design in any of its branches.

Certain conditions, rules and requirements must be complied with by all competitors. A copy of these may be secured from the Society for Electrical Development.

The judges who will decide upon the merits of the various designs and award the prizes as follows: John Quincy Adams, secretary, Municipal Art Commissions; Arthur W. Wiener, president, International Art Service; James P. Haney, art director of New York High Schools; Herbert F. Houston, president, Associated Advertising Clubs of the World; P. L. Thomson, advertising manager, Western Electric Company; Henry L. Doherty, president, Society for Electrical Development.

The committee in executive charge of the competition is as follows: Frank H. Gale, General Electric Company; J. C. McQuiston, Westinghouse Electric & Manufacturing Company; E. W. Rockafellow, Western Electric Company; George Williams, Henry L. Doherty & Company; Executive Staff, Society for Electrical Development, Inc.

Convention Program of the Northwest Electric Light and Power Association.

The ninth annual convention of the Northwest Electric Light and Power Association will be held in Seattle, Wash., September 6 to 9, inclusive.

The program committee has submitted a report which shows the following assignments of topics for papers to be presented at the convention: "Application of Overhead Line Construction Rules of the Public Service Commission of the Northwest," assigned to the Puget Sound Traction, Light & Power Company, Seattle, Wash., H. T. Crawford selected as editor. "Effect of Obsolescence of Equipment on Cost of Service," assigned to Portland (Ore.) Railway Light & Power Company, Leslie Craven suggested as editor. "The Employer as an Educator of the Public," assigned to the Wenatchee Valley Gas & Electric Company, Wenatchee, Wash., Arthur Gunn suggested as editor. "Merchandising and Operating in Small Towns and Rural Communities," assigned to the Pacific Power & Light Company, Portland, Ore. "Co-operation Between Central Stations, Manufacturers, Jobbers, Contractors and Dealers," assigned to the Pacific States Electric Company, San Francisco, Cal., W. L. Goodwin selected as editor. The Round Table Conference will be conducted by E. G. Robinson, president of the Association, who plans to mail a circular letter to all member companies, requesting them to submit subjects of general interest to be discussed at the conference.

The program is considerably shorter than those of former years, it being the intention of the Association to devote more time to discussions. With this in mind, abstracts of the papers will be in the hands of the members prior to the convention dates so that attending delegates can be prepared to discuss the papers.

The Pacific Coast Branch of the American Institute of Electrical Engineers will hold its convention on September 5, 6, 7 and 8, with a morning and afternoon session on the first day, and morning and evening session on the second day, and an executive session on the afternoon of Friday, September 8, thus giving an opportunity to A. I. E. E. members to attend the important sessions of the Northwest Electric Light & Power Association on the afternoon of Wednesday and Thursday, September 6 and 7. The Range Committee report will be discussed Thursday afternoon. Friday evening the annual banquet will take place, which will be a joint affair of both associations.

Electrical Exports for January.

The monthly summary of the foreign commerce of the United States for January, just issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., shows that the electrical exports for that month were surpassed in recent months only by the record shipments in November. In the four electrical classes for which the numbers of articles exported are given in the government report, there were shipped in January the following: Electric fans, 1,433; arc lamps, 154; carbon-filament lamps, 128,522; metal-filament lamps, 507,527.

The detailed figures for last January and for the corresponding month in 1915 are given below:

Articles	Jan., 1916	Jan., 1915
Batteries	$ 115,354	$ 100,946
Dynamos or generators	56,983	309,868
Fans	16,010	17,221
Insulated wire and cable	265,622	83,728
Interior wiring supplies, etc. (including fixtures)	87,611	72,104
Lamps—		
Arc	1,203	759
Carbon-filament	14,667	5,802
Metal-filament	109,720	38,504
Meters and other measuring instruments	75,352	40,556
Motors	389,380	205,140
Telegraph instruments (including wireless apparatus)	5,802	17,326
Telephones	69,050	184,556
Transformers	55,708	57,122
All other	1,058,360	640,306
Total	$2,320,822	$1,773,938

Electric locomotives are separately listed in the report. In January eight of these, valued at $151,245, were exported.

Boston Street-Lighting Contract to Be Arbitrated.

Consideration of the Boston street-lighting contract with the Edison Electric Illuminating Company may be taken up April 17 by the Massachusetts Gas and Electric Light Commission. Professor H. E. Clifford has been investigating the question of rate, for the city, during several months past. A large volume of data on plant and operating costs has been compiled, which will be used in deciding the case. The Edison company claims an investment of $637 per arc lamp.

At a hearing March 30, John A. Sullivan, Boston city counsel, held that it is the company's duty to prove that its proposed rates are fair. He held that if the company is allowed to put in its exhibits as prima facie evidence, the Commission will lose control of the case and be obliged to endorse the published schedule.

F. M. Ives, for the Edison company, contended that the burden of proof is not on the company. It will, however, show how it bases its rates, and to this end has furnished Professor Clifford all data. If the city's expert is to formulate conclusions on a different basis, the company will wish to suspend the case and examine his figures. Chairman Weed held that it was not necessary to determine in advance what is a prima facie case, nor discuss burden of proof. The latter relates to an issue of facts, and the Commission would still be bound to investigate for itself and determine what is a fair price, assisted by everything presented by both parties.

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Fire in East Nashville Causes Loss to Utility Companies.

Both the Cumberland Telephone & Telegraph Company and the Nashville Railway & Light Company were affected to a large extent by the fire that devastated a large area in the section of Nashville, Tenn., known as East Nashville, on March 22. The two utility companies suffered loss of several miles of lines and were both forced to make extensive repairs under pressure.

Every available employee of the telephone company was placed in service calling up business concerns for trucks and delivery wagons to be used in removing the furniture of residents in the path of the flames, this prompt action saving thousands of dollars worth of property. The number of telephone calls developed by the fire increased the switchboard load to three times the normal for a period of four hours, in which every operator on the list was on duty.

The heaviest line loss was that of a quarter of a mile of cable on the telephone toll lines to Louisville and Chicago, while several miles of open wire were melted down. The lighting company's loss was comparatively light, the greatest being the loss of customers. The first step taken by the company was cutting off of current to the eastern side of the Tennessee River, which separates East Nashville from the rest of the city. The mains to this section run under the river to manholes from which distributing wires serve various portions. By disconnecting lines at these points, the company was enabled to restore power to the industries on that side of the river which were out of danger.

About five miles of lines were down, while some of the street-railway feed lines were annealed so that they will require replacement as soon as this can be done. About 100 poles were burned down. New lines were strung on stubs and trees in order to restore lights to the sections beyond the fire area. Lighting current was flowing within a few hours after nightfall and only one street-car line was out of commission at that time.

A cordon of militia thrown around the burned zone prevented the stealing of the melted copper and enough of this was recovered by the company to reduce the loss materially.

Professional Men Work for Reconstruction of Belgian Arts and Industry.

Nevil Monroe Hopkins, as chairman of the Belgian Scholarship Committee, 309 Wilkins Building, Washington, D. C., is making an appeal to the professional and scientific men of the country for assistance in providing a fund for the reconstruction of Belgian educational facilities and opportunities for development in arts and science. The committee includes among its members the presidents or chancellors of the following universities: Johns Hopkins, Princeton, Michigan, Missouri, Leland Stanford, Pennsylvania, George Washington, State of New York, Nebraska, Rice Institute, Western Reserve, and many other leading men of the country, conspicuous among whom are Leo H. Baekeland, Thomas M. Chitard, Oscar T. Crosby, Harvey W. Wiley and Nathan C. Wyeth. It is proposed to establish a fellowship upon the basis of $1,000 a year for the duration of the war and two years thereafter, a sustaining membership of $100 and an associate membership of $10 each year under the same circumstances.

Oklahoma Association to Hold Annual Convention, May 23-25.

The fifteenth annual convention of the Gas, Electric and Street Railway Association of Oklahoma, will be held May 23-25 in Oklahoma City.

Among the papers to be presented are: "Safety-First Gas, Electric and Street Railway," by J. J. Johnson, Oklahoma City, to be accompanied by an exhibit by State Labor Commissioner Ashton; "Taxation of Public Service Corporations," by Prof. J. W. Scroogs, University of Oklahoma; "Development of New Business," by R. K. Johnston, Pauls Valley; "Diesel Oil Engines," by Prof. L. W. W. Morrow, University of Oklahoma; "Fuel Efficiency," by A. J. Neff, Abilene, Tex.; "Report of Rate Research Committee," by S. B. Irelan, Bartlesville; "Operation and Maintenance of Gas Distributing Systems," by J. F. Owens, of the H. M. Byllesby Company, and "Privately Owned Utilities and the Public," by W. R. Molinard, Oklahoma City.

H. V. Bozell, Norman, Okla., is secretary of the Association.

Ninth Annual Convention Banquet of the Minnesota Electrical Association.

The ninth annual convention of the Minnesota Electrical Association, held in Minneapolis, March 21-22, was one of the busiest and most successful meetings held by the Association, and was concluded by the annual banquet, at which there were covers laid for over 200 men of the electrical industry. The principal speaker of the evening was J. Adam Bede, former Congressman from Minnesota, who gave a rapid-fire talk, both serious and humorous, on the importance and progress of the application of electricity to industrial pursuits.

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Miscellaneous NEWS NOTES

Portland Valuation to Be Completed.—The valuation of the properties of the Portland (Ore.) Railway, Light & Power Company, which the Public Service Commission started about two years ago, will be completed about April 25.

Draft Electric-Lighting Franchise.—The City Commission of Lexington, Ky., has authorized Mayor Rogers to enter into a contract with the Utilities Bureau, of Philadelphia, in connection with drafting of the proposed electric-lighting franchise which will be offered the Lexington Utilities Company.

High Temperatures in the Laboratory.—On March 15 the Faraday Society had an informal discussion in London, England, with demonstrations, on methods and appliances for the attainment of high temperatures in the laboratory. Sir Robert Hadfield, the well known steel manufacturer, was in the chair and Dr. J. A. Harker, of the National Physical Laboratory, took a prominent part in the discussion.

Institution of Electrical Engineers.—The third paper of the session on electric railway matters was read before this institution in London, England, in March. N. W. Storer, the author, dealt chiefly with the characteristics and possibilities of the direct-current motor for handling trains in the most economical and satisfactory manner, not only on one line but for interchanging equipments on lines where different conditions prevail.

New Lighting System for Cincinnati.—The Business Men's Club is advocating a plan for a comprehensive uniform ornamental lighting system for the entire business district of Cincinnati, O. Under this plan 234 arc lamps now used will be replaced with nearly three times that number of lamps, on ornamental standards, to be placed at proper intervals along the sidewalks. William O. Kleine, superintendent of street lighting, favors the plan, it is understood. The Sixth Street Business Men's Club has secured signatures of more than 90 per cent of the property owners on Sixth Street between Sycamore and Elm to a plan for the installation of an ornamental street lighting system, 14 lights to the square for the five squares, the lights to be 500-watt tungstens on ornamental iron posts, with opalescent globes.

Merger of New York Electric Companies Sought.—The Rochester (N. Y.) Railway & Light Company has applied to the Public Service Commission for an approval of a merger of the Canandaigua Gas Light Company, the Eastern Monroe Electric Light & Gas Company and the Dispatch Heat, Light & Power Company, through the purchase of the stock and property of these companies and for approval of the company's plans for taking over all but the railroad property of the Ontario Light & Traction Company. The petition states that all these properties can be acquired for $1,000,000 and permission is asked the Commission for the issuance of common stock in this amount.

Electric Show at New Orleans.—Plans for an electric show at the Hippodrome Building, New Orleans, La., April 24-28, are being made. Various spaces have been set aside for exhibition purposes for the electrical concerns of the city, and Tulane University has been invited to contribute an exhibit along the lines of electrical engineering. A miniature Niagara Falls will be shown in electric lights. The show will be under the general auspices of the New Orleans Jovian League, and W. E. Clement, secretary and treasurer, will have general charge of the arrangements. Others participating in the planning for the event are Colonel J. H. DeGrange, R. S. Stearnes, C. R. Churchill, P. G. Stern, C. S. Barnes, Fred Hannemann, and H. M. Muller, assistant secretary.

New York Jovian League Booming.—The Jovian League of New York held another boom lunch at the Hotel Imperial on Wednesday, March 29. The speaker was T. Commerford Martin, secretary of the National Electric Light Association, who delivered an inspiring address entitled "Electric Vistas and Outlooks." Arthur Williams, vice-president of the New York Edison Company, presided, and there were over 200 in attendance. At the meeting on April 4, Dr. Miller Reese Hutchison, chief engineer of the Edison Laboratories, was the principal speaker. Addresses were also made by J. R. Crouse, William Gloeckner, J. C. Forsyth and J. M. Wakeman.

Dallas Votes for Municipal Light Plant.—At the election held in Dallas, Tex., on April 4, the bond issue providing for establishment of a municipal lighting plant carried. The model franchise proposed by the city also carried.

Special Agent for South American Electrical Trade.—Stanley H. Rose, commercial agent in charge of the New York office of the Bureau of Foreign and Domestic Commerce, announces that Philip S. Smith has been appointed special agent of the bureau to investigate the markets for electrical goods in South America. Mr. Smith will report both on the present conditions as well as the future prospects in the South American market for electrical goods of all character. His reports will enable the American manufacturer to intelligently cultivate the South American market. At the present time Mr. Smith is visiting a number of American cities with the purpose of interviewing American manufacturers and to ascertain what ground American firms interested in foreign trade would like to have covered in the investigation. Mr. Smith proposes to be in New York City, Room 409, Custom House, from April 24 to April 27, and will be very glad to meet American manufacturers and exporters of electrical apparatus and supplies.

New Charging Station Booklet.—The New York Electric Vehicle Association has published a new electric automobile charging station booklet. It contains a complete list of all charging stations in New York City and within a radius of a hundred miles of the City Hall, together with the maximum amperage and voltage available, the hours during which service is available and the prices charged for boosting at all of the stations listed. There are two route maps, one of New York City and the other of suburban runs with the charging stations shown. There is an interesting and instructive chapter on auxiliary charging or "boosting," with a table of constant-current boosting rates. Perhaps the most notable feature of the booklet is the story it tells of the constantly decreasing price of electricity for battery charging. Year by year the trend has been constantly downward until at the present time the maximum rate of The New York Edison Company is five cents per kilowatt-hour, which tapers down to two cents per kilowatt-hour, according to the amount of current used. The electric garage established about a year ago by The New York Electric Vehicle Association, at Sixty-second and Central Park West, maintains passenger electric automobiles at a flat rate of $40 per month, including storing, cleaning, washing, polishing and charging with an unlimited amount of current. Typical garage rates in New York City for electric trucks range from $45 per month for a 1,000-pound car to $60 per month for a five-ton truck. This economic advantage is one of the strongest reasons why the future of the electric vehicle looks brighter than ever—particularly when it is considered that the cost of fuel for other types of motor trucks has advanced from 14 to 31 cents a gallon, with the prospect of going still higher.

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The New Street-Lighting System of Milwaukee

Details of Lamp Fixtures, Circuit Layout, Illumination Characteristics and Cost Data

Part II

Lamp Fixture.

Through the adoption of the incandescent type of lamp as the standard unit, it was possible to design a special fixture of artistic pattern. This fixture, in two sizes, is substantially identical regardless of whether the lamp is mounted on bracket or harp posts or is suepended from a cable and, moreover, is exactly similar in external appearance whether it houses an electric lamp or a mantle gas burner. The exterior appearance has been shown in several of the illustration; Figs. 9 and 10 show the interior arrangement of an electric fixture.

It includes a number of new features on which patents assigned to the city of Milwaukee are pending. Liberal ventilation is provided by means of screened, and therefore bugproof, inlets and outlets of ample size. A special arrangement is provided by means of which the lamp socket can be vertically adjusted so as to change the character of the distribution. On lowering the socket the filament is brought deeper into the refractor and a more extended distribution (suitable for ratio M=8 or 12) is obtained; raising the socket in accordance with a definite gauge changes the distribution to make it correspond to M=6 or a still lower ratio. Thus the units are adapted to special requirements.

A close view of one of the refractor globes is shown in Fig. 11. These are of special Holophane construction used in the form shown in the Milwaukee installation for the first time; in the standard form they have been employed in numerous installations. They are duplex concentric globes with prisms on the inner sealed surfaces and smooth outer surfaces. For the tungsten lamps of 400 and 600 candlepower the modified standard eight-inch refractor is used. For all of the gas lamps and all electric units of 15 and 30-foot heights a special 11-inch size was developed for this installation. The refractor is firmly held in place by resting on a rigid ring just below the octagonal portion of the fixture. This part of the fixture can be swung down, permitting the refractor to be removed, if necessary, although as a rule it can be easily wiped out without even lifting it from its supporting ring. The glass panels in the octagonal portion can also be easily cleaned. These panels are illuminated and can have street names etched thereon, if desired.

Circuit Layout.

The idea carried out in the general design of the circuits was to provide a street-lighting system wired complete as to lamp circuits and subsidiary feeders and which could be supplied from the distribution system of the public utility company or that of the city, if the proposed municipal generating plant should ever be constructed. Thus the street-lighting system would be connected to the central-station lines through meters and service switches in the same way as the lighting system installed in the building of any private consumer. For this reason, and also to promote maximum economy and simplicity of operation, it was decided to eliminate entirely the special substation equipment usually provided for street-lighting circuits, such as constant-current transformers or regulators, rectifying apparatus, etc. The plan followed also eliminates the need for long special series mains connecting the local street-lighting circuits with the generating or substations of the central station.

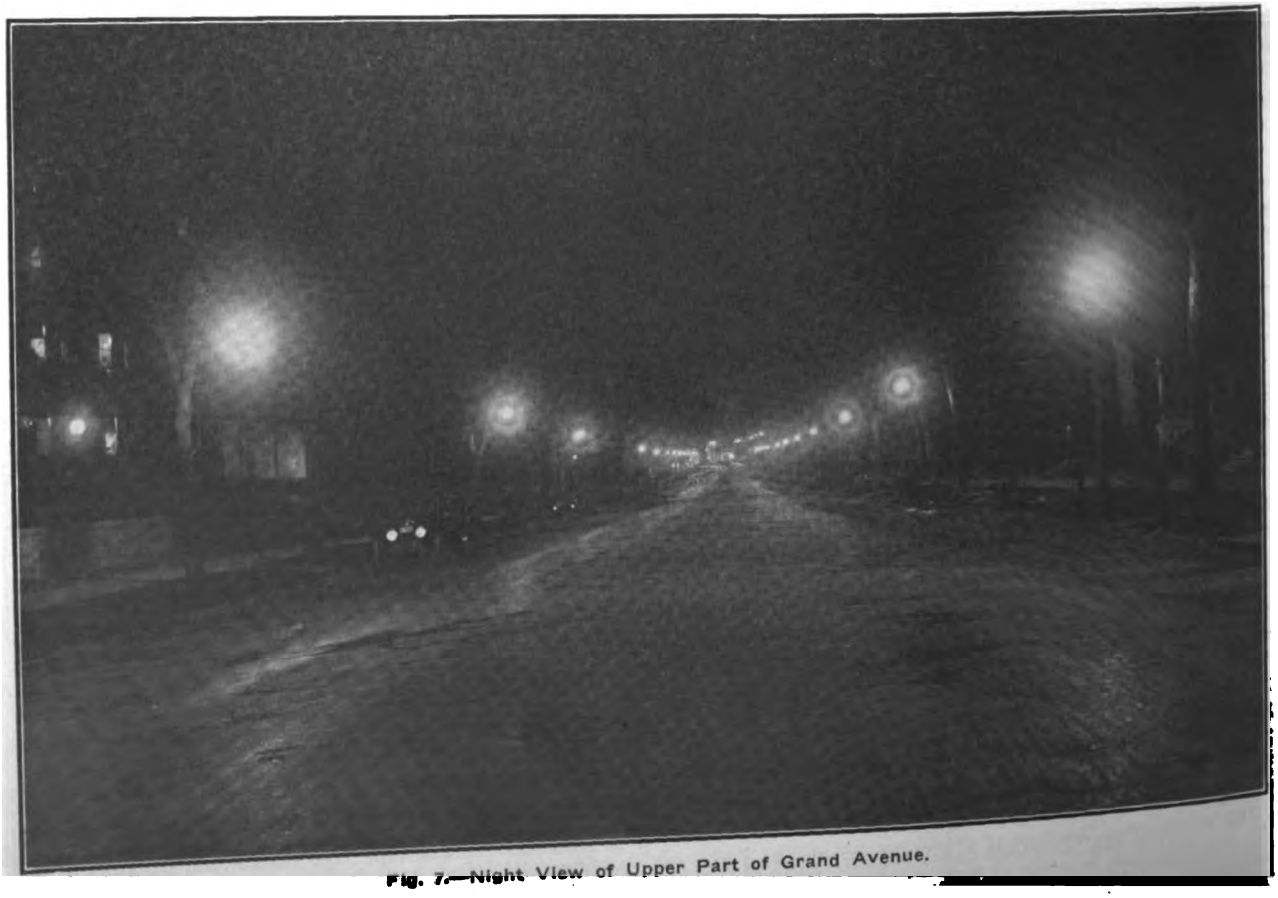

Fig. 7.—Night View of Upper Part of Grand Avenue.

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At the points of connection of the lighting system to the central-station 2,300-volt primary lines, which are mostly overhead lines in the alleys, what amounts to a pole-type outdoor substation of a compact design is installed. This includes primary and secondary line lightning arresters; one circuit transformer or a bank of transformers with taps on their secondaries to permit adjustment of the secondary voltage for varying numbers of lamps installed in the district; an electrically controlled pole-type oil switch for automatically cutting out the transformer in case of trouble and for turning on and off the lights in the district under the control of a time switch; there is also a meter for measuring the energy actually used and a recording voltmeter for checking the voltage regulation.

The oil switch is connected in the primary circuit of the transformer and therefore completely cuts it off, thus eliminating the core losses during the day; this switch also acts as automatic breaker and is connected to the time switch so as to avoid the need of having special operators or patrolmen for turning the circuit on and off. In the present installation a hand-wound time switch of the Anderson type is tentatively used. Electrically self-wound time switches will be used in the extensions of the system. Complete dependence is placed on time switches, since they have been developed to a very reliable state. The recording voltmeter and watt-hour meter are installed in a locked metal cabinet near the bottom of the pole which is conveniently arranged for meter reading without necessitating climbing the poles. The transformers used are usually of 15-kilowatt capacity and are so connected to ground that if one should be damaged or burned out it will not interfere with the others in the bank; thus while one of the secondary circuits might be affected, those connected to the other transformers will not be disturbed. A simplified circuit layout is shown in Fig. 14.

Fig. 8.—Night View of a Residence Street with 22.5-Foot Suspension Units at Intersections and 15-Foot Posts Intermediate.

From the secondary of the primary transformers is run a 6.6-ampere secondary circuit resembling the ordinary series lighting circuits in that it consists of a single wire loop run in a few cases on overhead poles, but for the most part (about 88 per cent of the complete system) as a single conductor of special armored construction buried about 15 inches below the surface under the sidewalk, or under the sod in the parkways directly back of the curbing, or under the pavements close to the curbing, no duct or conduit of any kind being used, except at street intersections where two-inch iron pipe was pushed under the pavement by pipe pushers and the cable pulled through this. It was not found to be economical or expedient to use any present underground conduits.

The buried cable, a view of a section of which is shown in Fig. 12, consists of the following layers: (1) jute covering; (2) two layers of saturated felt paper; (3) 0.035-inch steel tape; (4) 0.035-inch steel tape; (5) two layers of saturated felt paper; (6) 0.0625-inch lead sheath; (7) two layers of saturated cotton tape; (8) 0.0625-inch high-grade rubber insulation; (10) stranded No. 8 copper wire. The use of

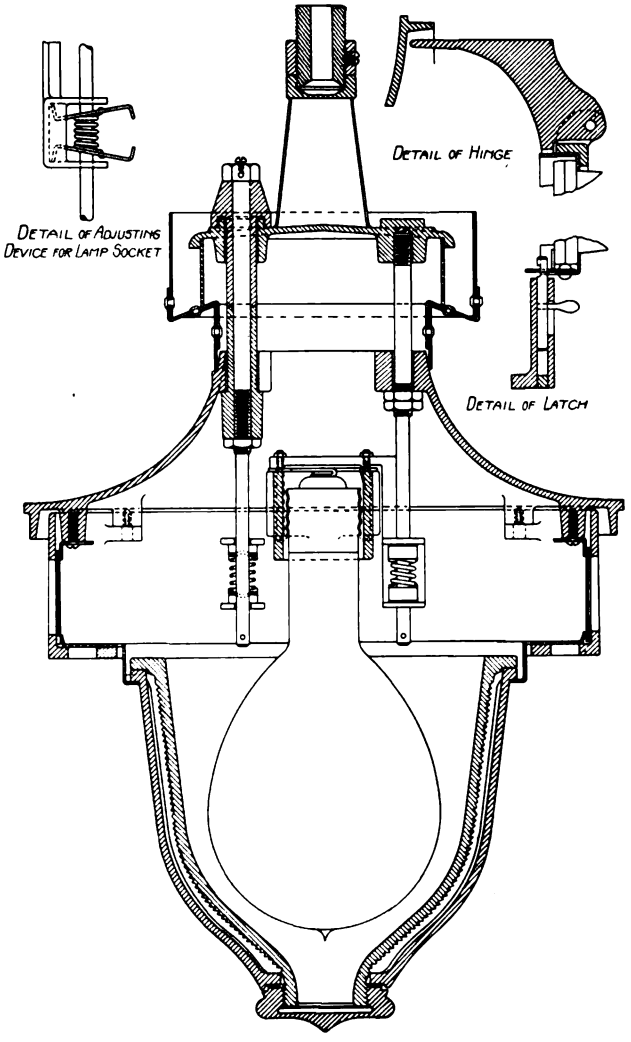

Fig. 9.—Sectional Elevation of Electric Fixture.

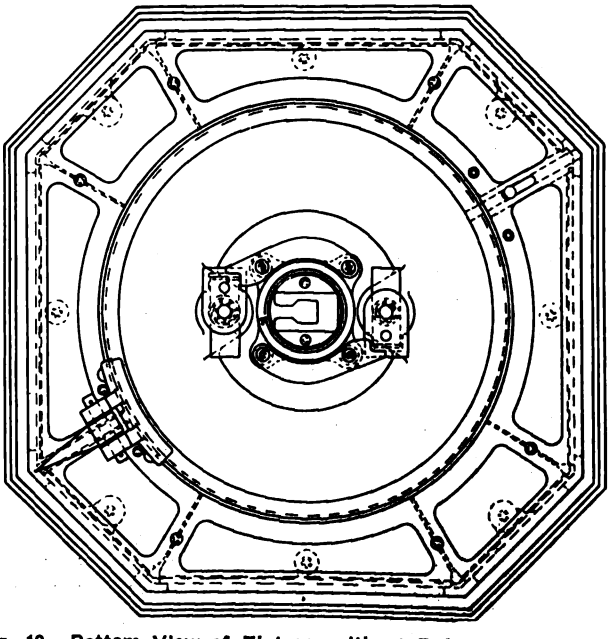

Fig. 10.—Bottom View of Fixture, without Refractor and Lamp.

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felt paper (2) and (5) is an innovation in this country, although it has been used in Italy to minimize electrolysis of the armor and sheath.

Lamps are not connected directly into this secondary circuit, but are connected into individual lamp circuits by

Fig. 11.—Special 11-Inch Refractor Globe.

means of series transformers whose primaries are in the secondary circuit referred to. These transformers thus serve in place of the autotransformers or compensators frequently installed in connection with gas-filled lamps for street lighting; they are used in preference to the ordinary compensators because they insulate the lamp from high voltage. The transformers are buried on a layer of concrete at the base of the post and, after being connected in, are covered with sealing and waterproofing compound and with a layer of concrete for mechanical protection in case subsequent street excavation might be made. Fig. 13 shows the pit at the bottom of one of the posts just before the transformer was connected in. The transformer can be seen at the right of the picture. These transformers are of special Kuhlman construction; they are compact in size, inclosed in a steel case and are designed to withstand several times the maximum voltage that is likely to be impressed upon them. In the case of the larger lamps, these transformers step up the current in the lamp circuits to 20 amperes; for the smaller lamps the current transformation is 1 to 1.

A general idea of this entire layout can be seen from the simplified diagram of Fig. 14; this is not a diagram showing any particular circuit, but has been drawn simply to illustrate how the lighting units are connected to the lines. In the case of the small amount of overhead lines, the lamp transformers will probably be placed on the nearest poles.

No rigid or standard number of lamps has been adopted for any of the secondary circuits, this depending upon the size of the lamps to be installed on the different posts. The maximum load on any of these secondary circuits will be approximately 15 kilowatts, which might consist of 30 500-watt lamps or 150 of the 100-watt lamps or of various other numbers depending on the wattage of the lamps. In some cases two or three different sizes of lamps will be fed from the same circuit transformer.

In case any lamp is burned out or broken, it does not affect the remaining lamps on the circuit, since it is always connected to the circuit through a double-coil transformer. If the secondary of this is open-circuited, due to lamp failure, an almost negligible effect is produced on the current in the primary circuit because the transformer then acts as a reactance. This arrangement therefore eliminates the use of film cutouts and constant-current regulators. For double-bracket posts, the two lamps are connected to separate sections of the lamp transformer by means of a three-wire cable of which the middle wire acts as a common return; thus, if one of these lamps burns out, the other will continue to burn, which would not be the case were the two lamps connected directly in series across a two-wire secondary.

For testing the underground cables and equipment a number of testing stations are installed in each district; at the present time 12 of these have been equipped. These are neat iron pedestals with a locked door giving access to a test and cutout block of the Pemco type and a loop of the buried cable runs up to this. It is therefore possible to insert instruments and make any desired tests from these stations. In case of a ground, the point can be easily located because all lamps beyond the ground will be out. By means of a special testing set, such as a Telafault or one of the howler type, it is also very easy to trace faults in the cable, which lies only 15 inches below the surface and close to the curb. Troubles are not anticipated, however, because the cable is designed for 15,000 volts and will at no time be subjected to over 2,300 volts.

On some of the streets which are as yet unpaved and on which no definite grade has yet been established, the circuits will run as overhead lines from lamp to lamp and no underground construction will be used until the street is paved. In the outlying parts of the city this type of construction will be used and something like 12 per cent of the total system will be laid out in this manner. Even on these overhead circuits, however, the lamps will be connected to their lines through transformers.

The entire city was divided into 59 circuit areas, each comprising as compact and regular a district as local conditions would permit. The dividing lines between adjoining areas were usually placed on important streets, one side of these streets being fed from one circuit and the other side from the adjoining circuit. By this arrangement trouble on one circuit would not deprive these principal streets of all

Fig. 12. Sample of Cable.

Fig. 13.—View Showing Pit Along Base of Post Just Before Connecting in Transformer.

light. The circuit map of the city is shown in Fig. 15. The efficient and short routing of circuits permitted thereby is in marked contrast to that still in use in the old system.

Character of Illumination.

The accompanying night views, Figs. 7 and 8, give an inadequate idea of the excellence of the illumination pro-

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duced on those streets where the full number of lamps has been installed according to complete schedule. The most distinguishing characteristic is the uniformity of the illumination, this being due chiefly to the general use of refractors which decrease the light directly below the lamps

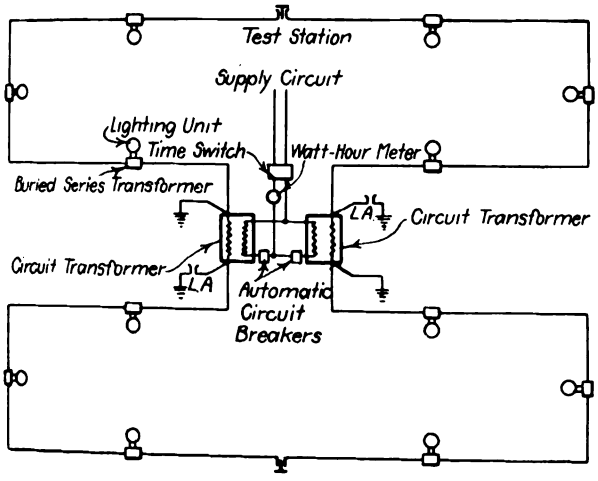

Fig. 14.—Simplified Circuit Diagram.

and increase that at points between adjoining lamps; this is also aided by high mounting of the lamps, which at the same time minimizes their glare and blinding effect.

On the principal street lighted (Grand Avenue) where there are four 30-foot posts, each with two 1,000-candlepower lamps, per block, the intensity of the illumination is about equivalent to 16 times that of the brightest moonlight. On less important business streets the illumination, though less intense, is also very uniform and this is true whether the light comes from post lamps at the curb or from center-suspended lamps. One street has post lamps arranged in the usual staggered order; its lighting is nearly as good as that of the streets where the standard order of posts directly opposite each other is followed, but the appearance of the latter arrangement is more pleasing. This is particularly noticeable on the narrower part of upper Grand Avenue, Fig. 7, where 15-foot posts face each other at intervals of 120 feet. The illustration shows how even slight irregularities in the street surface are made conspicuous.

On those streets where additional lamps are to be added in the future the lamps now in do not give as perfect uniformity as in the case of streets already fully equipped. The additions of the other lamps called for at intervening points will bring this uniformity up to the standard. On the less important residence streets it has been found that quite uniform and practically as good lighting on both sides of the street is obtained from a single row of lamps placed at one side only.

At those street intersections where the suspension unit is not used, one is at first surprised to find that the curb posts are not directly at the corners. However, the illumination at all parts of the crossing is entirely satisfactory. This is due to the fact that it comes from eight units, each located a little back of the corner. Four of these on the first street provide uniform illumination over its entire surface; the other four on the second street likewise uniformly illuminate its surface. The result is that at the entire crossing these two uniform illuminations overlap and there is practically twice as much light as along the interior of the block. In all cases throughout the demonstration installation the illumination is vastly superior to that formerly provided.

Scope of New System.

A good idea of the character of the different units proposed for the completed new system is gained from the following table:

Type of Unit	No. of Units
15 -foot harp post, electric	1,430
22.5-foot single-bracket post	1,924
22.5-foot double-bracket post	142
30 -foot single-bracket post	429
30 -foot double-bracket post	362
45 -foot double-bracket post	10
45 -foot four-bracket post	3
22.5-foot center suspension	2,499
15 -foot harp post, gas	2,022
Total	8,821

All of the foregoing, except the last, are electric units. The lamp equipment for these units is as follows:

	Candlepower of Lamp	No. of Lamps
Electric	100	1,015
Electric	250	881
Electric	400	3,328
Electric	600	1,359
Electric	1,000	739
Total electric	.....	7,322
Gas	100	2,022
Grand total lamps		9,344

A comparison on a candlepower basis of the old and new system shows that the 5,746 lamps of the old system aggregated to the amount of 956,580 candlepower, or an average of 167 candlepower per unit. The 8,821 units of the new system aggregate 3,409,550 candlepower, or an average of 387 candlepower per unit.

Installation, Operating and Maintenance Costs.

Although from the foregoing it is evident that the new system will provide over 3.5 times as much light as the old, its total annual cost will exceed the present figure by only 42 per cent. This relatively small increase is due to some extent to the fact that several square miles of territory in the outskirts of the city will be lighted that never before were lighted. The number of lighting units will be increased by over 53 per cent and the character of the illumination will be improved to an almost incalculable extent because all dark spots along the streets will be obliterated.

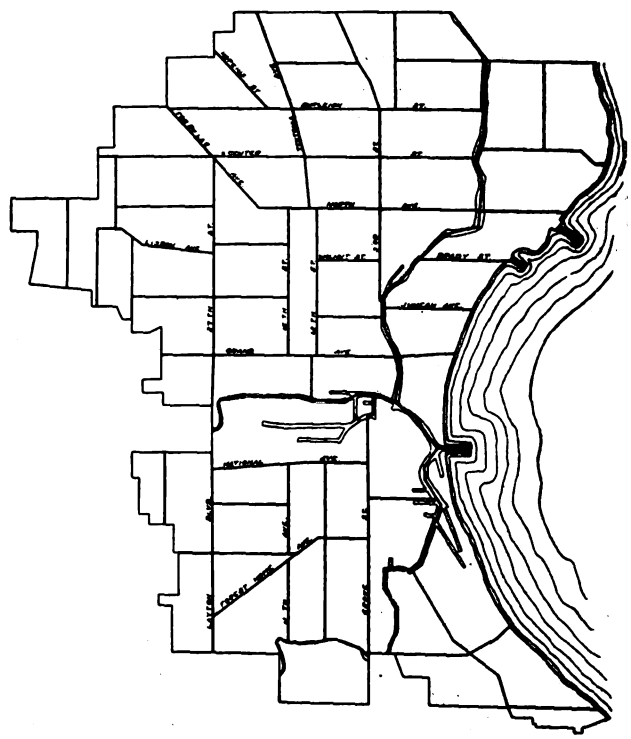

Fig. 15.—Map of City Showing the 59 Circuit Areas.

The inadequacy of the street illumination by the old system in Milwaukee was due not only to the inefficient equipment in use, but also to the meagerness of the amount annually expended for street lighting. Data on this matter

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were obtained covering the year 1915 from the department of public works of each of the twelve other American cities having a population between 300,000 and 600,000 and compared with the expenditures of Milwaukee, as shown in the following table, in which the population figures are those of the United States Bureau of Census.

City	Population in 1915	Street-Lighting Cost in 1915 Total	Per Capita
Baltimore, Md	584,605	$571,190	$0.98
Pittsburgh, Pa	571,984	527,817	.92
Detroit, Mich	554,717	361,349	.65
Los Angeles, Cal	475,367	435,454	.92
Buffalo, N. Y	461,335	497,190	1.08
San Francisco, Cal	456,009	435,000	.95
Milwaukee, Wis	428,062	232,910	.54
Cincinnati, O	406,706	399,422	.98
Newark, N. J	399,000	267,030	.67
New Orleans, La	350,695	*278,363	*.79
Washington, D. C	358,679	380,225	1.06
Minneapolis, Minn	353,460	312,193	.88
Jersey City, N. J	300,133	164,607	.55
Average			$0.84

*Figures for 1915 not obtainable; figures given are for 1912.

The foregoing figures include all energy and operating, maintenance and investment elements. This table shows that Milwaukee has been expending least for street lighting of all cities of its class. The total annual cost of the new complete system for Milwaukee will be $326,846, or $0.77 per capita, which is considerably lower than the average ($0.84) of all the 13 cities having populations between 300,000 and 600,000, as shown above.

A condensed summary of the installation cost of the completed system is given in the following table:

Quantity	Item		Cost
7,322	Electric lamps		$ 18,091
9,344	Lanterns or fixtures		159,705
8,821	Lamp supports—		
	3,452 15-ft. posts	$114,779	
	1,924 22.5-ft. single-bracket posts	72,612	
	142 22.5-ft. double-bracket posts	5,697	
	2,499 22.5-ft. suspension posts	184,926	
	429 30-ft. single-bracket posts	22,531	
	362 30-ft. double-bracket posts	19,910	
	13 45-ft. bracket posts	1,581	
			422,036
6,799	Wiring lamp supports		43,234
2,022	Gas connections		18,076
6,802	Lamp transformers		95,122
456,011	ft. cable under pavement		200,108
1,137,709	ft. cable under parkway		311,358
211,285	ft. overhead lines		29,581
59	Sets circuit-control apparatus		32,585
	Total Installation Cost		$1,329,896

A more general division of this total cost shows it to consist of $668,754 for circuit lines and $661,142 for lamps and posts. The average investment cost of each of the 8,821 units of the complete system is $150.76; the average investment cost of the 6,799 electric units is $176.56. The decreased investment cost of the 2,022 gas units is offset by the greater energy and maintenance costs, as will be shown later.

It has been estimated that by using overhead construction on all lines outside of the downtown business district, a decrease in the initial investment of about $200,000 might have been produced. Likewise by use of rough wood poles, instead of concrete and steel posts, in all but the most important streets a further saving of about $200,000 might have resulted. This $400,000 would represent a saving in the annual cost of only 9 per cent, which is a very small amount to pay for the permanence and attractive appearance resulting from elimination of wood poles and practically all overhead lines.

All of the above estimated first costs are based on the prevailing prices of copper and other materials as of January 1, 1916. It is probable that some of the actual costs will fall below those conservatively figured. For example, concrete posts now cost about $1 per foot of length; it is believed this figure will be reduced by quantity production.

To raise the necessary funds to meet the installation cost it is proposed to issue municipal 20-year serial bonds bearing 4.5 per cent interest, at which rate they will probably sell at above par; one-twentieth of the issue will be retired each year. Allowing for the gradually decreasing interest payments as the bonds mature, the average annual interest charge per dollar of investment is $0.02365; the annual amortization charge to pay for one-twentieth of the investment is $0.05 per dollar invested; the total annual investment charges aggregate $0.07365 per dollar invested.

The total annual lighting cost is composed of three elements. The first is the energy cost for gas and electricity; the second is maintenance of lamps, posts, lines, etc.; the third is the so-called fixed charge or investment cost alluded to in the preceding paragraph. Gas is figured at $0.45 per 1,000 cubic feet. The type of gas burner used consumes four cubic feet per hour of burning, and the pilot flame used for lighting the lamp consumes one-third cubic foot per hour throughout the 24 hours of the day. Electricity is figured at one cent per kilowatt-hour. The total electrical energy is calculated as the lamp load plus 16 per cent thereof for line losses. All lamps, both gas and electric, are to burn on a 4,000-hour per year schedule. In the following table are given the annual energy costs of the different lamps to be used:

Item	Gas Lamps 100 C.P.	Electric Lamps 100 C. P.	250 C.P.	400 C.P.	600 C.P.	1,000 C.P.
Cost of energy consumed by lamp	$7.08	$2.83	$6.10	$9.63	$11.09	$17.55
Cost of energy lost in circuit	.....	.45	.98	1.54	1.78	2.80
Cost of energy consumed by pilot	1.31	.....	.....	.....	.....	.....
Total annual energy cost	$8.39	$3.28	$7.08	$11.17	$12.87	$20.35

In the maintenance items are included daily general inspections of all circuits and lamps to check outages, monthly cleaning of electric lamps, three lamp renewals per year, street and laboratory checking of candlepower maintenance and lamp quality, annual painting of steel poles, circuit and apparatus tests and repairs, etc. All electric lamps and circuits will be maintained by the city. Gas lamps, mantles and burners will be maintained by contract with either the gas company or the manufacturer, the Welsbach Company.

A good detailed analysis of all the annual operating costs of the different types and sizes of units is given in the table at the top of page 631. All but the first are electric lamps and units.

A summary analysis of the annual operating cost shows it to consist of $96,234.00 for energy, $132,697.58 for maintenance, and $97,914.42 for investment charges. A study of the annual-cost table shows that in each case the suspension units cost more than the corresponding concrete-post units. The cost of two-lamp or double-bracket units is also higher than that of more powerful single-bracket units; for example, a 30-foot post unit with two 250-candlepower lamps costs $53.49 annually, whereas a 30-foot post with a 600-candlepower lamp costs only $43.46. The improved appearance of double-bracket units warrants their use on the most important streets, however.

Another interesting fact disclosed by this table is that the use of a larger lamp adds but a relatively small amount to the annual cost of the unit; for example, a 250-candlepower lamp on a 30-foot post costs $32.21 annually, while a 400-candlepower lamp costs only $39.26, in other words, for an addition of $7.05 per year the illumination is increased by 60 per cent. This slight increased cost will be taken advantage of along those business streets where the merchants wish to provide a higher illumination than that scheduled in the completed plan. For instance, suppose the merchants wish to enhance the commercial importance of a street by increased lighting; instead of putting in cluster posts or other private posts at considerable expense, they may pay an annual charge of a few cents per front foot which will provide for the increased cost to the city of the larger lamps. It is contemplated (in fact, has already been done in the demonstration installation) to prohibit private lamp posts along the streets

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DETAILS OF ANNUAL OPERATING COST.

No. of Units	No. and Candle-power of Lamps		Type of Unit	Annual Cost per Unit — Energy	Maintenance	Investment	Total	Total Annual Cost
2,022	1	100	15 -ft. Concrete post, gas	$ 8.39	$ 12.50	$ 4.71	$ 25.60	$ 51,763.20
1,015	1	100	15 -ft. Concrete post, electric	3.28	10.08	11.44	24.80	25,172.00
415	1	250	15 -ft. Concrete post, electric	7.08	11.88	11.54	30.50	12,657.50
266	1	250	22.5-ft. Suspension	7.08	11.88	14.33	33.29	8,855.14
50	1	250	22.5-ft. Concrete post, single bracket	7.08	11.88	11.29	30.25	1,512.50
32	1	250	30 -ft. Concrete post, single bracket	7.08	11.88	13.25	32.21	1,030.72
2,219	1	400	22.5-ft. Suspension	11.17	14.69	14.48	40.34	89,514.46
1,036	1	400	22.5-ft. Concrete post, single bracket	11.17	14.69	11.45	37.31	38,653.16
35	1	400	30 -ft. Concrete post, single bracket	11.17	14.69	13.40	39.26	1,374.10
59	2	250	30 -ft. Concrete post, double bracket	14.16	23.76	15.57	53.49	3,155.91
13	1	600	22.5-ft. Suspension	12.87	17.14	14.54	44.55	579.15
751	1	600	22.5-ft. Concrete post, single bracket	12.87	17.14	11.49	41.50	31,166.50
323	1	600	30 -ft. Concrete post, single bracket	12.87	17.14	13.45	43.46	14,037.58
13	2	400	30 -ft. Concrete post, double bracket	22.34	29.38	15.85	67.57	878.41
6	2	400	45 -ft. Concrete post, double bracket	22.34	29.38	21.04	72.76	436.56
1	1	1,000	Special suspension	20.35	19.68	14.66	54.69	54.69
87	1	1,000	22.5-ft. Concrete post, single bracket	20.35	19.68	11.63	51.66	4,494.42
39	1	1,000	30 -ft. Concrete post, single bracket	20.35	19.68	13.59	53.62	2,091.18
34	2	600	22.5-ft. Concrete post, double bracket	25.74	34.28	13.29	73.31	2,492.54
42	2	600	30 -ft. Concrete post, double bracket	25.74	34.28	15.94	75.96	3,190.32
4	2	600	45 -ft. Concrete post, double bracket	25.74	34.28	21.14	81.16	324.64
108	{1 / 1	600 / 1,000}	22.5-ft. Concrete post, double bracket	33.22	36.82	13.47	83.51	9,019.08
248	2	1,000	30 -ft. Concrete post, double bracket	40.70	39.36	16.16	96.22	23,862.56
1	4	600	45 -ft. Concrete post, four bracket	51.48	68.56	29.50	149.54	149.54
2	4	1,000	45 -ft. Concrete post, four bracket	81.40	78.72	29.95	190.07	380.14
8,821								$326,846.00

and those now in place will be removed. The idea is to adopt one municipal street-lighting system of harmonious design and character throughout the city and to concentrate all effort and expenditure on its development.

At the city election held on April 4, the voters of Milwaukee approved the issuance of bonds aggregating $750,000 to pay for the major part of the extension of the new system throughout the city. This insures having most of the work completed this year. The remainder will be finished in 1917 through an additional bond issue of about $500,000.

Advantages of Tie Lines Pointed Out.

At a recent hearing before the Gas and Electric Light Commissioners of Massachusetts, A. B. Tenney, of Charles H. Tenney & Company, Boston, exhibited a map which showed the territory north of Boston, in eastern Massachusetts, with the generating stations indicated, which included those in Lowell, Lawrence, Haverhill, Salem, Lynn, Chelsea, Malden, Revere and Boston.

The installed generating equipment in the territory, covering about 30 miles square, amounts to about 175,000 kilowatts, including the stations of the Bay State Street Railway Company. The maximum peak aggregates about 103,000 kilowatts, leaving 72,000 kilowatts surplus capacity.

It was pointed out that a greatly increased total capacity would result if all these plants were tied together, there being some 70,000 kilowatts in primary capacity, and 20,000 more of secondary power, in excess of the territory's demands for 12 months of the year, and some 20,000 kilowatts more for the 8 months, March to October inclusive.

The large margin above individual power requirements is due to the fact that the various plants are equipped to meet the maximum which occurs at varying seasons. For example, the generating station of the Suburban Gas & Electric Company, Revere, is taxed to its capacity during the summer months, when the important resort of Revere Beach draws heavily for light and power. On the other hand, the Malden Electric Company's station, supplying principally light to this well-to-do suburban residence district, has a much larger load during the winter.

It was brought out that an underground cable connects the plant of the Lynn Gas & Electric Company with the Suburban company's station. This passes under the Saugus River, and was installed a number of years ago for mutual protection. Lines of the Connecticut River Transmission Company are already installed as far east as nearly to Lowell, and it was pointed out that connection with the plants mentioned would give them the benefit of hydroelectric supply from the western part of Massachusetts.

Excellent Results Obtained in Electrical Operation of Panama Canal Locks.

At the meeting of the Western Society of Electrical Engineers held in Chicago on April 3, a paper entitled "The First Year's Operation of the Panama Canal Locks" was read by S. H. Grauten in the absence of the authors, F. C. Clark and R. H. Whitehead, respectively, superintendent and assistant superintendent of lock operation. In the first year of canal operation 1,370 vessels were locked through the canal without any accident whatever. The entire operation of the locks has been very satisfactory. The control apparatus has given excellent results and it was only by use of such a control system that so large a system of locks could be operated properly. Both up and down lockages are made at about twice the speed that was anticipated. Both lock operators and canal pilots were given very careful training. The night illumination of the locks has proven entirely satisfactory so that vessels can pass through the locks as freely at night as by day.

Electric locomotives used in towing and guiding vessels through the locks were designed for a speed of two miles per hour. It was feared this speed was too high when it came to handling very large vessels, so a scheme by which the locomotive speed could be reduced to one mile an hour was developed through concatenation of the motors. It has been found, however, that practically all vessels can be manipulated at the speed of two miles an hour without danger or trouble. Bids are now being sought on a number of additional towing locomotives in which certain improvements are to be incorporated.

The operation of the locks has produced some very interesting phenomena. Peculiar problems arose due to the difference in salinity on opposite sides of the lowest lock gates which produced difference of level and set up peculiar currents in the water. It has been found best to follow a definite cycle of operation in opening and closing the mitering gates and the various sets of valves. The salt water has been found to cause electrolytic corrosion in the steel where this is exposed to the action of the water in proximity of some other metal, such as bronze. No very large amount of metal is exposed in this manner and the potential difference between the metals is very low; however, since the action of this electrical couple goes on throughout the entire 24 hours, perceptible corrosion has been noticed when each lock chamber is unwatered and pumped completely dry for inspection, which is about once a year. Of the large number of paints and other coatings tried out to overcome this corrosion, bitumastic enamel paint has been found the most satisfactory.

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Electrical Features of a Publishing Plant

New Installation at Establishment of the "Youth's Companion" Comprises a Comprehensive Motor and Control Equipment of Unusual Interest

Industrial Power Series—Article No. 160

About October 1 the famous publication, "The Youth's Companion," Boston, Mass., moved from its location on Columbus Avenue, in that city, to a newly constructed six-story reinforced concrete building in the Allston district. The presses, folders and other machinery employed in publishing were set up and electric motor drive applied individually to each machine. The earlier drive was by a steam plant, with line shaft, except for about 10 small direct-current motors operating small machines. Central-station power was decided upon for the newly installed plant, and a contract closed with the Edison Electric Illuminating Company for 220-volt, three-phase service.

The motor installation was placed in the hands of the Boston office of the Sprague Electric Works, of the General Electric Company.

The installation consists of about 100 Sprague motors, with an aggregate of 218 connected horsepower. All are on three-phase service except for job-press motors, which are single phase, giving a 3-1 speed variation. A 2-1 speed variation is typical for the three-phase service.

There are eight large rotary printing presses and eight flat-bed presses. Each of these machines is provided with a predetermined speed controller located on the nearby column which divides the pressroom into bays, in each of which one press is located. The controller, which is of recent Sprague production, carries the main switch and fuses for both the main driving motor and the small motor which operates the table, and the starting handle, which gives 16 different speeds from eight staggered contact buttons. This provides a range of 60 per cent variation between the fastest and the slowest speed.

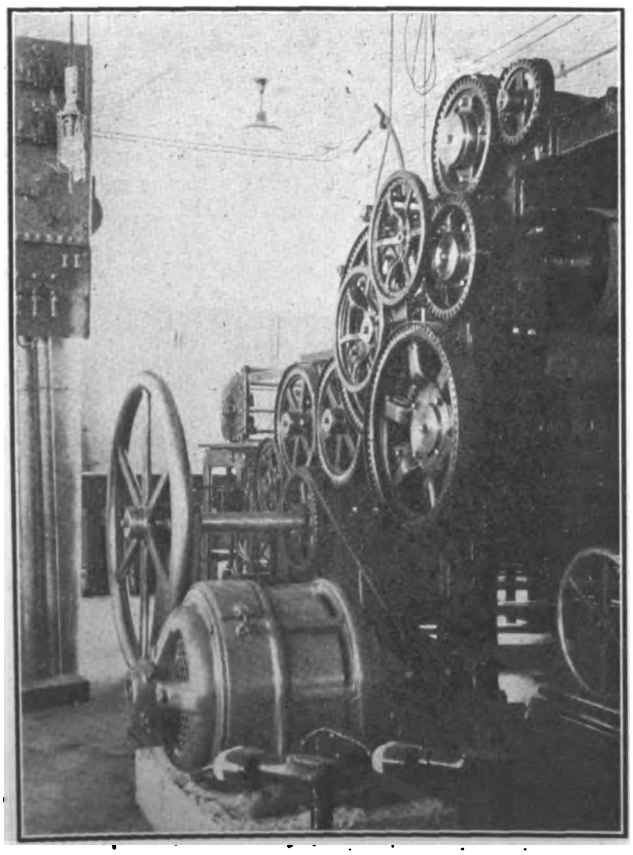
Motor-Driven Press Equipment.

In operating a press, the predetermined running speed is obtained by setting the handle on the proper point, and two push-button stations on the press, each with six buttons, give start, stop, jog, reverse, fast and slow motions.

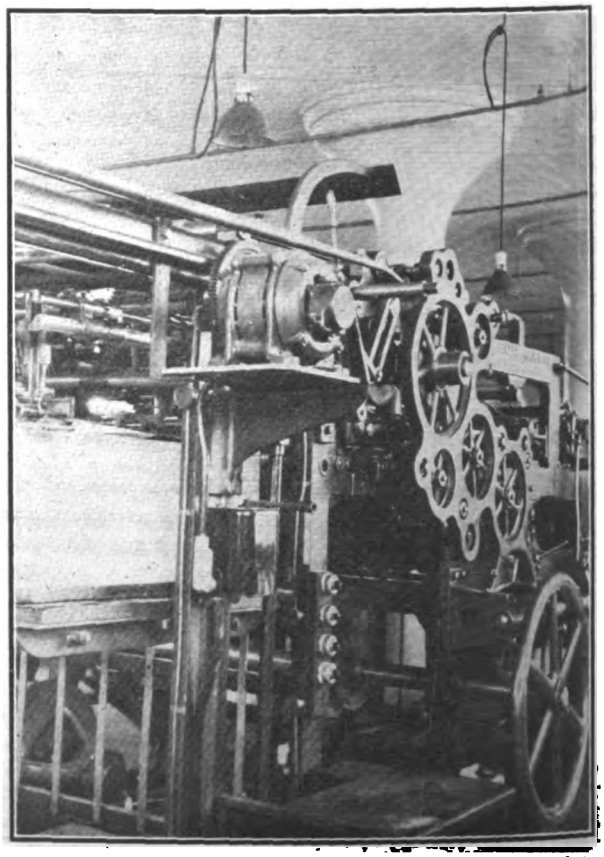
Motors driving the flat-bed presses are mounted on a special bracket attached to the frame under the step. Those driving the rotary presses are, in most instances, located directly on the floor, with conduit and condulets carrying the power loads vertically from the floor to the motor connections. In one or two instances a concrete base was cast for supporting the motors, on account of interference of the driving chain if located on the floor. The base is 24 by 36 inches and 5 inches high, and into it were cast two 26-inch sections of 6 by 6-inch Southern pine timbers. Lagscrews attach the motor bed to the timbers.

The eight rotary presses and four Dexter folders are connected to their respective motors by silent-chain drive, with sprockets on press and motor shafts. This type of drive was decided upon as giving a positive action, avoiding the slippage that smooth belts are subject to, and as being economical, obviating the necessity to relace and tighten ordinary belts.

A feature of the motor application, on the folding machines, which provides for the lifting of the table, is a



A 10-Horsepower Three-Phase Motor Driving Rotary Press By Chain Drive, Youth's Companion Plant, Boston, Mass.



Method of Mounting Small Motor to Lift Table on Dexter Folders, Youth's Companion Plant.

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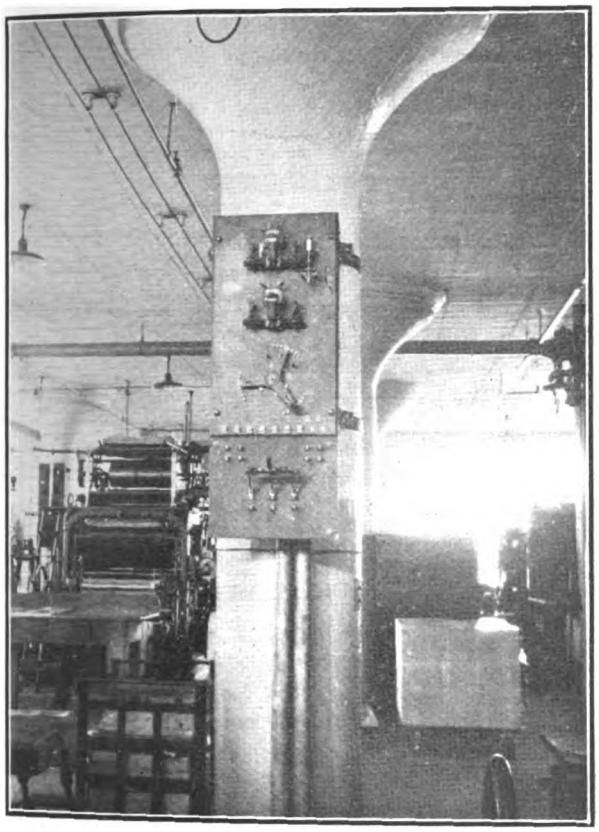


Starting and Control Board for Motors Operating Presses and Folders, Youth's Companion Plant.

hanging bracket consisting of a 12 by 12-inch sheet-steel plate, for the motor to rest on, supported by hangers of strap steel about two inches wide and 12 inches long, bolted to the folder frame. The lifting apparatus was originally operated by means of a pulley belted from the line shaft. The motor now performing this duty is geared to the axle of the lifting apparatus.

On the four job presses referred to, the speed variations are obtained by the shifting of the brushes through a new foot-lever device; and this is clearly a more economical and efficient means than the wasteful method of putting the energy through resistance. The same lever starts the press by friction contact of belt or flywheel, after the motor has been brought up to speed. By this advanced device a 0.5-horsepower motor is adequate to drive a Golding jobber which otherwise would require one of much larger capacity.

Each of the large presses and folders is mounted on Southern pine scantlings about 2 by 6 inches, which extend under the whole length of the frame, giving the proper elasticity, on the concrete floors.

In re-furnishing the smaller machines, particularly those used in preparing electrotypes, the motors were in all cases mounted either on the frame or on the floor, in either case being encased in a removable corrugated iron hood, closely fitting over the motor and preventing the flying metal chips entering the mechanism. One of these machines, a flat-bed router, requires a speed of 12,000 revolutions per minute at the chisel. This is obtained from an 1,800 revolutions per minute vertical-shaft motor belted to the driving wheel of the router. A view of this motor is shown in one of the accompanying illustrations.

General Features.

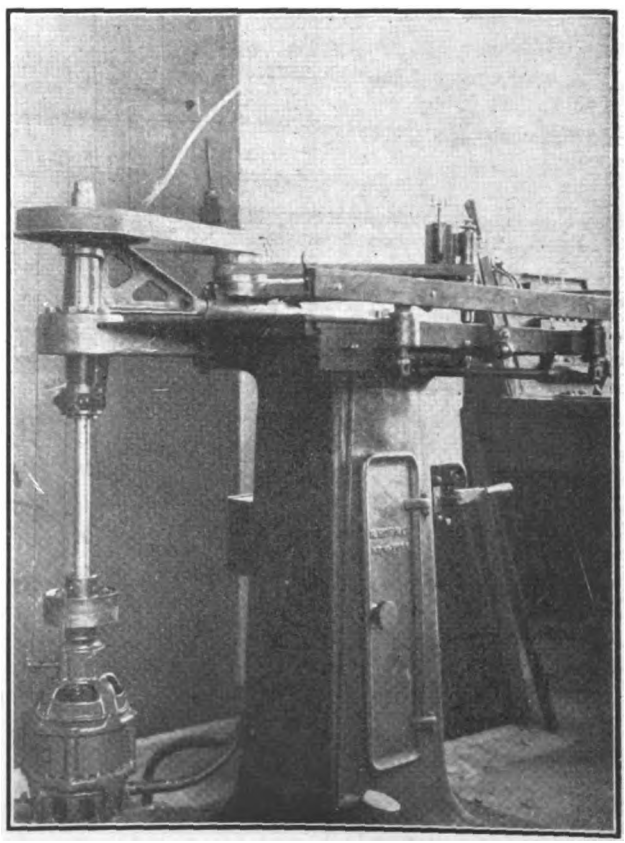
The building is served by three electric freight and one passenger elevator, all of A B See manufacture, and the lighting throughout the plant is by means of tungsten lamps, those in the offices being two-unit indirect bowl fixtures with 100-watt Mazdas, and those in the workrooms 50-watt tungstens on flexible cord with hook arrangements for suspension at convenient heights.

A complete list of the motors and the machines they operate follows:

MOTOR INSTALLATION—YOUTH'S COMPANION PLANT, BOSTON, MASS.

No.	Horsepower.	Application.
1	0.5	One Unitype machine.
2	0.5	Two Golding job presses.
1	1	One Golding jobber.
1	0.5	One Harris rotary press.
4	7.5	Four Dexter folders.
3	0.75	Lifting tables on folders.
1	1	Rotary converter for bell system.
12	0.25	Monitor stitchers.
1	1	Monitor punch.
1	3	Acme cutter.
4	2	Acme cutters.
5	0.5	Chambers folder.
1	1/10	Numbering machine.
2	0.25	Pasting machines.
8	0.25	White addressers.
1	3	Acme cutter.
1	10	Autopress.
8	10	Cottrell rotary presses.
8	0.5	Lifting tables on above.
8	5	Cottrell flat-bed presses.
1	3	Cottrell flat-bed press.
6	1	Feeders for flat-bed presses.
1	1	Tympan winder.
1	0.5	Saw and drill.
1	1	Metal shaper.
1	0.5	Flat trimmer.
1	0.75	Beveler.
1	0.5	Router.
1	0.5	Channeller.
1	0.5	Newell press.
1	0.5	Roller washer.
1	0.5	Saw beveler.
1	1	Curved router.
2	1/25	Mail openers.
1	7.5	Machine shop—2 lathes, drill, shaper, metal planer and emery grinder.
1	3	Paper-cutter knife grinder.
1	5	Carpenter shop.
3	0.25	Envelope machines.
1	1	Blower on roof.

In the accompanying illustrations are shown a few of the more important motor applications at this plant.



Vertical-Shaft Motor Driving Flat-Bed Router at Youth's Companion Plant.

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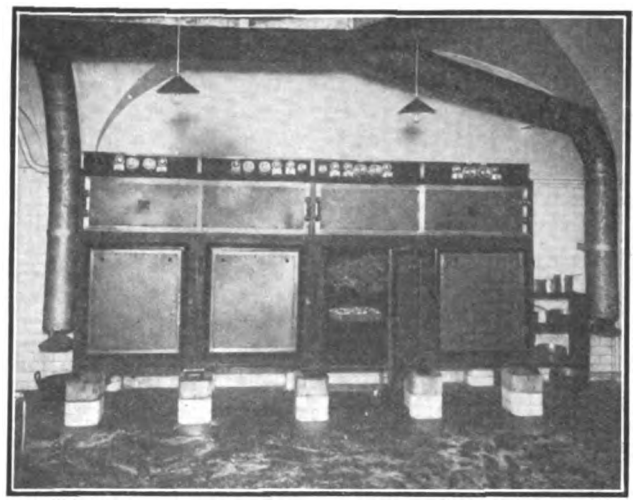
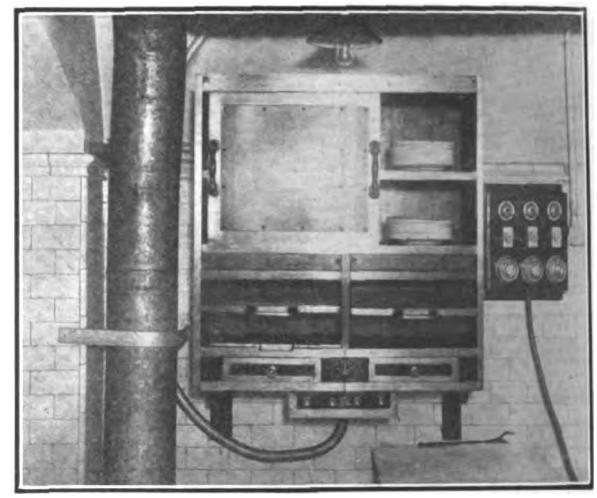


Electric Ovens and Hot Cupboard in Euston Station Restaurant.



Double Electric Grill and Hot Cupboard, Euston Station.

NOTABLE ELECTRIC COOKING INSTALLATION IN ENGLAND.

Restaurant of London & North Western Railway Finds Electric Equipment Admirably Suited to Requirements.

In the accompanying illustrations there is shown various features of electric cooking installation in the Euston Station, London, of the London & North Western Railway. There is wide scope in all big centers in England, as indeed everywhere where electricity is available for railway hotel and station installations of this kind. Every public restaurant run electrically is an attraction to diners and may be regarded as an excellent means for popularizing electrical service if only by reason of its ability to increase the satisfied consumer class who form so valuable an asset. Euston is of course one of the leading terminal stations of London and its dining hall is naturally patronized by throngs of customers at most times. The electrical equipment that has recently been installed is serving 400 meals per day, and Lieutenant Colonel Cortez-Leigh, the railway company's chief electrical engineer, has been responsible for it.

The total electrical load is 150 kilowatts and 90 covers can be dealt with in the dining room at one time. The railway company's own staff was responsible for the design of a number of the fittings used for the illumination of this hall. The electric kitchen is situated in the basement, and there are four ovens to the range as shown in one of the views. These ovens each measure two feet by two feet by two feet six inches high, with a warming oven above. The heating elements are of standard design. The total load of the range is 23 kilowatts, including 5 kilowatts per oven and 3 kilowatts for warmers. The switch and fuse panel is placed above, the seven heats being controlled through two three-way switches with pilot lights. The warming oven has the heating elements fitted at the back.

In connection with this installation there are two ham-boilers which are situated on the left of the above range. Together they take 7.5 kilowatts, and each boiler will hold eight hams, its capacity being 30 gallons; they are not exclusively ham-boilers as they are available for other classes of boiling duty as required. These boilers are fitted for three heats, and the heating elements are underneath, the switching devices being mounted on steel panels on the wall. The principal part of the equipment is the large boiling table shown in one of the illustrations. It has 23 hot plates, of 12, 10 and 8 inches diameter respectively. They are standard inclosed type, are fitted for three heats, and range from 1,200 to 1,500 watts. The switches, fuses, and pilot lights are placed round the frame as shown. On the wall there is a double grill and hot-cupboard. The grill elements are of nichrome wire spirals laid in grooves in a fireclay base, and the cupboard above derives its heat from these grill elements. There is a large hot-cupboard to take 1,000 plates, the heat being controlled from two single pole switches which together with fuses and pilot lamps, will be seen mounted below the top plate. There is also a six-compartment vegetable and pudding steamer, and a carving table, hot closet and vegetable server; this table is 11 feet 6 inches long by 3 feet wide.

All wiring in the restaurant and kitchen is carried in water-tight cast-iron channels and is arranged to be readily accessible.

The restaurant advertises the fact that all food served is prepared electrically and it is believed that an appreciable amount of business can be attributed to this advertising.

Electrically Heated Carving Table and Vegetable Server.

Large Electric Boiling Range at Euston Restaurant.

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BOOK REVIEWS

"Elementary Lessons in Electricity and Magnetism." By Silvanus P. Thompson. Seventh edition, revised and enlarged. New York: The Macmillan Company. Cloth, 706 pages (5x 7¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $1.50.

The seventh edition of this standard textbook of electricity and magnetism has been brought out and it possesses the same virtues as its long line of predecessors. The present edition has been revised and enlarged and forms a very suitable textbook for the student of the subject who has had enough mathematics to understand an algebraic equation. Chapters have been added relating to wireless telegraphy and to the modern conception of the electron. The printer has done an excellent job of mechanical work.

"Inventions and Patents." By Philip E. Edelman. New York: D. Van Nostrand Company. Cloth, 288 pages (5x8 inches), several illustrations. Supplied by the Electrical Review Publishing Company, Inc. for $1.50.

Written by a well known writer on wireless telegraphy, this volume covers an unusually wide range of the topics on which those interested in inventions should be better informed than is usually the case, being far more comprehensive than the numerous handbooks issued for free distribution (or sold at nominal prices) by the class of advertising patent attorneys who are severely scored in this volume. But like these same handbooks, Mr. Edelman's volume concerns itself largely with the speculative inventor, the man who expects to get rich quickly through patents on supposedly commercial and profitable inventions, rather than with the manufacturer or investor who looks upon a patent merely as the means for controlling profits on what has proven commercially profitable. Indeed, the author even says (p. 160): "Remember, the inventor's chief object should be to invent." This point of view is doubly unfortunate at a time when far too large a percentage of the issued patents are of the speculative variety, and in a volume which contains so much information of real value to those seeking protection through the Patent Office for actually established business ventures.

Moreover, many points of great importance are practically untouched. For example, design patents, in spite of their growing importance for manufacturers, are dismissed with brief statements about their being difficult to dispose of and about their requiring only brief specifications. Nothing is said about their running for different terms than the structural or process patents, or their requiring no final government fee. The fact that a shop right usually cannot be assigned, that even an "undivided" part interest gives the holder of the same the right to operate under the patent independently of those holding the other part interests, that an interference gives each party access to the other party's application papers—these and other extremely important points are left unexplained. So also, the language frequently is such that the average layman would not understand the same. To be sure, the author in his preface proclaims his book as intended for inventors, investors or manufacturers (adding, incidentally, that laymen might also find matter of interest), but judging from the reviewer's own practice, such parties all should be considered as laymen when addressed on subjects of this kind. To mention rules to them by number without stating where these rules are to be found, or to speak (page 77) of the rejecting of claims and the citing of references without explaining what is meant by "references" and by a rejection of claims on references, still leaves the reader in the dark as to these important points.

So also, some of the author's statements are seriously open to question, as when he reports it as good practice (page 114) "to file prints of the drawings at the time an application is filed", or states on page 61 that "the Patent Office is revising all issued patents." So also, a compliance with Mr. Edelman's recommendations as to avoiding all interferences would work great harm in many cases and certainly does not seem justified where the reader is decidedly earlier in his dates. The author's horror of interferences is shown by several pages enlarging on the possible expenses when the matter is contested to the last ditch, which rarely occurs in practice. No account is taken of the numerous instances where the mere showing of dates, involving only trifling expenses and formalities, results in a withdrawing of the contesting application. On the contrary, the inference from the chapter on Interferences would be that even the earlier applicant (if a reader of this volume) would drop out of the race as soon as an interference is declared, the impression being given in the last paragraph on page 150 that after doing so, he can effectively contest the patent issued to the other party! Such misleading statements are unfortunate in a volume addressed to laymen, and so also is the absence of advice as to methods of determining the commercial prospects of an invention, or in other words the patent-worthiness of the idea. Much space is devoted to criticisms of the Patent Office and of the methods of a certain small class of patent solicitors, and the author very properly advises a minimum expenditure of $10 for a preliminary search. Perhaps his likewise urging a minimum of $40 or $50 as the attorney's fee for filing and prosecuting a patent application would be even more beneficial in lessening the number of rejected applications and of unremunerative patents.

ALBERT SCHEIBLE.

"Engineering as a Career." A series of papers by eminent engineers, edited by F. H. Newell and C. E. Drayer. New York: D. Van Nostrand Company. Cloth, 214 pages (4¾x7½ inches). Supplied by Electrical Review Publishing Company, Inc. for $1.00.

This book presents for the guidance of youths and their advisers some of the facts usually hard to obtain concerning engineering as a life work. Over a score of engineers and experts prominent in the United States have written separate articles telling what they believe are the personal and educational qualifications required for success and what opportunities await the young man who chooses engineering as a career. The inspiration for the book came in response to numerous inquiries from high-school teachers and others who are frequently called upon to advise young men in their choice and preparation for a professional life. It was found from experience that many youths who planned to study engineering had only the most hazy ideas of what is involved, nor were their teachers and parents much better informed. A feeling of personal contact with the writers grows out of the fact that each author has unconsciously written into his story something of his own characteristics and aspirations, and has pointed out a few of the courses which to him have seemed to lead to success. The book should prove of special value to professional advisers in vocational guidance work and to parents who have the opportunity of continued observation and intimate acquaintance from which may be learned the aptitudes of their sons.

"The 'Mechanical World' Pocket Diary and Year Book for 1916." Manchester: Emmott & Company, Limited. Boards, 388 pages (3¾x6 inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for 25 cents.

The twenty-ninth year of publication finds some new features introduced into this useful collection of tables, data and engineering notes. The section on steam boilers has been improved by a discussion of boiler mountings, etc. A separate section is devoted to Diesel engines, and there is much material of value in the machine shop. There are a number of new tables and the book has been generally revised.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

POSTCARDS TO CUT DOWN THE DIRECT ADVERTISING COST.

Reduce Cost of Letters With Return Postal 22 Cents Per Prospect.

An interesting experiment which seeks a way to reduce the cost of direct advertising is being conducted in Louisville, Ky., by the Louisville Gas & Electric Company, through the commercial department, of which Robert Montgomery is manager.

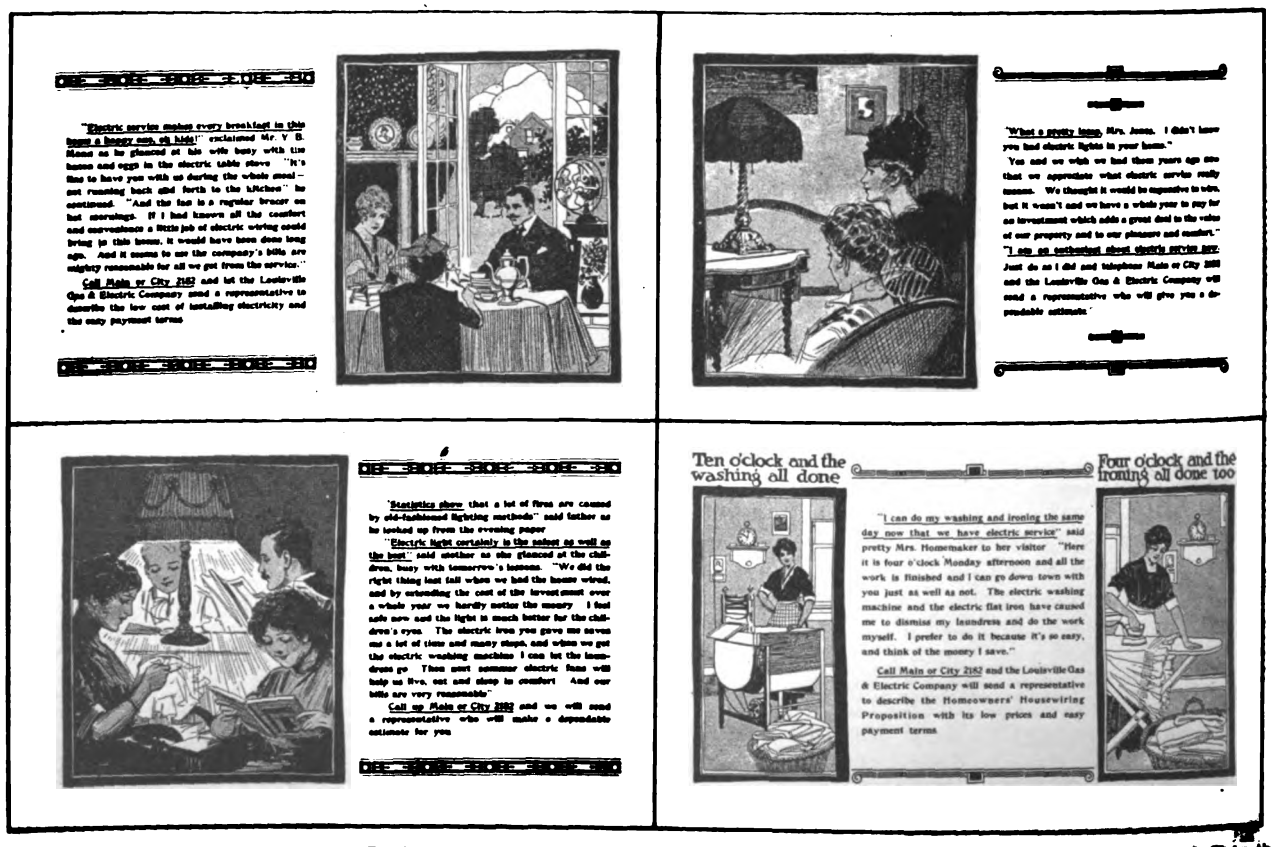
There are at this time about 9,000 houses, prospective house-wiring customers Mr. Montgomery calls them, within reach of the existing lines of the company. This number has been reduced week by week during the past several years from a figure twice as large, the company cooperating with the electrical contractors and, in addition, indulging liberally in advertising.

It has been a more or less frequent custom of the department to send out letters to house-wiring prospects, calling attention to special proposals or to one or another feature of electric lighting. These have contained as much matter as a two-cent stamp would carry, including a stamped, return post card. Booklets, calling attention to the electric-service advantages have been set before these prospects and others who have signed contracts in such a manner.

The returns have not been what the company liked to see, considering the cost of this method of circularizing. In the first place the total cost figures out as much as five cents, including the three cents for postage. Responses have averaged about five per cent, pretty good for the class of business, but obtained at rates Mr. Montgomery believed he could improve on. And in spite of the fact that the stamped return post card was inclosed in the envelopes in the several cases, only about half of the responses were by mail, the remainder being by telephone or by personal visit.

This suggests, at this point, the question whether for local circularization, at least in matters where responses cannot be expected to be heavy, it is not prohibitively expensive to inclose stamped post cards. That is one of the propositions Mr. Montgomery considered when he determined on the test he is now carrying out. In these days when telephones are to be found in general use, available to most householders if not actually installed in houses of prospective subscribers, such a ready means of communication is often preferred to even addressing of a post card. Take a series of 12,000 envelopes, for instance; the postage on the return cards alone would cost $120. If half of the five per cent of responses was by card this meant that this sum went largely for postage on 300 post cards, rather exorbitant postage.

These and other considerations set Mr. Montgomery to work on the post-card plan. After considerable thought



Four of a Series of Six Cards Mailed to Each House-Wiring Prospect by the Louisville Gas & Electric Company. These Cards Take the Place of Six Follow-Up Letters and Save the Company 22 Cents Per Prospect.

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he decided on the text and the form of the illustrations for each of the cards and decided on a series of six. Drawings were made for him and the six sets of the series, 9,000 cards to a set, were struck off. The plan is to mail them out, one set every two weeks, to the 9,000 prospective customers on the company's list, until the series of six is used up. This will give intervals for responses and at the same time keep the idea from growing cool in the minds of those who have felt an impulse to ask for a definite proposition on receipt of earlier cards. Of course the responses will be checked against the original lists and no prospect will be snowed under with cards when he has already responded.

In preparing the plan for the series Mr. Montgomery undertook to present the case for electric lights in brief from several angles and to make the appeal to several different motives on the part of the recipient. Four of the cards are shown in the accompanying illustration. One presents the advantages and desirability of electric lighting in general; one is directed to the house owner and shows that there is small chance of renting houses without electric lights; one puts the emphasis on the beauty of electrical fixtures, another the ease with which a breakfast can be electrically prepared, a fifth the safety element in electric lights and the sixth the way electric service lightens housework.

The text is written in an easy conversational style, and the drawings are well executed. The breakfast scene really carries a punch and alone would be sufficient to prompt many a prospect to call the number which is given below the text, while the quality of the punch in the other pictures is also of a high order. The cards themselves measure 5 by 8.25 inches, and are printed on a white bristol board.

It is too soon, as yet, to consider whether the returns from this campaign will meet the expectations of Mr. Montgomery and his company. But the outstanding feature of the whole procedure is the low cost of the cards. This will not be more than eight cents for each set of six cards mailed out and should fall slightly under that amount.

"I anticipate," Mr. Montgomery stated, "that they will have triple the advertising value of one circular letter."

And compared with the cost of one appeal or reminder at a cost of five cents, six times at the prospect, in an attractive way, at the cost of eight cents is something very well worth getting.

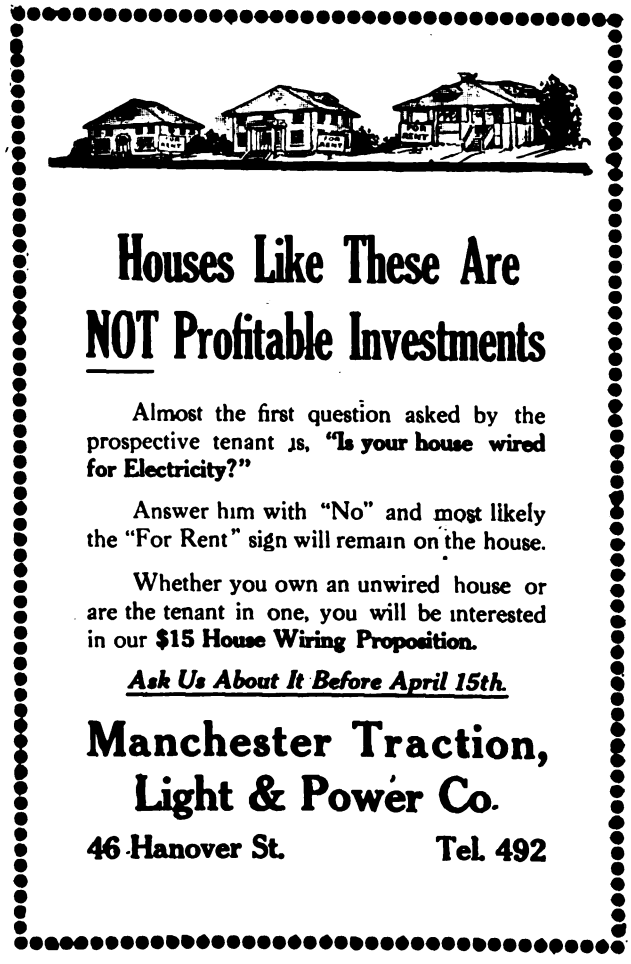
Pittsfield Company Gains Aid of Customers.

The accompanying ad of the Pittsfield (Mass.) Electric Company shows how the company is securing the aid of its customers in the acquisition of new business by offering to reduce rates when the number of customers has reached a certain figure.

Advertisement That Is Gaining Co-operation of Customers.

New Hampshire Company Appeals to House Owners.

A potent appeal to landlords is contained in the accompanying advertisement of the Manchester (N. H.) Traction, Light & Power Company. Unwired houses are generally neglected nowadays by tenants of the desirable sort; at least, such houses are left as the last resort and rented, if at all, at low rates. By adding a small investment, in lighting, permanent tenants are readily secured. The ratio of this investment in installation may be scarcely one per cent of the value of the premises, and yet it may be the cause of making a paying proposition out of a non-revenue producer.



How the Manchester Company Appeals to House Owners.

As noted in the issue of March 25, the Manchester company offers to wire for service, for a basic price of $15.

Boston Company Promotes Use of Tailors' Electric Irons.

The Edison Company of Boston has been making a special drive in introducing electrically-heated tailors' irons, or gooses, as they are called. About 2,000 tailors, both masters and journeymen, were circularized and during six weeks about 50 irons were placed. They call for a special circuit and are supplied on the low heating and cooking rate. The irons weigh 12 to 22 pounds and take 700 to 850 watts, according to size.

Their introduction in tailors shops has brought about an interesting situation, many journeymen now refusing to work except where electric irons are installed. They are in favor because of their greater comfort and healthiness, and piece workers are able to make more money than with the old type of goose.

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Electrically Operated Advertising Signs on Horse-Drawn Vehicles.

A novel method of advertising Crystal Domino sugar is employed by the American Sugar Refining Company of New York at its Brooklyn (N. Y.) plant.

Horse-Drawn Vehicle Equipped With Electric Sign Operated From Storage Battery.

All of its horse trucks are being equipped with electrically driven advertising signs. Fifty are already in operation and 25 more will soon be placed in service. The low cost in maintenance of this publicity is quite remarkable when one considers the extent of the local territory so thoroughly covered by these signs.

There are three types of signs, viz.: One advertising Crystal Domino granulated sugar. This one is furnished with a revolving disk illustrating the flowing of Crystal Domino granulated sugar from the carton to the bowl.

The second mechanical sign shows "Little Miss Crystal Domino" emptying a carton of crystal Domino sugar tablets into a sugar bowl. This sign is furnished with a revolving disk having colored stripes painted spirally thereon. When revolving the disk gives the effect of a rotating rainbow. This rainbow effect is seen through the lettering on the edge of the disk, namely, through the wording, "The American Sugar Refining Co. of N. Y.—Crystal Domino Sugar."

The third mechanical sign advertises both the Crystal Domino tablet sugar and Crystal Domino granulated sugar alternately; by an ingenious mechanism the picture of Crystal Domino cartons and tablet sugar appear, and, by passing a vertical lath over the face of the picture mechanically, the picture disappears as if wiped out, and in its place cartons of Crystal Domino granulated sugar appear. This latter picture, after the lath has made the full stroke or length of the picture, reverses automatically, and in turn is wiped out. All of the sign moving mechanism is driven by a six-volt, ball-bearing motor, taking 10 amperes and running 1,000 revolutions per minute. A six-volt, 120-ampere-hour Exide battery manufactured by the Electric Storage Battery Company, of Philadelphia, Pa., supplies the energy for running the motor.

As the batteries have only sufficient capacity for one day's service, it is necessary to recharge them each night. Polarity plugs are used to connect the battery to sign, or to the charging receptacle. Twelve batteries are charged in series across 115-volt mains. The batteries, when removed from the trucks, are placed on a double-deck platform, six on top and six on the bottom. A hand-drawn elevating platform truck is used to raise the load and convey the batteries from the wagons to the charging stand. Six sets of 12 charging receptacles are provided, allowing 72 batteries to be charged at one time. The batteries are charged all night and are replaced in the trucks each morning, ready for service.

Four men are employed maintaining the operation of the signs, two on day and two on night. They make all necessary repairs to moving mechanism, motors, storage batteries and wiring, and systematically clean and overhaul each sign.

New Street-Lighting Contract for Milford.

The town of Milford, Mass., has voted adversely on a project to acquire a municipal light plant, and has decided to contract with the Milford Electric Light & Power Company for four years for incandescent street light in place of the present gasoline street lamps and 17 arcs. The rates offered by the company are:

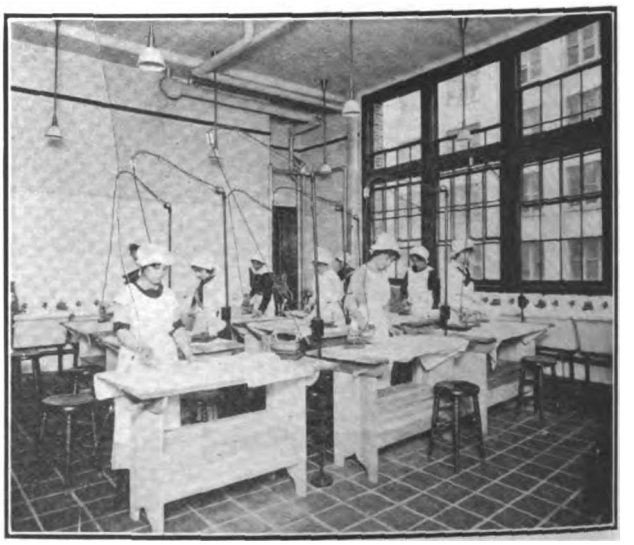
32-candlepower incandescents	$18 per year
40-candlepower nitrogen-filled	19 yer year
60-candlepower nitrogen-filled	20 per year
80-candlepower nitrogen-filled	24 per year
250-candlepower nitrogen-filled	36 per year

Lamps to be installed by the company and to burn on an all-night schedule.

Training Electrical Housewives of the Future.

So that the housewives of tomorrow will have a clear knowledge and understanding of the various and important uses of electricity in the modern household, the Domestic Science Department of the Washington Irving High School, New York City, maintains a thorough course in electric household appliances. The Washington Irving High School is the largest and most completely equipped girls' high school in the world. There are 800 girls enrolled in the Domestic Science Department, of which Miss Florence Willard is the head. Among other electric appliances which were installed under the supervision of the Heating Bureau of the New York Edison Company are more than 20 electric flat irons, electrical percolators, chafing dishes, tea kettles, toasters and grills.

Among some women there existed a strange and unfounded fear of anything electrical. Some women actually shrank from touching anything electrical for fear of a shock. It is the plan of Edward C. Zabriskie, principal of the Washington Irving High School, by means of this course in the domestic uses of electricity to dispel forever these false and ridiculous notions from the minds of the future generations of housekeepers and teach them that electricity is their friend and servant.



This Domestic Science School is Completely Equipped With Electrical Devices. View Shows 20 Electric Irons in Use.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Electric Power Economies in a Small Factory.

Upon careful analysis, the advantages of electric motor driving in a small factory are often found to be highly significant. In a representative installation producing belts, a power survey indicated an average load of 11.3 indicated horsepower; the average power and lighting load was 16 horsepower; the maximum power requirements with mechanical drive were 14.6 horsepower, and the maximum power and lighting load was 20 horsepower. The friction load was two-thirds of the average power load.

Running 58 hours per week, the cost of operation with mechanical drive was found to be $909 per year, the items being coal, $717; water, $52; ash removal, $40; oil and supplies, $50; electricity for lighting, $50. Considering the installation of one 7.5-horsepower and two 5-horsepower motors, it was found by the local central station that 5 horsepower net could be eliminated from the factory demands. This reduces the average power load to 6.3 horsepower and the maximum to 9.6 horsepower. There are 65,000 cubic feet of building space to be heated. The estimated yearly cost of operation with central-station service was $803; the detailed items being, coal, 35 tons, $175; water, $25; ash removal, insignificant expense; oil and supplies, $15; energy for power service, $492; energy for lighting, $96.

The estimated saving yearly, including an allowance for a reduction in boiler and fireroom labor, totals $206. The cost of installing the motors was found to be $450, and improved speed regulation was also promised with electric service, the existing speed varying 22 per cent.

Electric Furnace in Milwaukee Effects Economies.

For the past two years the Crucible Steel Casting Company, Milwaukee, Wis., has been operating a Snyder electric steel furnace and the company reports that during this time decided economies have been effected over previous operation. Except for charging and pouring, the furnace requires the attention of only one man, who receives $2.50 per day. The energy consumption is approximately 500 kilowatt-hours per ton of steel produced.

The furnace is rated at one-ton holding capacity. The foundry operates 12 hours per day and in that time the furnace gives four heats with an average of 3,200 pounds per heat.

As to maintenance cost, it is stated by the Crucible Steel Casting Company, that the present roof has lasted 500 heats and is expected to give 200 to 300 heats more. The linings need replacing only once every 215 heats, and complete relinings can be effected between Friday and Monday, when the furnace is not ordinarily in operation. An average of 3 to 3.5 pounds of electrodes are consumed per ton of steel.

Economies of Electrically Heated Shoe Machines.

The average cost of repairing and dressing up defects in patent leather shoes made by a Massachusetts shoe concern has been cut down more than 50 per cent since the installation of electrically heated turners' irons, made by the Boston Last Company on Simplex patents. The cost was formerly 2.5 cents per pair, based on accurate figures, but with the new equipment it has been reduced to 1.12 cents, representing for the 1,000 pairs of shoes produced daily, a saving of about $4,000 a year.

Another shoe manufacturer using 90 turners' irons finds that a great saving has resulted by a year's use of this equipment, in that now there are no burned shoes, whereas formerly much damage was done by gas irons used, which took off the enamel because too hot.

Advantages of the electrically heated wax pot are the evenness of heat which makes possible an even application of wax to the surface of the heel, and the saving in wax and in the operators' time.

The electric-heated shank burnisher is another efficient tool. This is maintained at any required heat by rheostat control, and is always ready for instant and efficient use without the operator being obliged to watch an oil or gas stove for fear of overheating the iron. When these irons are heated over a stove, the operator is obliged to rub the iron on a pad to remove the soot and smoke. The electric iron is always clean, insuring freedom from danger of soiling or defacing shoe bottoms.

Model Shoe Factory at Salem, Mass.

What is regarded as the "last word" in shoe-shop equipment is that of Daniel Glover & Sons, Salem, Mass., makers of youths' and boys' shoes. The four-story brick building just completed houses a plant capable of producing 2,000 pairs per day.

The factory is electrically driven throughout, the machines and the motor connected being as follows:

Four leather-cutting machines and one cloth-cutting machine driven by a three-horsepower motor. Each machine will cut 720 pairs of vamps or of tops per day.

Forty-eight stitching machines, driven by two three-horsepower motors, connected to line shafting by link chains.

Two assembling machines, two pulling-over machines, five Consolidated lasting machines, two sole-laying machines and two pounding machines, all driven by a three-horsepower motor.

In the bottoming room there are one McKay sole-sewing machine (capacity 1,500 pairs per day), three loose-nailing machines, an Atlas leveler, heeling and finishing machines, all motor driven. Energy is supplied by the Salem Electric Lighting Company.

Campaign to Eliminate Isolated Plants in Louisville.

One more of the few remaining isolated plants in the central part of Louisville has been superseded by central-station service, where the Louisville Gas & Electric Company has just contracted with Crutcher & Starks for its lighting service. The home of the company is a six-story mercantile building with about 60,000 cubic feet of space and an elaborate electric-sign equipment. The load is about 100 kilowatts.

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Talks to Central-Station Power Salesmen

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

In this, the second of a series of articles by Mr. Stevens, the subject of heating is fully discussed insofar as it applies to the analysis of a plant by a central-station power salesman or engineer. The fallacy of the old theory that an engine acts as a reducing valve between the boilers and heating system is shown and many arguments advanced in favor of central-station service. The next article of the present series will deal with the fixed costs of an isolated plant, showing how they affect the cost of power as compared with central-station supply.

This being the second of a series of three articles on "Talks to Central-Station Power Salesmen," we will attempt to deal to some extent with the actual problems which the power salesman has to contend with in selling power. The subject is extremely broad and but a small part of it can be covered in the space allotted here. Hence, the principal or more important problems will only be considered. No hard and fast rules can be given for handling the work, as almost every proposition is affected by certain peculiar conditions which really place it in a class by itself. However, there are certain important problems which appear in most propositions and these are the ones that will be taken up in order of their importance in this article.

Heating.

Undoubtedly the question of heating the building is the most important item in connection with the private plant which the average manufacturer has to consider aside from actual power to be generated. One of the principal arguments against the use of central-station service advanced by those interested in the development of the steam plant and by manufacturers who are securing their power through independent means is the necessity for warming the building throughout the heating season. Every office building and manufacturing concern requires heating throughout part of the year and, realizing the importance of this, private-plant advocates are apt to give undue weight to the heating item, and in a great many instances it is the deciding factor in the question of choice of private plant or central-station power.

Advocates of the private plant, while admitting the many advantages of the central-station product, will maintain that the private generating plant and the steam heating are economically inseparable, and the purchase of electric power from a local power company and generating steam for heating by private means can only be effected at a serious loss. They argue that as exhaust steam from the engine is used, the heat derived from this source is without cost, and the statement is frequently made that the engines merely act as reducing valves between the high-pressure boiler and the low-pressure steam heating system. Private-plant exponents have so long advanced and exaggerated on these arguments and there has been so little opposition against the theory that they have practically been accepted up to the present time as facts, not only by private-plant advocates, but by the stationary engineers and manufacturers. In some instances the central stations themselves, from lack of actual data on the subject, have obtained the false impression of the value of this exhaust steam, and have considered it a serious handicap towards getting business.

This question of the value of exhaust steam is probably the most important problem which we have before us, not in the sense of its having a serious and real influence on the adoption of central-station service, but because the public has been educated up to thinking that it has.

The private-plant advocates will not admit that exhausting the steam from the engine into the heating system will affect to any appreciable extent the steam consumption of the engine. No consideration is given to the question of back pressure, to the fact that a certain amount of heat must be abstracted from the steam in order to produce power, and that the supply of exhaust steam is not coincident with the heating demand.

In most cases, where the central station has compiled comparative reports on private-plant operation versus operation under the central-station system, and the consulting engineers or plant advocates have submitted a counter report, the principal differences are shown in the heating item. Usually these figures on the quantity of steam required for heating are based on formulas from various handbooks, and while it is not here intended to criticize the value of theoretical calculations, the results obtained by the application of say four of the standard formulas given in text books to any given heating problem will give widely different results. The author has in mind one instance in which the amount of coal required to heat a certain building was the deciding point as to whether private-plant service would be continued, or whether central-station service should be adopted. In this case three separate and distinct reports were made by as many disinterested consulting engineers as to the amount of coal required to heat the building in question. In each the results were obtained after a careful study of the situation, although different formulas were used in each instance. The net results varied from 1,600 tons to 2,900 tons per year, and each report from a theoretical standpoint was correct. The figures which were submitted to the prospective customer by the central-station representative were based on actual investigations and data from similar buildings in the same neighborhood, and gave 1,000 tons of coal per year as being sufficient. The coal consumption as given in any of the other reports was sufficiently high to preclude any consideration of central-station service. This contract was closed by the central-station company, and after two years operation the owners of the building reported that an average of 980 tons of coal per year were used.

This goes to show that while theoretical formulas are of help in solving these problems, the better method to derive results is to compile some practical data taken from actual operating conditions. The central-station companies are in a position to collect these data from buildings where they are now supplying electrical service, and where the boilers are used for heating purposes only. Such data cannot be refuted by private-plant advocates, and must of necessity bear weight with the prospective customer.

The power salesman may state without fear of contradiction that the back pressure on the engine when they are exhausting into the heating system very materially increases the steam consumption. It also reduces the engine capacity, which means that in some cases the engines must operate at heavy overloads during the heating season at a loss in efficiency and at a higher rate of depreciation. The power engineer may point out that the exhaust steam available for heating is not at all coincident with the heating demand. In the mornings after the heating

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season comes the heaviest demand for steam. The building must be made comfortable before work is started, hence before the engines are operating live steam must be admitted into the heating system. Again, late in the afternoon or evening, when the heating demand is the least, if the plant is carrying a heavy lighting load, the exhaust steam may be considerably in excess of the amount required. Therefore, while the use of exhaust steam in special instances may be economically applied, still in ordinary practice, under average conditions, the supply is not coincident with the demand and little saving can be effected.

Fuel.

An item upon which there is wide differences of opinion is the amount of fuel required to produce power. Some consulting engineers and manufacturers of plant apparatus may make statements, and sometimes guarantees, on steam consumption of their engines and evaporation by their boilers which really are of little real value, as they apply only to theoretical or laboratory practice. Many plant owners have found after several years' operation of their equipment, that the actual fuel consumption bears a very small relation to estimates and perhaps guarantees submitted when the plant was installed. The power salesman must differentiate between these and fully explain to the prospective customer that while these figures may be theoretically true, they have very little bearing on the proposition in hand.

Boiler Performance.

Guarantees of boiler performance of 10 pounds of water or even more per pound of coal are frequently made, and while we will not question the fact that boilers may equal this performance under test conditions, still in every-day practice there are so many factors which enter into this item that such a figure is usually found far from right. An evaporation of 7 to 1 is a fair average for the ordinary industrial plant, and in many instances it is much lower. While occasional boiler tests may show higher rates of evaporation under ideal conditions, the yearly consumption, compared with the amount of power generated, tells the true story.

The power salesman must show to the manufacturer that his figures are based on conservative estimates and on actual practice. Some of the following points may help to prove his contention. The greatest single factor affecting boiler performance is the human element. It is the aim of the average fireman to keep a constant steam pressure on the gauge. He does this in accordance with his own ideas of fuel supply and draft regulation. It is impossible for him to do his work in actual practice according to laboratory or test methods. He is handicapped too by the fuel which varies greatly in different shipments, showing an ash percentage of 5 to 10 per cent and moisture percentage of 2 or 3 per cent in the same grade of coal, and cases are known in which improper regulations of air supply has increased a yearly fuel consumption by as much as 25 per cent. With such points in view it is comparatively easy to show that average boiler evaporation is much nearer a ratio of 7 to 1 than a ratio of 10 to 1.

Engine Performance.

Likewise, figures quoted on engine performance when competion is keen may have little bearing on what the apparatus will do under actual operating conditions. While a certain guarantee of 20 pounds of steam per indicated horsepower made to the manufacturers may hold if the engines carry constant and full load with dry steam at the throttle, these conditions are not met in ordinary practice, therefore such guarantees are of small value in figuring yearly operating costs. Few engines carry constant load at or near their rated capacity throughout the working day, which, of course, results in a reduction in the efficiency; moreover, superheaters must be used to obtain absolutely dry steam at the throttle, and the engine must exhaust into the atmosphere or vacuum and not against a back pressure created by the heating system, in order to even approximate such figures.

The power salesman may also lay special stress on the point that the plant auxiliaries require considerable amounts of steam for their operation and that when the plant is carrying a light load, the generation of power is very inefficient, because the steam consumption of the auxiliaries remains practically constant. A much larger boiler plant is required if the plant is operated by steam engines. Therefore, the cost of banking fires at night is considerably increased and if there is any overtime work to be done, either the day engineers must be paid for their extra time or night engineers must be employed. A special breakdown connection may be contracted for with the local central-station company to take care of this overtime work, but this, of course, carries much higher energy charges than if power is purchased under regular forms of contract and in large quantities, all of which must be added to the plant operating costs.

While the question of heating and boiler and engine performance are the chief technical points which are considered in negotiations of this kind, there are many others which have a more or less important bearing upon its outcome, which will be discussed in a subsequent article.

Central Stations Increase Power Load With Leased Motors.

The several electric lighting companies under the general management of the Gas and Electric Improvement Company, Boston, Mass., have adopted a plan of leasing motor equipment to factories and shops, and a large amount of new power business has been secured on this basis.

A contract is made between the local company and the customer, by which the latter pays for the leased property, as rental, 6 to 8 per cent interest, taxes and depreciation at 9 per cent. The customer may buy the property at any time at a stated price, in which case he is allowed to deduct the full amount paid for depreciation.

Inside wiring may be furnished by the customer, or, if he prefers, the company will wire and install the motors, for which the customer will pay the cost in 12 monthly instalments.

Title remains with the company until full payment, and the customer protects the property and keeps it insured. The lease proposition has been adopted for textile mills, lumber mills and various industrial plants. Nearly 50 per cent of the new business has been gained through this medium. During the last 6 months of 1915, 827 horsepower were contracted for. The following are the individual companies employing this plan:

North Adams Gas Light Company, Northampton Electric Lighting Company, Spencer Gas Company, Adams Gas Light Company, Williamstown Gas Company, Leominster Electric Light & Power Company, Ayer Electric Light Company, Milford Electric Light & Power Company and Harvard Gas & Electric Company.

First Electric Steel Furnace Installed in Alabama.

What is said to be the first installation of an electric furnace in the south has recently been made at Anniston, Ala., for the Anniston Ordinance Company. The furnace is of the arc type, Heroult model. Energy is supplied by the Alabama Power Company, of Birmingham.

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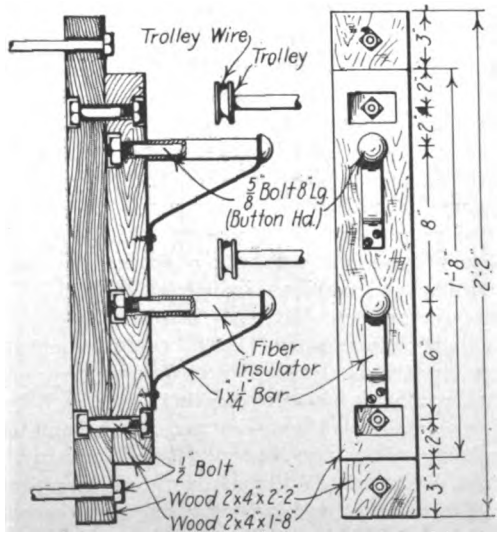
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Method of Insulating Traveling-Crane Trolley Wires from Crane Girder

In the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of March 4 are some answers by inspectors regarding the wiring of traveling cranes. In this connection the question also came up of the best way of insulating the wires from the crane girder. In the accompanying sketch is shown the method I have found best for this purpose. What is necessary is some means for supporting the trolley wires and also keeping them from touching or swinging against the girder.

The general arrangement of these supports is well shown in the diagram. Since very high voltage is seldom used on the cranes, the two wood strips of 2 by 4 mounted as shown, provide ample insulation. The trolley wires normally rest upon the long bolts provided with button heads, being insulated therefrom by means of a fiber insulating tube. As the crane trolley comes along, each wire is temporarily lifted and again drops upon the fiber tube after the trolley has passed. Occasionally the wire may slip off from the device. To bring it on top of the tube again I have used a curved iron bar about one inch wide by one-fourth inch thick, which is shaped and mounted in the manner shown. This acts as a guide to throw the wire back on top of the fiber insulators as the crane trolley again approaches. The button-head bolts must have good round heads so that the wire can slip over easily. Formerly we had trouble with the trolley



Insulating Crane Trolley Wires.

wires slipping from the supports and when the trolley wheels would approach to pass over the supports it was found they would either break the wire or the support. After putting on these guide bars the trolleys easily carry the wire back into place as they approach. Since putting on this arrangement we have not had any broken trolley wire for over two years. Each trolley wire has a turnbuckle at the end, or use a hook bolt with strain insulator at the end.

W. D. Wilson.

DIRECT-CURRENT MOTOR STARTERS.

By J. H. McIlroy.

When a motor is at rest the speed, and consequently the counter electromotive force, is zero, so that if the impressed electromotive force be applied directly to the motor terminals the current $I=E/R_a$, where R_a is the armature resistance. And since R_a is only a small fraction of an ohm, the current I would be excessively large. Therefore in order to avoid this heavy rush of current a starting resistance must be put in series with the armature and cut out step by step as the motor speed increases, until at full speed the only resistance in circuit is that of the armature itself.

When starting rheostats were first introduced, the invariable practice was to distribute the resistance equally between all steps. This method, however, was soon discarded, as it gave very unequal increments of current, the result being excessive sparking and uneven acceleration.

The current i required to start a motor with its load from rest is greater than the full-load current I. When the switch arm is moved to the first contact of the starter the counter electromotive force is zero, and the motor current is expressed by $i=E/(r+R_a)$ where E denotes the pressure of the supply mains, R_a the armature resistance, and r the starting resistance in series with the armature. If n denotes the number of steps into which the resistance is divided, then $r=r_1+r_2+....+r_n$. Let e_1 denote the counter electromotive force generated when the switch arm is on the first stud and the motor has accelerated until the current I is steady, then $I=(E-e_1)/(r+R_a)$. When the switch arm is moved to the second stud the resistance will have been diminished by r_1, and before the counter electromotive force increases the current i is expressed by $i=(E-e_1)/[(r-r_1)+R_a]$. Each time the switch arm is moved from one contact to another, the current will suddenly increase and then fall as the counter electromotive force increases. The current I is that required to provide the necessary torque for accelerating the rotation of the armature; and the value of the resistance cut out in each step should be such that the ratio i/I is constant during the period of acceleration.

$$i/I=R_1/R_2=R_2/R_3=R_{n-1}/R_n.$$

The ratio i/I for a starting resistance having n steps is given by the equation $(i/I)^n=E/iR_a$. Hence $n \log (i/I)=\log (E/iR_a)$. Therefore the number of steps n required so that the current shall not exceed i amperes during acceleration is given by the equation $n=\log (E/iR_a)/\log (i/I)$.

Having determined the number of steps required for a given starting resistance, the resistance required for the first step is given by $r_1=(r+R_a)(1-I/i)$. Similarly the resistance required for the second step $r_2=(r-r_1+R_a)(1-I/i)$ and the resistance of any step n of a starting resistance is given by the equation $r_n=(r-r_1....-r_{n-1}+R_a)\ (1-I/i)$.

Example.

Determine the number of steps and resistance per step for a 10-horsepower, 220-volt, shunt-wound motor whose full-load current is 38 amperes; the starting peaks must not exceed 56 amperes. The armature has a resistance of 0.35 ohm. The number of steps in which the resistance must be divided is

$$\log \frac{220}{56\times 0.35}/\log\frac{56}{38}=\log 11.2/\log 1.47=6 \text{ (about)}.$$ With a start-

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ing current of 56 amperes, the starter being hand-operated, it should be built to attain this value of current in two steps; so that the actual number of steps should be 7, that is, there will be 8 contact studs.

On the first contact 28 amperes should be allowed to pass through the motor, so that the total resistance in the armature circuit when the switch arm is moved on to the first contact stud $=220/28=7.855$ ohms. Since the motor should start on the second contact stud and the starting current should not exceed 56 amperes, the total resistance in the armature circuit when the switch is moved on to the second contact $=220/56=3.928$ ohms. But the armature has a resistance of 0.35 ohm, so that the resistance between contacts 2 and $8=3.928-0.35=3.578$ ohms, while the resistance between contacts 1 and $2=R_1=7.855-3.928=3.927$ ohms. The second step of the starting resistance, or the first step for which the current is equal to the starting current $=r_1=(r+R_a)(1-I/i)$

$$=(3.578+0.35)(1-38/56)$$
$$=3.928\times0.32=1.257 \text{ ohms.}$$

Again, the resistance of the third step

$$r_2=(3.578-1.257+0.35)\ (1-38/56)$$
$$=0.85 \text{ ohm.}$$

Similarly $r_3=058$ $\quad r_5=0.27$

$r_4=0.39$ $\quad r_6=0.18.$

Thus by making the resistance steps of these values the ratio I/i is constant and an even acceleration of the motor is obtained.

Resistances.

The resistance coils of motor starters are generally made from high-resistance metals or alloys. The size of wire required for any particular case may be found as follows. Let R=resistance of the wire in ohms, a=area of cross-section, l=length and ρ=specific resistance; then the rate of generation of heat due to the current I flowing is I^2R watts$=0.24I^2\rho l/a$ calories per second.

Let s denote the specific heat of the metal, g its specific weight, and T the temperature rise in degrees per second above the surrounding air. To produce the rise of temperature in one second the heat generated$=l\,a\,s\,g\,T$ calories.

Owing to the short period during which the motor is under acceleration, the heat radiated may be neglected, in which case $l\,a\,g\,s\,T=0.24I^2\rho l/a$, or the rise of temperature per second, $T=0.24I^2\rho/a^2sg$. Suppose the wire carries the current I for t seconds, and let Tt=the permissible temperature rise of the resistance.

In the starting resistance calculated in the preceding example find the size and length of wire required in the last step. It may be assumed that the resistance wire used has a negligible temperature coefficient and that 30 seconds are required for starting. The permissible temperature rise is 150 degrees, so $T=5$. The average current is 47 amperes. For platinoid wire $\rho=0.00004$ ohm-centimeters; $g=8.6$, and $s=.098$. The area of cross-section of wire$=a=\sqrt{0.24I^2\rho/sgT}=$

$$47\sqrt{0.24\times0.00004/5\times0.098\times8.6}$$
$$=0.071 \text{ square centimeter.}$$

Diameter of wire$=d=0.30$ centimeter.

Nearest size of wire diameter in mils$=119$.

Length of wire to give the requisite resistance of 0.17 ohm $=l=aR/\rho=0.071\times0.17/0.00004=302$ centimeters.

A Starting-Box Remedy.

On circuits where the current is on and off the lines suddenly, caused by opening of the circuit-breakers, motor fuses are frequently blown if the starter does not release and open quickly. Slowness in the starter handle releasing is frequently caused by the retaining magnet being stronger than necessary.

A simple remedy for this trouble can be applied by prick-punching the magnet armature where it makes contact with the core of the magnet frame. The slight bur will increase the air gap and thus weaken the magnetic pull.

R. L. Hervey.

English Wiring Rules.

The seventh edition of the Wiring Rules of the Institution of Electrical Engineers appeared last month. The rules have been revised since last published. Among the requirements of these rules are the following:

When wires larger than No. 16 S. W. G. are used in fittings of any kind, they must be stranded.

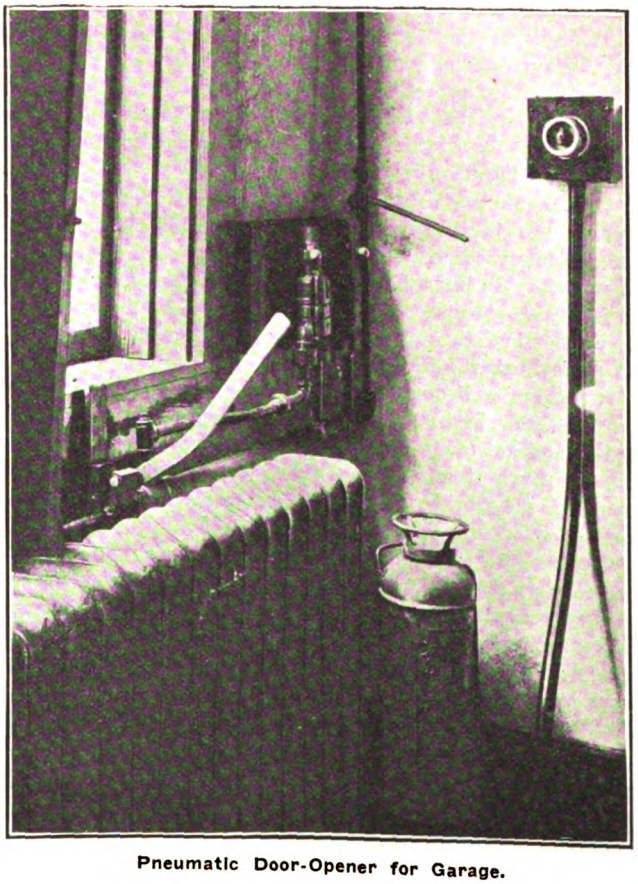
Slip sockets are no longer permitted in conduit work, but a screwed or grip joint must be used.

Insulated conductors protected by an outer reinforcing of tough rubber compound not less than 50 mils thick and capable of resisting abrasion, acids, oils and alkalis may be used without conduits or wood casing provided that (*a*) the resistance of the covering to fire is equal or superior to that of vulcanized rubber and (*b*) that the covering incloses the insulated conductors as a whole or each insulated conductor separately.

All heating devices which consume over 1,000 watts must be provided with double-pole switches.

Pneumatic Door-Opener for Garage.

At the garage of the Greenfield (Mass.) Electric Light & Power Company the main sliding door is opened and closed by an air cylinder, as shown in the accompanying photograph. A 0.75-inch steel plunger traveling in a 1.5-inch cylinder operates the door upon the turning of one of two engineer's valves shown in the corner of the room. Despite the fact that the door is 10 feet 6 inches by 13 feet by 2 inches in dimensions, it can be opened or closed in



Pneumatic Door-Opener for Garage.

3 or 4 seconds. A home-made brake shoe with hand lever, shown behind the radiator, enables the door to be stopped immediately at any point in its travel. Compressed air from the garage system is supplied through a 0.375-inch pipe at about 40 pounds per square inch. The switch shown herewith controls the outside lighting, at the approach to the garage.

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Prevention of Accidents by Electrical Workers.

A recent prize offer by *Safety Engineering* brought forth the following advice for the electrical man on the job.

In the installation or maintenance of electrical equipment, one is confronted with an element of danger not encountered in other lines of work, and in the performance of duties one must exercise carefulness, watchfulness and prudence to avoid difficulties.

Electrical work is a calling where caution is a prime virtue, and fortunate are those in whom this faculty is largely developed, because it exerts a restraining influence over the more propelling forces of one's nature, and prevents one from plunging into danger.

Safety demands that one must be constantly alert, especially where high potentials are handled; in the vernacular of the craft, the "juice" is prepared at all times and places to deliver without warning a "knockout" to the unfortunate victim caught off guard.

Of course there are unforeseen possibilities in all situations. It is difficult to guard against unknown peril, but where danger is manifest and an accident occurs it is invariably shown to be amenable to human control.

To one engaged in electrical work a thorough knowledge of the fundamental laws that govern the action of electricity is a necessity. They are immutable laws and, once mastered, the worker can in a measure guard against mishap, because he can think and act for himself.

"Live" and "dead" electrical conductors are identical in appearance. This fact alone serves to emphasize the importance of treating all apparatus as "hot" until definite indications to the contrary are shown by an application of tests.

It displays sound sense on the part of the worker to survey his surroundings, analyze the conditions and securely fortify himself before proceeding with any work. It is equally important to see that every precaution is taken to preclude any possible chance of the apparatus or circuit being livened up while working upon it.

One should not depend upon the "say so" of another. It is best to test, because the information imparted may not always be absolutely correct. If, for any reason, an employee finds it necessary to leave his work for a short time, on his return it is a wise precaution to always give the job "the once-over," as a brief investigation might show some change in conditions to make further work unsafe.

A job not well done would better be left undone. Careless work should not be tolerated. Just because the work is concealed and not likely to be condemned is no excuse for slighting it. Even if it does not offend the sense of good workmanship, the worker should at least show some consideration for the safety of the next man on the job.

One should never allow himself to become so inured to the presence of high voltages as to cause him to slacken his tension on concentration. When an employee finds his surroundings uncongenial, his work uninteresting, it is high time to seek another position, because with interest centered elsewhere, work becomes a reflex action, and a most vital point in "Safety First" is lost when a worker does not think.

One should never overlook the importance of apparently insignificant things. A little attention at the proper time will often avert a serious accident. It is well to remember that it is easier to quench a spark than a fire.

A worker should never allow his vigilance to relax even in the handling of low-voltage systems. The harmonic pulsation received by a contact with 110 or 220-volt alternating current is not a pleasant sensation and it is extremely dangerous if one happens to receive a jolt while working from a step ladder or scaffold; the sudden involuntary contraction of the muscles may cause one to drop a tool or lose his balance.

One whose position involves the handling of "hot stuff" cannot afford to commit blunders, as the penalties are too severe. Even if the unfortunate one survives an encounter, the pyrotechnical display that invariably accompanies a short-circuit is certain to leave a trace of damage which will conspicuously fix the incident in the memory of the victim.

Frequently an employee in his haste to restore service after an interruption will overlook his personal safety. It should always be borne in mind that it is vastly more important to preserve a life than the continuity of a circuit.

It is very poor practice to carry tools about the person, and more so if they are not properly insulated; in fact there is no necessity for it except on line work.

Good thinking can come only from a clear brain and it is the worker's duty to keep his gray matter in perfect working order, at least while on the job.

The writer is no disciple of prohibition doctrines, yet he believes it a grave mistake on the part of a worker to appear on the job burdened with a 50-per-cent overload of the products of some distillery; he not only exposes himself to danger but he also jeopardizes the safety of his fellow workmen.

The worker should at all times welcome any new appliance and readily respond to any suggestions tending to minimize accidents.

When a fatal accident occurs, employers experience little difficulty in securing applicants for the worker's position, but it rarely happens that the vacancy created in his family circle is ever satisfactorily filled. It is well for the worker to pause at this point long enough to have this fact made perfectly clear to his mind.

Among the Contractors.

Miller & Halls, electrical contractors, 264 Stark Street, Portland, Ore., have been awarded the electrical contract for the proposed new mill of the Inman-Poulsen Lumber Company, which recently burned and is to be rebuilt immediately. The contract is for the wiring to be used in connection with all power apparatus.

The contract for electrical wiring for the new DuBois School, Springfield, Ill., has been awarded to the Barth Electric Company, on its bid of $1,269.86.

Control of the Louisville Wiring & Fixture Co., of Louisville, Ky., is now in the hands of I. P. Barnard, who has purchased the interests of C. C. Herman and H. D. Catlett in the business.

H. B. Lucas will establish an electrical contracting business at Owensboro, Ky. He formerly was with the Rogers Electrical Company.

The State Board of Control recently awarded the contract to the Liberty Electric Company, of Aberdeen, Wash., for furnishing and installing electric fixtures in the Administration Building, State School for Girls, at Grand Mound, Wash.

Titus Schmid has become associated with J. Lowe in the electrical contracting business in Dubuque, Iowa, and the firm name will hereafter be Schmid & Lowe. The association of Mr. Schmid with the firm means the bringing in of additional capital and the branching into newer channels of trade.

The new electrical firm of Strite & Stine has opened for business at 353 West Second Street, Waynesboro, Pa. Their specialty will be charging automobile storage batteries, house wiring and furnishing complete electric light plants for farms and residences.

E. A. Emery, of Galva, Ill., has received the contract for all the electrical work for the new Parkside Hotel at Kewanee, Ill. This hotel is to be fireproof throughout and will cost about $100,000. All the wiring will be in conduit.

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Loose-Leaf Sheets a Convenience for Troublemen.

When a troubleman is sent out to repair a fault on an electric circuit he should have an accurate and conveniently arranged diagram of the circuits to be investigated or worked upon. In the Worcester (Mass.) Electric Light Company's distribution department troublemen are furnished with exceptionally convenient letter-sized loose-leaf sheets, as reproduced herewith, to enable them to carry accurate information as to the line conditions about the system with ease.

Fig. 1, which is a typical street-lighting sheet, shows at a glance just what parts of a particular circuit are of overhead and what portion of underground construction, the location of each arc and incandescent lamp on the circuit, and the route of the wire with all loops on a correct geographical scale. On the circuit illustrated, which starts from the Webster Street generating plant in underground cable, there are 56 series arc lamps and 21 series incandescents. The major part of the line is underground, but some of the loops on the side streets run overhead, as shown. In case of emergency repairs, reconstruction, etc., the map is of great convenience. To enable the sheets to be used outdoors in strong winds, those made for field service are white-printed on cloth, a celluloid cover being used at the front and rear of the book to protect the sheets in handling them. In reducing this sheet for the engraving, its clearness has been somewhat spoiled. The originals are very easily read and entirely to scale.

Fig. 2 is a map of a power circuit, all three-phase and single-phase transformers being shown by symbols, with the size of conductors, location of oil switches, taps to various industrial plants, the number of conductors installed at various points, etc. Another sheet showing the detailed connections in the Park Building, which is on this circuit, is shown in Fig. 3. This shows in detail the arrangement of cables leading to power and lighting transformers from the service manhole outside the building, connections of the demand indicator, primary circuit leading to motor-generators employed in furnishing direct current to elevators and dental motors, and the possibilities in the way of feeding through the building substation in emergencies.

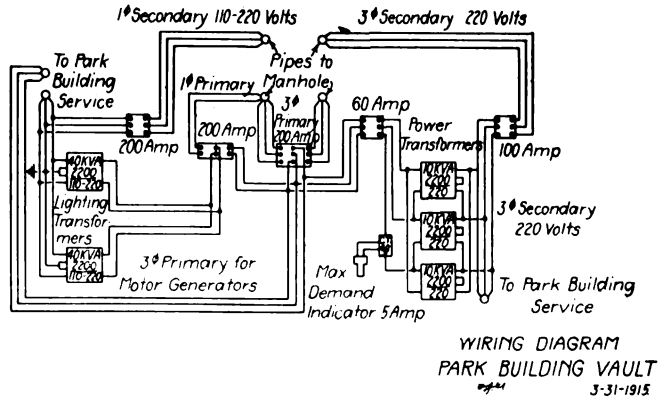

Fig. 3.—Record Sheet Showing Detailed Wiring Connections in a Building on Central-Station Service.

The value of such diagrams becomes the greater as the circuits become more complex and especially so when service on circuits must be restored as quickly as possible. The "safety first" element also is an important feature taken care of by an accurate and easily understood diagram. Although most of the large central-station companies have developed sets of such diagrams for load dispatching and trouble hunting, not so many of the smaller companies and but few industrial plants have ever taken the trouble to make simple and condensed diagrams especially to facilitate trouble hunting. Usually the circuit layout is left to the memory of only one or two men and in their absence long delays and serious difficulties may result.

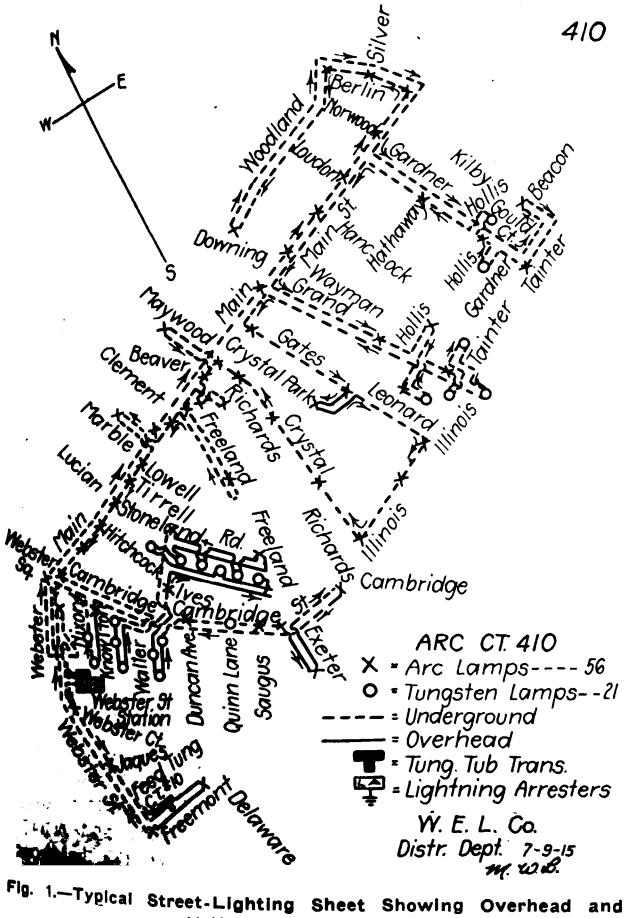

Fig. 1.—Typical Street-Lighting Sheet Showing Overhead and Underground Circuits.

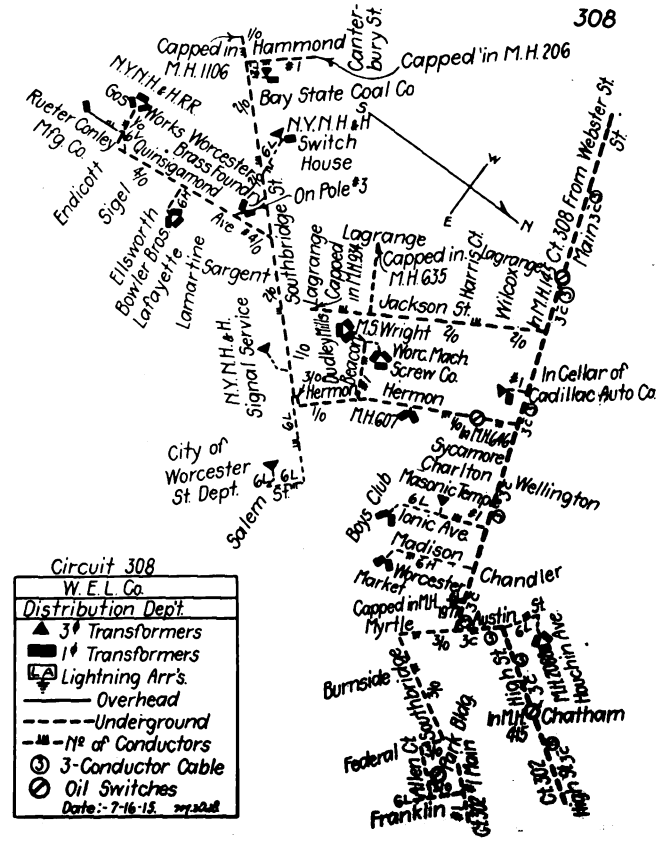

Fig. 2.—Map of a Power Circuit Showing Types of Transformers, Size of Conductors, Location of Switches, Etc.

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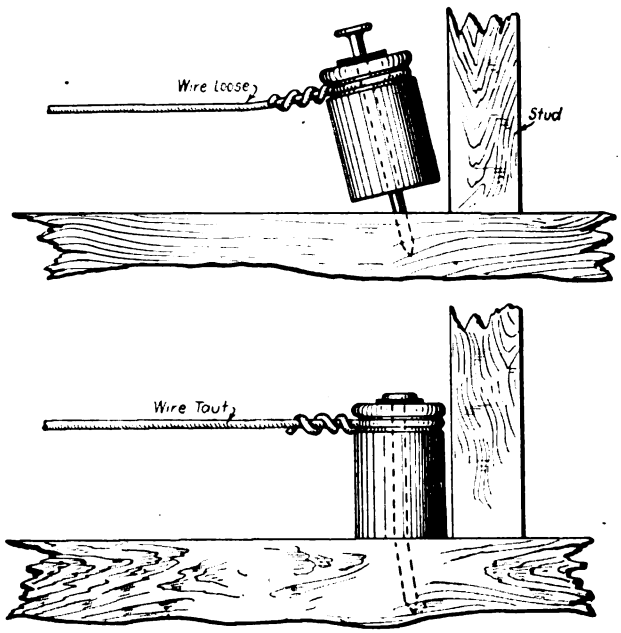
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

To Insure Taut Wires in Knob-and-Tube Work.

I notice on many jobs of knob-and-tube work in which solid knobs are used much trouble is found in getting proper strain on the wire in cases where the knob must be set very close to a stud or other obstruction. I find that a good way to make a tight job is to start driving the nail for the knob on the slant, then as it is driven home the nail is hammered in straight, causing the knob



Tightening Wire in Knob-and-Tube Work.

to straighten up and draw the wire taut. A sheet of glass, slate or other insulating material should be put between the stud and the adjoining knob.

E. C. Sylvanus.

Taking Up Floor Boards Neatly.

In taking up flooring to conceal wires, I find that a large amount of work and trouble can be saved by first ascertaining the grooved side of the boards. Then by driving a flat chisel slantingly under the board to be taken up so as to break off the lower part of the groove, the board can be pried up easily, leaving the surface in good condition to be replaced. I find this to be better than to drive the chisel straight down and cutting off the tongue, because on replacing the boards they lie more nearly flush if at least part of the tongue is left.

E. A. Davidson.

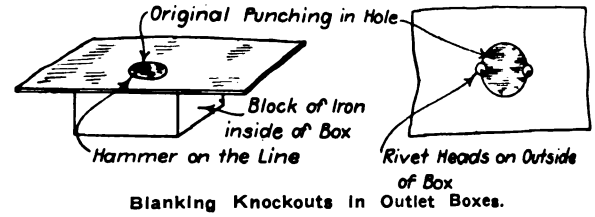
Fishing Wire into Bent Fixture Arms.

An easy method for fishing wires into various kinds of bent fixture arms is to take a long piece of bead chain, such as is used for pull-chain sockets, and put one end of the chain into one end of the fixture arm. By gently tapping the arm you will find that the weight of the chain will carry it around in whatever angle you are holding the arm. By doing this you will find that the chain will slide right through to the other end of the pipe. Next you tie your fixture wires to the end of the chain and pull them through gently so that you will not break the chain. In some cases it will be desirable to first pull through a strong, smooth cord by means of the chain and then pull the wires through by the cord.

Walter Morris.

Blanking Knockouts in Outlet Boxes.

The neatest, quickest and easiest way to stop up knockout holes in cutout boxes is to rivet the punching, which



Blanking Knockouts in Outlet Boxes.

comes out of the hole, back into place again. If a heavy hammer or flat-faced block of iron held inside the box and a light hammer applied outside does not accomplish the trick, two small rivets, as shown, will do it.

A. F. Stearns.

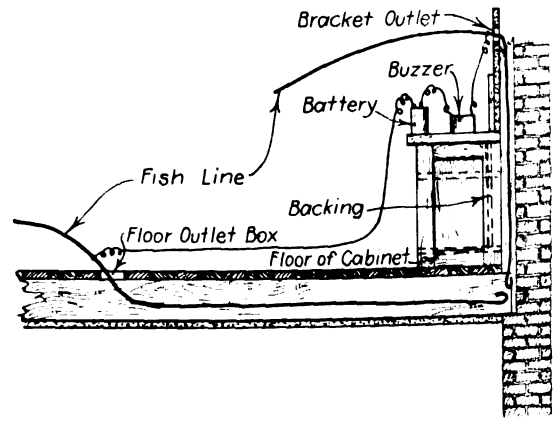
Handy File for Fixture Work.

I find that a three-eighths-inch round file is a very handy tool for the fixtureman's tool bag. The tapered handle end can be used for a punch and reamer to make socket bushing holes in canopies. If a larger hole than the end can ream is wanted, it can be filed to the required size, In pulling fixture wires out of a bad bend in a fixture fitting, the handle end point can be made into a small hook that is a great help in pulling wires through an arm.

M. J. Moriarty.

Simple Test as Aid for Hooking Snakes.

An easy way to find whether the ends of two snake wires used in fishing difficult places in ceilings and partitions are near each other is by means of dry cell and buzzer connected in on the wires as shown. One side of the circuit is connected to one of the snake tapes and the other side of the circuit is connected to the other tape. When the two snakes come in contact the buzzer sounds. In the accompanying sketch is shown a case



Test Used in Hooking Snakes.

where this test proved effective. It was required to install a floor outlet near the center of the room and the nearest other outlet to it was a bracket above the sideboard built in at the wall. Since the cabinets in the bottom of the sideboard were provided with false floors and separate backing it was not possible to get at the baseboard. In this case two snakes had to be used and the simple test facilitated the work.

W. Morris.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Electrolysis.

To the Editor:

Your editorial on electrolysis in the issue of January 22 was indeed interesting. It is a true description of its effects and the remedies offered for its prevention.

To the knowledge of the writer there has been much expense incurred in experimenting along these lines. We hear the British Board of Trade regulations referred to and other European methods cited. These are no doubt good as far as they go, but here in this country we have more to contend with than they have in Europe. Our street railways and other loads are much heavier and more surging; our underground pipes and cables are more numerous and laid with practically no regulation as to depth and location. Generally they are all connected in one great underground circuit.

To the network of pipes and cables let us add the steel buildings, with their footings deep down in the ground and see what an enormous ground-plate we have to collect stray current. We all know that electricity will go to ground. That is why we have to insulate conductors and equipment. In all cities there is a part of the street railway system where the rails are positive to the underground pipes and cables and other parts where the rails are negative to the pipes. The average inspector would call this a good condition, yet in such cases we have two parallel lines with an earth connection between them, where the current will equalize.

In what is commonly called the "danger zone" will be found a direct reversed condition, where the pipes and cables are discharging back to the rails. At these points the effects of electrolysis are plainly visible. A great deal more could be said on this subject, but not desiring to impose on your space I will confine myself to the remedy as I see it.

After many years of labor along this line, I can see but one permanent, sure remedy, and that is the porcelain pipe insulator. By its use it is possible to clear up any electrolytic troubles, no matter how large or small they may be. The result obtained from its use is governed by the number installed. It is possible to clear up the average pipe line by installing an insulator about every one thousand feet, with an occasional service pipe insulator close to the main where the pipes cross under the track. These insulators will increase the resistance in the main so that it will not carry current. In other words, if the route of the current in the pipes is obstructed, the pipes will not collect current at either adjacent or remote points.

It is not true that an insulator is dangerous in a pipe, for the electric current will not pile up against a resistance. The difficulty has been that where pipe insulators have been used, enough of them have not been installed.

There are few types of insulators that are safe to use. An insulator for water or gas service pipe should have an inside insulation of not less than twelve inches and outside break of not less than eight inches and main insulators twelve inches inside. Outside insulators may be reduced to four inches, by covering the surface of the insulator with some substance to keep it free from earth moisture.

A composition insulator will not meet the requirements, as it will saturate, leak current and disintegrate in a comparatively short time. A leaky insulator is much worse than none at all. It is difficult to insulate a main larger than eight inches, but by insulating the small ones and the branches leading to the large ones, it will be unnecessary to insulate the larger ones.

Sheaths of underground power and telephone cables are frequently collectors of large amounts of current. In such cases they lead into danger zones and drain to other cables, pipes or structures. Insulators put into the sheath of such cables will prevent current travel and consequent electrolytic action.

It will often be found that two service pipes in the same building coming from opposite directions, from two separate systems, say water and gas, will show considerable difference in voltage. The pipe insulator will eliminate this difference and reduce the danger of basement fires.

Edward Heydon.

Indianapolis, Ind.

Concentric Wiring.

To the Editor:

In regard to the answer to Question 330 concerning concentric wire, published in your issue of February 19, 1916, I would call attention to the fact that if the seam opens all that has been done is to reduce one of the special safety features of concentric wire, but even then it is less dangerous than the ordinary installations.

In the ordinary installations the insulation is depended on to protect the potential wire.

In the concentric wire of the Kuhlos type this insulation is protected against mechanical injury by the outer sheath, which has an open seam.

The outer sheath also protects it largely, but not absolutely, from moisture or corrosion, because a little moisture can get in through the open seam.

In the Stannos wire the insulation is protected permanently against mechanical injury, against corrosion and moisture. Even if the seam is abused and breaks open the wire is then as safe and good as the Kuhlos; and in any case, the potential wire is better protected than in any ordinary system.

R. S. Hale,
Chairman,
Committee on Wiring, N. E. L. A.

Boston, Mass.

Disposal of Wood Waste.

To the Editor:

In reference to article on this subject in the March 11 issue would say that the matter of securing power contracts where there is a large amount of wood waste available is certainly a very important one. As stated in the article, each particular case has to be treated on its own merits.

There is one point which might be brought out in connection with the use of shavings and sawdust as a partial supply of fuel, and that is that when this waste is blown into the fire of the ordinary furnace it burns at very low efficiency due to the large amount of cold air which is blown in on top of the fire. This also lowers the efficiency of the coal used as possibly the main source of fuel supply, and thus materially reduces the efficiency of the boiler plant. Specially designed furnaces are necessary if reasonable fuel economy is to be secured.

George H. Jones,
Power Engineer,
Commonwealth Edison Company.

Chicago, Ill.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 341.—Controller for Bascule Bridge.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

No. 342.—Trouble Finders.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

No. 343.—Theater Emergency Lights.—Rule 38*a* of the National Electrical Code provides that "where supply to a theater cannot be obtained from two separate sources, the feed for emergency lights must be taken from a point on the street side of main service fuses." Has this provision been found ample for the purpose? Would it not be desirable to insist on an entirely independent source, such as a storage battery?—J. H. R., Pittsburgh, Pa.

Answers.

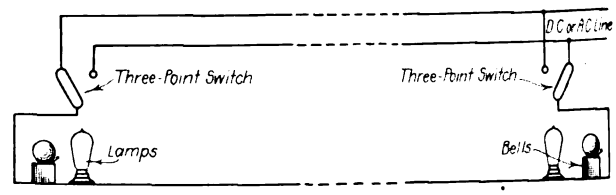
No. 333.—Electric Car Heating.—Has any system of electric heating been developed for electric street cars, elevated or subway trains, which gives a more uniformly distributed heat than the electric coils now commonly used under the seats? I have heard many complaints on very cold days that the seats are uncomfortably hot while the floor is chilly.—A. P. G., Chicago, Ill.

The present tendency is toward the more sanitary floor of composition or concrete. Obviously, the floor under these conditions will be quite cold during the winter months. The only remedy, namely, to put the heater coils in or under the floor, is out of the question on account of the cost and maintenance expense. Where there is a good circulation of air in the cars it will be found that few of the radiators overheat unless damaged. The great source of trouble seems to be in educating people to take sufficient fresh air to allow a thorough circulation of air in the vicinity of the heater. The older types of car heaters were placed much closer to the seat than is the present practice and these old cars are the only ones where too hot a seat may be found, except, of course, cases of damaged heaters, which are very infrequent. The old wood floors, though insanitary, can hardly ever be found to be cold, and never as cold as the newer flooring. This is not of sufficient moment to reject the newer materials.—H. E. W., Chicago.

In those cars heated by a hot-water system overheating of the seats is not noticed and the car seems to be uniformly comfortable. Where the hot water is heated in a coal-burning heater, objectionable gases (carbon monoxide, carbon dioxide, etc.) are very commonly given off. Therefore it seems to me that combination electric and hot-water radiators would solve the problem. At least one type thereof is now on the market. Should there be fear that the hot water will freeze when the cars are left over night in exposed yards, another type of combination electric-radiator in which oil is used as the circulating medium could be used. The advantage of all such combination radiators over the straight electric is that they have a much larger radiating surface, retain the heat better after current is off and do not overheat any part.—J. L. G., Oak Park, Ill.

No. 336.—Visual and Audible Signal.—I should like to know whether it is possible (and if so, how) to wire a simple but positive signal system which will indicate at the same instant at the sending and receiving points by means of lighting red lamps and ringing large gongs for perhaps half a minute. That is, the man at the sending end must know positively by the lighting of his lamp and ringing of his gong that the combined signal was properly actuated at the receiving end without a special answer-back signal.—G. S. C., Joplin, Mo.

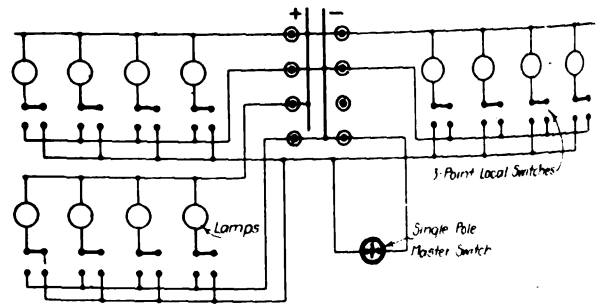
Signaling systems of this type have been in use for some time, especially in mining, electric railway work, etc. When used in mines they are so wired so that where there are several transmitting points on the line, all the indicators will operate on the line, whenever operated from any point. This prevents the operation from interfering with signals sent by other operators to the engine room. Of course, in this case the engine room is always the receiving end. The other receiving apparatus installed at each transmitting station is used both for test, to see that all is working properly, and also a precautionary measure to prevent more than one signal being sent in at a time. These signals are manufactured by any good signal manufacturer. If it is only necessary to have a receiving and a sending station to act as either, a simple way of doing it is the method used by street-railway companies. The sketch shown herewith will illustrate it. It can be used on battery systems, direct-current circuits with a lamp bank in series, or alternating-current system with a bell transformer and alternating-current tuned bells. Low-voltage lamps should be used, so that with a low-voltage supply serious burning at contacts is prevented. After the signal has been actuated for a long enough time, turn the sending switch to the other point, so that the other operator can answer back showing he understood the signal.—W. T. E., Ansonia, Conn.



No. 336.—Visual and Audible Answer-Back Signal.

No. 337.—Master Switch for House Lighting.—There are thirty lamps in a house arranged on three circuits. It is desired to be able to light all of the lamps throughout the house by means of a master switch placed along the bed of the owner in one of the bedrooms. I have heard that it is possible to do this. What special wiring is necessary?—O. P., Lewiston, Idaho.

To control all 30 lights at one time from a master switch run the feeders direct to a double or triple-pole switch (depending on the number of wires in feeder) located in the



No. 337.—Master-Switch Wiring.—Fig. 1.

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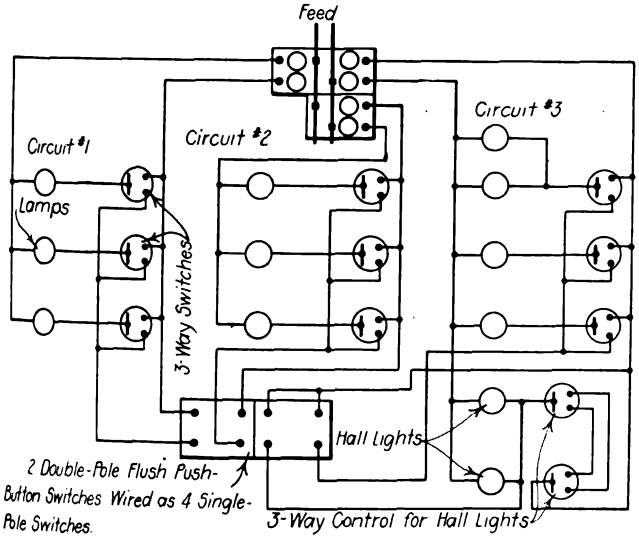
bedroom. To control some of the 30 lights as emergency lights and the others for general purposes use three-point switches as local switches for all emergency lights and with a two-wire supply a single-pole switch as a master switch, as shown in Fig. 1. With a three-wire supply a double-pole switch is used as two single-pole switches for this purpose.

The master switches must be protected by fuses of proper capacity before passing to the feeders as shown in sketch and not more than 32 sockets should be placed on one master switch; as this usually only controls one light in each room it is ample for most purposes. On the three-point switches the heel is a permanent connection placed on the back of the switch by the manufacturer. By using two three-point switches in place of one single-pole master switch, the master control can be had from two stations, if desired.—A. T., New York, N. Y.

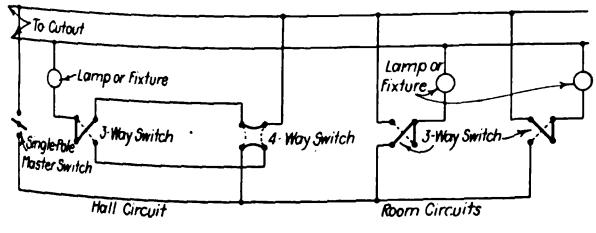
The diagram (Fig. 2) shows three circuits wired up with master switches. Each circuit is kept separate and the whole 30 lights will not be thrown upon one set of fuses



No. 337.—Master-Switch Wiring.—Fig. 2.

at entrance switch, as in case of one single-pole master switch for the entire house. By using two double-pole flush switches, only two buttons will have to be pushed, and the lights will still be protected by their respective circuit fuses. To have positive master control, there should be at least one keyless socket (preferably locked) in each room and hall, these sockets or fixtures being controlled by the three-way switches indicated. In the lower right corner of the sketch is shown one way for including in the master-switch control one or more hall or stairway lights, which are themselves controlled from two places by the ordinary three-way switches.—J. B. S., Chillicothe, O.

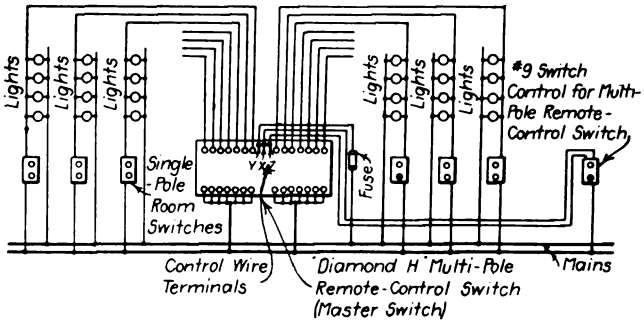
In wiring the house for master switch I suggest the following for use with three-way-switch circuits in hallways: Instead of using two three-way switches as ordinarily, use one three-way and one four-way connected as shown in Fig. 3. This does not affect in any way the number of four-way switches that may be used between the three-way and four-way switches. A four-way switch may also be



No. 337.—Master-Switch Wiring.—Fig. 3.

used as a three-way in case of emergency. The hall light or fixture must be connected to the three-way switch and not the four-way, For the ordinary room circuits a three-way switch is used for each lamp or fixture to be controlled locally. These are connected to the master-switch circuit as shown. Only one lamp or fixture is shown on each of the two room circuits; of course, there may be as many as 12 lamps on each of these circuits. Proper fuses (not shown) must be used.—W. W. F., Philadelphia, Pa.

The best way to wire for a master switch is to use single-pole switches for each fixture or room, all wired on the same side and run a tap from this side to a remote-control master switch located near the main cutout cabinet in the basement. I have used for this purpose a "Diamond H" multi-pole switch made by the Hart Manufacturing Company. The wiring is shown in Fig. 4. Any number of circuits or lamps can be controlled in this way. The con-



No. 337.—Remote-Control Master Switch.—Fig. 4.

trolling switch is just like an ordinary flush wall switch. It momentarily closes the solenoid circuit of the master switch to open or close the latter.—D. K. N., Brooklyn, N. Y.

No. 338.—Grounding of Motors.—What is the best way to ground a group of motors? Can motors of different voltages be connected to the same ground plates, say in the case of 110, 220 or 440-volt alternating-current machines?—R. B., Jackson, Mich.

A copper or steel sheet cut to the size of the motor frame and placed between the frame and base, makes a good ground plate for the motor end of the ground connection. The motor frame, of course, is bolted to its base so that a good connection is made between the frame and ground sheet. The ground wire should be bolted and soldered or riveted to this sheet. Usually it is not necessary or expedient to connect more than two or three motors to the same ground connection, for as a general rule the several motors on the one installation are too far apart to warrant this, it being cheaper to make a separate ground connection from each motor to the nearest water pipe or other good ground. A good reason for not connecting more than one motor to the same ground connection is that in case of a charge coming in over one machine and a ground existing in another, the latter machine is liable to be damaged through the ground connection.

It is not considered good practice to ground motors of different voltages to the same ground connection, although the National Electrical Code does not prohibit this. As a general rule this difficulty does not present itself, since different voltages for motor service do not exist on one installation. However, if motors of different voltages are grounded to the one terminal, there is always a chance that the voltage of one machine will be crossed with that of another.—R. L., Detroit, Mich.

[Answers to Questions Nos. 339 and 340 will be published in an early issue.—Editor.]

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

CHARGING PANEL FOR STORAGE BATTERY FOR OPERATION OF EMERGENCY LIGHTS ON PASSENGER VESSELS.

An Important Provision for Safety at Sea.

In compliance with the regulations of the Steamboat-Inspection Service of the Department of Commerce, requiring auxiliary lights fed from an independent source of power on passenger vessels, a number of such vessels at Baltimore, Md., have been equipped with emergency lights, using the emergency radio storage battery as an auxiliary source of power to operate them. The auxiliary power furnished primarily for the wireless telegraph is thus made to serve two purposes.

In order that the storage battery shall be properly charged, a charging panel has been designed by Radio Inspector R. Y. Cadmus, of the United States Bureau of Navigation, which apparently meets these requirements. The board is so equipped as to disconnect automatically the charging circuit when the battery has been charged. Should the lights be used for purposes other than emergency, the Sangamo ampere-hour meter (which is used to show the amount of current put in or taken out of the storage battery) can be so set as to cut out these lights when the discharge reaches a certain point, thereby reserving the necessary emergency supply.

The board is equipped with overload and underload automatic switches to prevent excessive charging. It is simple in construction and comparatively inexpensive. Should an accident require the use of emergency lights, an officer or wheelman on the bridge throws one switch or presses a push-button on the steering head of the wheel.

Emergency lights are placed in the main passageways; in the passageways leading to the staterooms; over the doors leading to the decks; on the stairways leading to the lifeboat decks; on the boat deck in immediate vicinity of lifeboats and rafts, and the auxiliary current is also connected with the signal lights of the vessel.

The above lights are arranged on three circuits, one for each deck, leading to the charging panel. These circuits consist of two-wire, lead-covered cable. The lamps are connected in parallel, so that should one of the lamps be broken the circuit is not interrupted. On the freight deck three-ampere fuses are used, on the passenger deck five-ampere, and on the boat deck ten-ampere fuses are used. In the event of an accident, should the water reach the freight-deck circuit the lower fuses will blow, allowing the lights on the upper decks to remain in service.

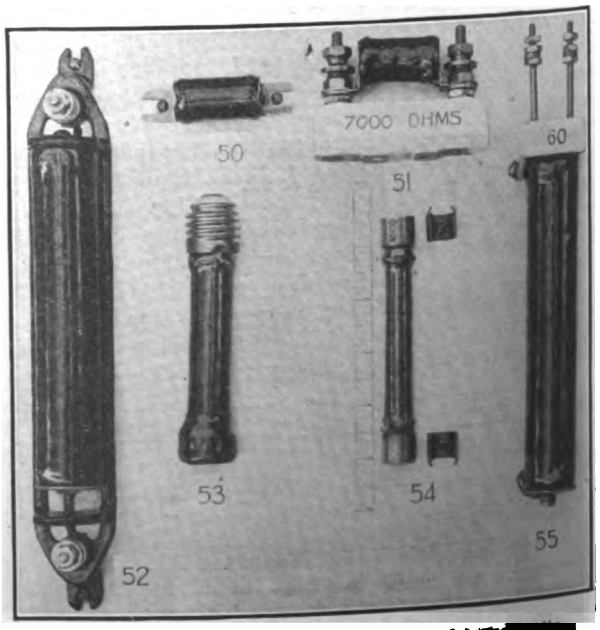
These auxiliary lamps can be so placed as to illuminate the lifeboats, so that in case of accident, light is provided to the last, where most needed.

Ward Leonard Resistance Units for Signal, Telephone and Telegraph Circuits.

The Ward Leonard Electric Company, Bronxville, N. Y., has devoted its attention recently to the task of producing a compact unit of high resistance and moderate current-carrying capacity, combining in a small space the salient features of a strong durable resistance unit for signal, telephone or telegraph circuit. The illustration herewith shows units made of practically zero-temperature-coefficient wire, wound on porcelain tubes, and covered with a vitreous enamel that is said to possess the following advantageous features.

The resistance wire is imbedded in a material which will expand and contract at the same rate as the resistance itself within the limits of usage, thus preventing the adjacent turns from closing together and short-circuiting, thus preventing, therefore, a change in the resistance of the unit which causes a burnout in the circuit. The vitreous enamel in which the wire is embedded and by which it is entirely covered, protects the wire from the atmosphere. As the entire wire is hermetically sealed it cannot deteriorate owing to the action of moisture or other corrosive elements. The coating of enamel over the wire is so thin, and the enamel so good a conductor of heat, that the heat generated is dissipated very rapidly, because the radiating surface is practically increased from that of the fine wire to that of the porcelain tube. The resistance wire has practically zero temperature coefficient, that is, its resistance does not alter with change of temperature, the importance of which is well known.

These units are very strong mechanically, are small, compact, nonabrasive, rustproof, waterproof, fireproof and dustproof. The terminals are very strong, and the connections between the resistance wire and the terminal leads are imbedded in the vitreous enamel, which preserves the joint against any depreciation. The shape is the best possible for mounting, as is evident from the cut, which shows units arranged to be screwed into lamp sockets, equipped with ferrule ends for fuse-clip mounting, equipped with angle ends, standard Railroad Signal Association, signal practice for mounting in standard signal blocks, also especially adapted types for telephone and telegraph service. Any of the units shown can be furnished with resistance as high as 10,000 ohms on one layer.



Samples of Compact Ward Leonard Resistance

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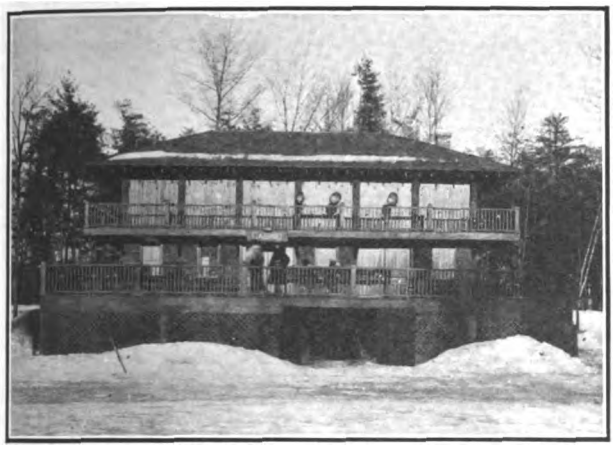

Projectors on Skating Pond Casino.

Installations of Flood Lighting by Projectors.

The public skating rink on the lake in Central Park at Schenectady, N. Y., has this winter been illuminated with flood-lighting projectors so this popular sport could be enjoyed during the evening. The projectors were placed on the balcony of the Casino so as to light the skating pond and the toboggan slide in the background. A 500-

Flood Lighting of Skating Pond.

watt Edison Mazda lamp was used as the light source of each projector.

On the evening of March 1, a celebration was held at Plymouth, Mass., to commemorate the opening of a white way consisting of 35 ornamental luminous arc lamps. One feature of the celebration was the illumination of the Court House and the tower of the new Federal building by means

Flood Lighting of Court House, Plymouth, Mass.

of flood-lighting projectors. Ten of these projectors were used to illuminate the Court House, two being installed to light the tower and eight to light the face of the building. As the building has a front built of red brick with white trimmings, the effect was very beautiful as well as strikingly attractive.

In both of these installations projectors made by the General Electric Company were used.

Hartman Automatic Switch for Use in Charging Ignition Batteries.

Charging ignition and lighting batteries, such as are used for gasoline automobiles, has come to be an important feature in most garages. Equipment for such charging is now commonly of the motor-generator type. In many such sets a reverse-current circuit-breaker is not provided for protecting the battery from discharging back into the generator in case of failure of line current. To meet this need an automatic switch has been placed on the market

Fig. 1.—Automatic Charging Switch.

by the Hartman Electrical Manufacturing Company, Mansfield, O.

As shown in Fig. 1, it is a compact device, the coil of which is inclosed in the case at the top. The wiring scheme for this switch is shown in Fig. 2. It will be observed that the coil has two windings, one in series with the current from the generator to the battery and the other connected

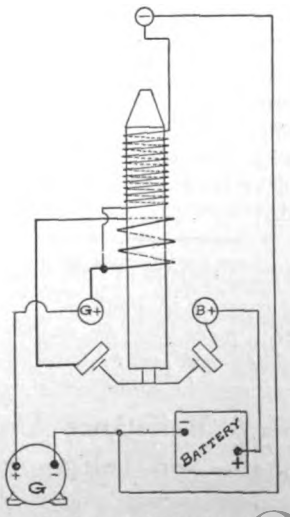

Fig. 2.—Wiring of Automatic Switch.

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across the generator terminals. As soon as the charging current fails, the contacts on the switch drop, opening the circuit and preventing discharge at the battery. The shunt coil is so arranged that as soon as the generator again is placed in service and has the requisite voltage for charging, the switch is automatically closed, thus permitting charging to proceed. This shows that the switch is both an automatic cutout and cutin.

The switch includes an adjustable resistance which is put in series with the shunt coil by means of a button and pointer; the latter can be turned to 1, 2, 3 or 4, these numbers indicating the number of six-volt batteries which are to be charged in series at one time. The switch is arranged to accommodate four such batteries or two 12-volt batteries. As many sets of batteries in parallel can be connected to the generator as the latter has charging capacity for. The moving contact of the switch consists of a laminated brush made of thin slotted copper strips. An additional arcing contact is provided, although it is merely as a safeguard because the switch almost invariably opens at no load. This switch is made in three sizes having current capacity of 30, 50 and 100 amperes, respectively.

New Perkins Automatic Door Switch.

The Bryant Electric Company, Bridgeport, Conn., has recently brought out an improved automatic door switch for use on closet doors, hotel-room doors, etc. This new device, known as Perkins automatic door switch, is said to overcome all of the objections existing in previously designed switches of this character.

Compact Door Switch.

The operating button projects only eleven-thirty-seconds of an inch beyond the face plate, whereas in other designs this projection has been as much as five-eighths of an inch or more. The advantage of less projection is important, as the door does not have to be opened so much as formerly to permit the complete operation of button and insure the lighting of lamp. With the new design of shorter button, the required movement of button is also shorter so that the light is "switched off" more quickly. Another great improvement over previous practice, is the use of two screws to hold the plate in position, instead of one, and the fastening of these screws into special ears, independent of the mechanism, instead of to the bracket part of the mechanism itself as was the former practice.

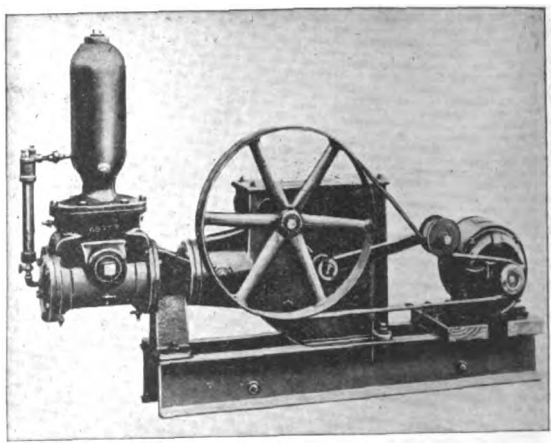
The operating mechanism of this new switch has also been greatly simplified and the parts thereof made larger and stronger. The commutator is of the knife-blade type, well insulated by liberally designed fiber blocks which prevent overheating and eliminate risk of damage or rapid carbonization.

Comparative tests under normal rating (3 amperes, 250 volts) of this type of switch show an average life for the new design of upwards of 100,000 cycles, or approximately ten times the operating life of old-style switches.

This new type of switch can be furnished to either close the circuit when the door is opened or to close the circuit when the door is closed.

A New Electric Shallow-Well Pumping Outfit.

Where electric current is available, the pumping outfit shown will exactly meet the water-supply requirements for bathroom, kitchen and laundry purposes in residences, bungalows and cottages in suburban districts not reached by the city water mains, or where the city or artesian water is hard or otherwise unfit for household use. The manufacturer, the Leader Iron Works, Decatur, Ill., has designed this pump to operate quietly, reliably and with little attention.



Motor-Driven Shallow-Well Pump.

The working parts of the pump are inclosed in a dust-proof case and operate in an oil bath insuring minimum wear and quiet operation. An air chamber is connected in the discharge line of the pump to prevent "pounding" in the lines which also tends toward quiet operation and according to the manufacturer, eliminates bursting or loosening of pipe joints.

The pump is driven by a Westinghouse motor belted to the pump pulley and mounted compactly on channel iron together with the pump so that no special foundations are required.

New Electric Signal Lamp Visible 100 Miles.

E. G. Fischer, chief of the Instrument Section of the Coast and Geodetic Survey, Department of Commerce, has just completed the design and construction of a signal lamp which will be used during the coming summer in the mountainous regions of Idaho and Oregon on primary triangulation where the distance between stations is frequently as much as 100 miles. This lamp has been tested by the Bureau of Standards and is shown to be more than 150 times as powerful as the acetylene signal lamps which have been used for a number of years by the Survey. These acetylene lamps have been observed with the telescope over lines more than 120 miles in length. The new lamp is an electric one, with a specially designed filament, and the power is the ordinary dry cell. While no tests have been made on the field with the new lamp, it is expected that ordinary haze or smoke will seldom prevent observations.

The Bureau of Standards has made careful tests of the new lamp and states that the larger sizes of this lamp are so powerful as to be scarcely comparable with the acetylene lamp.

Close Voltage Regulation Necessary for Heating Units.

In connection with the operation of electrically heated units it is pointed out that 110-volt energy is found best suited where small heating elements are used, because of the larger wires in the windings than those suitable to 220-volt operation. When a factory is being equipped with machines of this type the installation of a separate transformer in connection with heating circuits is found desirable, as variations in voltage due to operation of motors on the same circuits are liable to cause trouble, or at least subject the heating units to a severe test. The current in all cases should be closely regulated to coincide with the indicated voltage of the machine.

A little care in installing the apparatus will result in the saving of time and money in operating this type of apparatus.

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INDUSTRY ACTIVITIES

Mountain Electric Company, Denver, Colo., has prepared a mailing folder on the Dostal dropout for protection of lines for overhead crossings.

Wireless Improvement Company, 81 New Street, New York City, has prepared a bulletin on special condensers, and Dubilier mica condensers.

National Conduit & Cable Company, 41 Park Row, New York City, is distributing its latest issue of "Copper Gossip," which gives a review of present conditions in the copper markets.

Standard Underground Cable Company, Pittsburgh, Pa., has issued Bulletin No. 202-1, on "Colonial Copper Clad" wire. Methods of manufacture, specifications and comparisons with other kinds of wire are given.

Roller-Smith Company, 203 Broadway, New York City, has issued Bulletin No. 100, on electrical instruments for signal-system testing, which include direct and alternating-current portable volt-ammeters and direct-reading portable ohmmeters.

Duncan Electric Manufacturing Company, Lafayette, Ind., manufacturer of electric meters and transformers, which established a branch office at 608 Globe Building, Minneapolis, Minn., in January, has experienced a marked increase in sales of its products in that territory.

E. L. Goldschmidt and C. P. Lyman, for a number of years with the Waclark Wire Company, New York City, have resigned and formed a company under the name of Goldschmidt & Lyman, Inc., to conduct a brokerage business in raw metals and manufactured metal products at 90 West Street, New York. Mr. Goldschmidt will handle the raw metal end of the company's business, having had many years' experience in that field, and Mr. Lyman that having to do with manufactured metal products.

The Peerless Electric Company, Warren, O., has issued Bulletin No. 200, describing a new line of repulsion-induction single-phase motors designated as Type R. These motors are self-starting under full load, and upon attaining speed a governor mechanism operates to short-circuit the commutator and lift the brushes. The starting torque is 25 per cent in excess of full-load torque, and the starting current about 2.5 times full-load current, but this value may be reduced by using a starting resistance if desired. These motors are made in sizes from one-sixth to five horsepower, for frequencies from 25 to 133 cycles, and voltages from 90 to 500 volts. The efficiency and power factor are said to be high.

General Electric Company Annual Dinner at Boston.—Nearly 450 central station men, street-railway officials and isolated-plant operators were guests of the General Electric Company at its annual dinner at Boston, which was held at the Copley Plaza Hotel, March 27. Charles B. Davis, manager of the Boston office, presided and acted as toastmaster. The principal speaker was G. M. Dahl, vice-president of the Electric Bond & Share Company, New York City, who reviewed the world situation in connection with the European war and applied its lessons to American business conditions. He urged that business men should take a more active part in government, bringing to bear a strong influence toward making the management of affairs more efficient and economical. Taxation, he said, is one issue that demands careful study. E. W. Rice, Jr., president of the General Electric Company, made introductory remarks. A number of representatives of the Schenectady office were present.

Harvey Hubbell, Inc., Bridgeport, Conn., has issued, under date of March 15, catalog sheets giving trade discounts on Hubbell material in eastern and western territory.

Dayton Electrical Laboratories Company.—Addresses by a number of members of the "Delco Light" sales force, as well as by Messrs. Deeds, Kettering and Grant, officers of the company, enlivened a dinner attended by over 100 salesmen and sales agents on March 24. The new "Delco Light" was the principal subject of discussion, the gathering being calculated to start the selling campaign of the Domestic Engineer Company, which will manufacture the light.

The Economy Fuse & Manufacturing Company, Kinzie and Orleans Streets, Chicago, Ill., is distributing a circular, 18 by 24 inches, containing reproductions of hundreds of re-orders for Economy fuses. One side of the circular contains re-orders from miscellaneous users, showing the large number of important concerns using these fuses. The reverse side contains only reproductions of orders from the United States Navy Department and from the Carnegie Steel Company, practically the entire sheet being filled with these. In the center of the sheet are reproduced letters from various municipal inspection departments approving use of Economy fuses.

Nordberg Manufacturing Company, Milwaukee, Wis., has issued Bulletin No. 27A, on its high-compression, two-cycle oil engines. This engine is said to be one of the simplest oil engines on the market. It is of the two-cycle type, built in three sizes—a single-cylinder, 50-horsepower; a single-cylinder 100-horsepower, and a twin-cylinder, 200-horsepower, running at 300, 270 and 270 revolutions per minute respectively. The engine ignites on its own compression, therefore has no hot head, bulb, torch, or electric ignition devices. The injection of fuel is accomplished directly by a fuel pump driven by an eccentric. A single-piston valve on the cold end, which controls the scavenging air, is the only valve on the engine. The bulletin illustrates the engine by a number of photographs and detail drawings. Power and scavenging cards are also reproduced. Copies will be sent on application to the company.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has received, among the many orders for steel-mill equipment, three from new plants that illustrate clearly the growth of the steel industry in various parts of the country. Equipment sold to the Baltimore Sheet & Tin Plate Company consists of several large motors for main-roll drive; two 1,200-horsepower, 36 to 60-cycle, 2,200-volt, 244-revolutions-per-minute, wound-rotor induction motors, each motor to drive six hot mills, and one 750-horsepower, 36 to 60-cycle, 2,200-volt, 367-revolutions-per-minute, wound-rotor induction motor, geared to 12 standard cold rolls. The Chattanooga Steel Company has purchased equipment for a 34-inch blooming mill, consisting of an 8,000-horsepower motor and a flywheel motor-generator set, which acts as an equalizer. Equipment sold to the Llewellyn Iron Works for their new plant at Los Angeles, Cal., consists of two 800-horsepower, 36 to 50-cycle, 2,200-volt, 730 to 365-revolutions-per-minute, adjustable speed, wound-rotor induction motors, the first to drive a 22-inch billet mill, and the second to be geared to a 12-inch merchant mill, and one 250-horsepower, 585-revolutions-per-minute, 36 to 50-cycle, 2,200-volt, wound-rotor induction motor, to be geared to a 14-inch roughing mill.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless.—Benjamin Electric Manufacturing Company, 120-128 South Sangamon Street, Chicago, Ill.

Separable and non-separable or composition attachment plugs. Benjamin, 660 watts, 250 volts, catalog No. 919.

Listed February 28, 1916.

ATTACHMENT PLUGS, Fuseless.—R. S. Mueller, 423 High Avenue Southeast, Cleveland, O.

Non-separable attachment plug, consisting of single-piece porcelain body and Edison screw shell. Conductors soldered to screw shell and center contact. Attacho Plug. 660 watts, 250 volts, catalog No. 2.

Listed February 21, 1916.

CABINETS.—Metropolitan Electric Company, 324 First Avenue South, Seattle, Wash.

Cabinets shown by tests and examinations to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed February 9, 1916.

CARBONATOR, Electric.—The Rud. Mueller Manufacturing Company, 2129 Warner Avenue, Chicago, Ill.

Automatic electric carbonator, consisting of a motor-driven carbonator controlled by an automatic switch actuated by weight of water in tank. Motors are of enclosed type, rated 0.125-horsepower, 110 or 220 volts, alternating or direct current. Designed for use in carbonating water. "Unity."

Listed February 16, 1916.

CONDUIT BOXES.—M. B. Austin, 700 Jackson Blvd., Chicago, Ill., submittor.

Pressed steel conduit boxes, catalog Nos. 2, 4, 5, 7, 7-O, 7 R. B., 9, 9 Deep, 9-E, 9-0, 9-O Extra Deep, 10, 32, 32X, 33, 33X, 34, 34X, 35, 35X, 36, 36X, 37, 37X, 38, 38X, 40, 42, 44, 49-51, 300, 320.

Also above types with steel or porcelain covers or with porcelain bushings.

Listed February 10, 1916.

CONDUIT OUTLET PLATES.—John I. Paulding, New Bedford, Mass.

Cast-iron outlet plates for straight electric outlets. Catalog Nos. 031, 041.

Listed February 16, 1916.

CUTOUT BASES, Cartridge Fuse.—The New Haven Electric Manufacturing Company, North Haven, Conn.

600 amperes, 250 volts; 400 amperes, 500 volts.

Listed February 17, 1916.

INSULATING JOINTS.—E. O. McDowell, 154 Nassau Street, New York, N. Y. Manufacturer, Hemming Manufacturing Company, Garfield, N. J.

McDowell insulating joints.

Insulating joints, shown by tests and examination conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached.

Listed February 23, 1916.

INSULATING MATERIALS.—Formica Insulation Company, 3240-44 Spring Grove Avenue, Cincinnati, O.

A molded insulating material with high dielectric strength; not strictly non-combustible, although somewhat brittle, has moderate mechanical strength. Absorption of moisture is very small and affected little by oils. Suitable for use where a material molded in shapes or flat pieces is desired; in electrical appliances where it will not be exposed to high temperatures, and where a material having the properties indicated above is required for parts or bases of electrical appliances. Formica.

Standard for use as a substitute for hard fiber. This material is also judged suitable for use in small pieces as a support for current-carrying parts when properly enclosed or protected and where the use of strictly non-combustible material is not practical.

Listed February 21, 1916.

PHOTOGRAPHIC PRINTING MACHINE.—Ansco Company, Binghamton, N. Y.

Devices for printing photographs by incandescent lamps, consisting of cabinet with glass top and a hinged cover engaging with a standard door switch. Three sizes. 110 volts, 3.5 amperes or less.

Listed March 9, 1916.

RECEPTACLES, for Attachment Plugs.—Harvey Hubbell, Inc., Bridgeport, Conn.

Surface type, 10 amperes, 250 volts, catalog Nos. 5882-87, 5936-39, 6055-68; three-pole, catalog Nos. 6045-46, 6146; 20 amperes, 250 volts, three-pole, catalog No. 6055.

Flush type, 10 amperes, 250 volts, catalog No. 6257; three-pole, catalog Nos. 6049-50, 6148.

Chandelier type, 660 watts, 250 volts, catalog Nos. 5325, 5732, with porcelain cap; 5326, 5733, with composition cap; 5423, 5734, with brass-covered cap.

Adapters, 660 watts, 250 volts, combining Hubbell plug with Edison shell receptacles, catalog Nos. 5424, 5737, 5897, for use with receptacles rated at 20 amperes, 250 volts.

Angle receptacle adapters combining Hubbell plug with Edison shell receptacles, catalog Nos. 5516-17, 5613.

Motor attachment plugs, 10 amperes, 250 volts, catalog Nos. 5746-47, 6143.

Listed March 1, 1916.

RECEPTACLES, Standard.—Harvey Hubbell, Inc., Bridgeport, Conn.

Hubbell porcelain shell receptacles.

Keyless, 660 watts, 250 volts, catalog Nos. 4103, 9402, 28795, 50715.

Listed March 1, 1916.

SIGNS Electric.—Brilliant Manufacturing Company, 1035 Ridge Avenue, Philadelphia, Pa.

Electric signs shown by tests and examinations by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached.

Listed February 21, 1916.

SIGNS, Electric.—Brilliant Sign Company, 420 North Eighth Street, St. Louis, Mo.

Electric signs shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Board of Fire Underwriters have labels attached.

Listed February 25, 1916.

SOCKETS, Standard.—Harvey Hubbell, Inc., Bridgeport, Conn.

Hubbell porcelain shell sockets.

Key, 250 watts, 250 volts, catalog Nos. 3332-33, 3337, 3381, 3388.

Listed March 1, 1916.

SOCKETS, Weatherproof.—The Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, 660 watts, 250 volts.

Porcelain shell with aluminum casing, catalog Nos. 4106-07,

Listed March 1, 1916.

TRANSFORMERS.—The Jefferson Electric Manufacturing Company, 847 West Harrison Street, Chicago, Ill.

Bell-ringing transformer. Jefferson Junior. High-voltage, 110; low-voltage, 8.

Standard only for ringing bells or for similar signaling work when the primary wiring is installed in accordance with Class C of the National Electrical Code.

Listed February 21, 1916.

WIRES, Miscellaneous.—D. & W. Fuse Company, Providence, R. I.

Deltabeston stove wire.

Solid copper conductors of Nos. 14 to No. 6 B & S gauge, insulated by an unfilled felted asbestos over which is an outer braided asbestos.

Standard for use in wiring electric heaters, ranges, stoves, ovens and similar appliances.

Listed March 7, 1916.

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PERSONAL AND BIOGRAPHICAL

DR. M. I. PUPIN, professor at Columbia University, New York, was instrumental in arranging for a meeting held at Philadelphia on March 29 for the purpose of raising funds for the Serbian war suffers. Professor Pupin, who is well known for his inventions of the Pupin coil and other electrical devices, is the Serbian Consul General at New York and the only diplomatic representative of Serbia in the United States. Professor Pupin was born in Austria, in 1858, and came to this country in 1874. He attended school at Adelphia Academy. At the end of two years he was graduated with honors and was soon afterwards made the recipient of a scholarship at Columbia University, which institution he entered in 1879. Professor Pupin was next accorded a fellowship in Columbia and this enabled him to take a post-graduate course at Cambridge University, England, and at the University of Berlin, Germany. In 1889, Professor Pupin returned to Columbia and was appointed instructor of mathematical physics in the department of electrical engineering. His subsequent researches have been chiefly in the domain of electricity, particularly in the matter of electric-wave propagation. In February Professor Pupin was awarded the Hebert prize by the Academie des Sciences de l'Institut de France for his research work.

M. I. Pupin.

MR. L. EDWARD HERRMANN, Trenton, N. J., has been appointed counsel of the Board of Public Utility Commissioners by Governor Fielder, succeeding MR. FRANK H. SOMMER, resigned.

MR. H. M. BYLLESBY, president of H. M. Byllesby & Company, Chicago, was toastmaster at the annual banquet of the Illinois Gas Association, held at Hotel Sherman March 23. During the course of the evening Mr. Byllesby made an address upon the need for business rather than political regulation of utility companies.

MR. E. H. KIFER, who has been connected with the Madison (Wis.) Gas & Electric Company for the past ten years and as general superintendent for the past five years, has accepted the general managership of the Binghamton (N. Y.) Gas Company. The American Light & Traction Company controls both companies.

MR. GEORGE C. BOWEN, of the sales force of the Northwestern Electric Company, of Portland, Ore., has been promoted to the position of assistant sales manager, succeeding to the position made vacant through the resignation of MR. W. H. P. HILL. Previous to his employment by the Northwestern Electric Company, Mr. Bowen was employed by the Pacific States Electric Company and the Dedrick Electric Company.

MR. G. M. WELCH, who was recently promoted from the position of commercial superintendent of the Michigan State Telephone Company, Detroit, Mich., to the general managership, entered the telephone business ten years ago. Resigning a position as city salesman for the Eagle White Lead Company, Chicago, Ill., Mr. Welch entered the employ of the Northwestern Telephone Exchange Company, Minneapolis, Minn. After a short time he was made assistant to the general manager, continuing to act in that capacity till September, 1908, when he went to Detroit as division contract agent of the Michigan State Telephone Company. Following a short residence in Detroit, Mr. Welch was transferred to Chicago to assume the duties of commercial agent for Ohio, Indiana, Illinois, Wisconsin and Michigan, the states comprising what is known as the Central Group of Bell Companies. In 1912 he was again advanced, being returned to Detroit to become commercial superintendent of the Michigan State Telephone Company. Mr. Welch is extensively interested in the telephone business in Michigan, being a director of several telephone companies operating in the state. He took active charge of the Bell Company's business in Michigan March 5.

G. M. Welch.

MR. THEODORE N. VAIL, president of the American Telephone & Telegraph Company, and head of the entire Bell Telephone System in this country, was the principal speaker at the annual banquet of the National Geographical Society at Washington, D. C., on March 7. Some interesting reminiscences were recounted by Mr. Vail in his address which dealt mainly with the trials and tribulations of successfully establishing the telephone in this country. Mr. Vail said, "As general superintendent of the Railway Mail Service, I was brought into intimate personal contact with Mr. G. G. Hubbard, who was the chairman of a commission created by Congress to investigate and report upon the then aspects of the controversies over the compensation of railroads for transporting the mails. On the trips of the commission over the country, Mr. Hubbard carried with him a few telephones and without neglecting the work of the commission, he at every opportunity exhibited and explained this marvelous invention. We discussed the business, its possibilities and potentialities, and the policies which should underlie its development, so that my connection with the telephone may be said to date from its inception."

T. N. Vail.

OBITUARY.

MR. J. HENRY CARSON, who, as general manager of the Sterling-Meaker Company, was for many years interested in the manufacture of electric-railway supplies, died March 30, at his home in New York City, aged 52 years. Mr. Carson recently accepted the vice-presidency of the Pan-American Munitions Corporation, of New York.

MR. CHARLES WARREN BASSETT, who established the electrical-wire department of the old Washburn & Moon Company in Worcester, Mass., 25 years ago, died at his home in Boston, Mass., March 31, aged 73 years. Mr. Bassett was manager of that department, continuing after the concern was absorbed by the American Steel & Wire Company.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BIDDEFORD, ME.—Mayor J. H. Fenderson is considering a proposition to install an ornamental lighting system on Main Street.

CORNISH, ME.—The Cumberland County Power & Light Company, A. H. Ford, president, has begun work preparatory to the erection of a dam and generating station at Hiram Falls. The dam will be built about half way down the falls, which have a drop of 60 feet in a distance of 900 feet. The top of the dam will be about six feet above the level at the head of the falls, and a penstock will be run to the foot of the falls on the Baldwin side, where the power house will be erected. Machinery to generate 6,000 horsepower will be installed during the summer and provisions made for an ultimate capacity of 20,000 horsepower. The power developed will be used in Portland and intervening communities. The cost of the development is estimated at $500,000.

CONCORD, N. H.—East Concord is to be included in the street lighting district and electric lights will be installed on the principal streets.

MONTPELIER VT.—The Waterbury Light & Power Company, with its properties and franchises, is to be acquired by the Montpelier & Barre Light & Power Company, the latter to assume all outstanding obligations, including the first mortgage bonds amounting to $105,000. The Vermont Public Service Commission has approved the transfer. Charles H. Tenney & Company, Boston, Mass., are the managing engineers of the Montpelier & Barre Company.

BOSTON, MASS.—The Boston & Eastern Electric Railway Company has asked for an extension of three years' time in which to file their bond preliminary to building a railway between Boston and Lynn, Danvers and Beverly, Mass. It is stated that the company has already spent $250,000 in engineering and projecting the line, which will involve the expenditure of several millions of dollars.

MILFORD, MASS.—The power business of the Milford Electric Light & Power Company is rapidly increasing, and a new substation is being built to take care of the present and future demands.

NORTHAMPTON, MASS.—The Northampton Electric Light Company plans to install a new 2,000-kilowatt turbogenerator to meet the growing requirements of the city.

STOCKBRIDGE, MASS.—The Stockbridge Lighting Company is making preparations for an extension to its lines in West Stockbridge.

BRIDGEPORT, CONN.—Extensions of the white way on Main Street, which include 11 additional ornamental posts, are being planned by the Council.

CROMWELL, CONN.—The Connecticut Power Company has been granted permission by the Council to erect an electric power plant here. The company plans to build a steam generating plant here which will be connected with its plants at Falls Village and Middletown.

PLAINFIELD, CONN.—The Danielson & Plainfield Gas & Electric Company is planning to extend its lines to the villages of Attawaugan, Ballouville and Pineville, to furnish lighting and power service. Additional generating equipment probably will be installed in the Plainfield plant.

RICHMOND, MASS.—City officials are considering the application of the Pittsfield Electric Company for permission to extend its transmission lines to furnish power and light to this city.

BUFFALO, N. Y.—J. E. Mulroy and other residents of the South Side are making plans for improved lighting in that section of the city.

COHOES, N. Y.—An extension of the ornamental lighting system in the business district will probably be made in the near future. The Cohoes Electric Lighting Company is preparing to equip a number of knitting factories here with electric drive to replace hydraulic power.

DUNKIRK, N. Y.—The Niagara & Lake Erie Power Company, of Fredonia, has renewed its application to supply electrical energy in this city. City officials are adverse to granting any franchise affecting the value and future of the municipal plant, but the franchise will probably be granted in order to supply the needs of the Atlas Steel Company, which is seeking additional power facilities.

NORTHPORT, N. Y.—The Long Island Lighting Company is making improvements in its generating plant here. A reduction in lighting rates has been made and demands for more energy will necessitate extensions.

NYACK, N. Y.—The Rockland Light & Power Company, E. C. Peebles, manager, has received the approval of the Public Service Commission for an issue of $200,000 in capital stock. Extensions and improvements are planned.

OLEAN, N. Y.—The Public Service Commission has approved an issue of $126,000 in bonds and $33,000 in capital stock by the Olean Electric Light & Power Company. The proceeds will be used for extensions to the generating equipment and distribution system.

ST. MICHAELS, MD.—The Town Commissioners are planning to construct a municipal electric lighting plant.

ORANGE, VA.—H. O. Lyne is planning to install an electric-lighting plant here.

PETERSBURG, VA.—The tract occupied by Riverside Park is to be improved, and an ornamental lighting system and service mains will be installed.

DILLON, S. C.—The City Commissioners have completed plans for establishing 24-hour service for electric lighting and power.

SPARTANBURG, S. C.—The Interborough Power Company, of Spartanburg, with a capital stock of $100,000, has been commissioned by the secretary of state, with the following Spartanburg men as petitioners: A. M. Law, R. E. Boggs, C. R. Willard and W. G. Willard. The company was formed for the development of Hill's shoals on Tiger River, 16 miles south of Spartanburg, where there is said to be a possible development of 3,000 horsepower.

SUMMERTON, S. C.—The local electric lighting plant was destroyed by fire recently. Plans for rebuilding are being made.

TYBEE, GA.—The Central of Georgia Railway is planning to install an electric pumping plant here. Two 20,000-gallon water-storage tanks will be erected.

JACKSONVILLE, FLA.—The Liquid Carbonic Company will build a $50,000 plant here. A. E. McLean, Atlanta, Ga., is southern manager of the company.

NORTH CENTRAL STATES.

CANTON, O.—Two buildings, to cost about $50,000 each, will be constructed by the Canton Electric Company and allied companies in connection with contemplated expansion. One will be a garage with some shop equipment, and the other a substation with transforming equipment to handle the high-tension current from the American Gas & Power Company for use in the city.

CINCINNATI, O.—A considerable amount of electrical equipment will be required in the construction of the medical college building of the Cincinnati General Hospital, contract for which has been awarded to the Westlake Construction Company, of St. Louis, on its bid of $250,000. No power plant will be required.

CINCINNATI, O.—Stockholders of the Cincinnati Gas & Electric Company have formally voted their approval of the plans of the company, in connection with the Union Gas & Electric Company, to issue bonds and construct a power plant on the river front in Cincinnati, to serve this entire district. Bonds to the amount of $15,000,000 will be authorized, of which $4,500,000 will be issued at once to finance the power plant, and as soon as the approval of the Ohio Public Utilities Commission is secured ground will be broken for the building.

COLUMBUS, O.—The Northwest Ohio Light Company has acquired the Hicksville Electric Light, Heat & Power Company and several independent transmission lines connected with it, for use in its plan for the extension of electrical service to numerous small towns in that territory.

SPRINGFIELD, O.—The lighting and power system of the new Memorial Hall, to be built by the County Commissioners, will be installed by the Springfield Light, Heat & Power Company, which will also furnish service. The same company is negotiating with the Caldwell-Marshall company for similar contracts on the Hotel Shawnee.

SPRINGFIELD, O.—Electrical equipment for lighting, power and other purposes connected with the repair shop and general work of a large garage will be required by T. A. Graham in the construction of a building for Trout & Anderson here.

SOMERVILLE, O.—A franchise to furnish electric service here and a contract for lighting the village streets has been awarded to an outside company.

YOUNGSTOWN, O.—H. W. Jones, city lighting engineer, has prepared plans for lighting systems for Lincoln and South Side Parks. These will be considered by the Park Commissioners and may be installed this year.

ZOAR, O.—The Zoar Electric Company has been organized by John Bimeler and others with a capital of $10,000 for the purpose of furnishing electric service here.

COLUMBUS, IND.—A movement has been inaugurated by the East Columbus, Ind., social center to provide for an electric lighting system and other community improvements. The suburb has more than 2,000 residents.

COLUMBUS, IND.—The Columbus, Greensburg & Richmond Interurban Railway Company is being reorganized. It is planned to begin work in the near future. August M. Kuhn, 2014 North New Jersey Street, Indianapolis, Ind., is president of the company.

ELKHART, IND.—M. D. Franey, master mechanic of the New York Central shops here, states that work on the company's new power house will be started in a few weeks. Estimated cost of the plant is $20,000.

MADISON, IND.—The Public Service Commission of Indiana has granted the Madison Light & Railway Company permission to issue $13,000 in securities, proceeds of which will be used for improvements in its power plant.

BOYNE CITY, MICH.—The Boyne City Electric Company has recently completed the installation of a 75-kilowatt generator and auxiliary equipment.

ALBANY, ILL.—A stock company, of which Charles Peck is president, has been organized to establish an electric lighting system here.

DUPO, ILL.—The Dupo Electric Light & Power Company has been incorporated with a capital stock of $5,000, to furnish electric light and power here. The incorporators are: J. L. Burnett, L. J. Dyroff and W. A. Schwartztauber.

NORMAL, ILL.—Agitation for a municipal electric lighting plant in Normal has been started, and the movement may take definite form during the summer.

SHABBONA, ILL.—An electric lighting system will be installed here. Present indications are that the service will be secured from the Illinois Northern Utilities Company, which may buy the plant at Pawpaw and extend its transmission lines from Earlville to that city and then to Shabbona and Waterman.

DELAVAN, WIS.—The United Heat, Light & Power Company is planning to construct a transmission line around the north and south shores of Delavan Lake.

MADISON, WIS.—Merchants and residents on University and Gilman Avenues

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are circulating petitions calling upon the Council to extend the new ornamental lighting system to these thoroughfares.

MERRILL, WIS.—The Wisconsin Valley Electric Company's power line between this city and Wausau is rapidly nearing completion.

SHARON, WIS.—Damage to the extent of $10,000 was done to the municipal water, gas and electric plant by an explosion which occurred last week.

SPOONER, WIS.—G. S. Williams, consulting engineer, 134 South La Salle Street, Chicago, Ill., has been engaged to prepare plans for a hydroelectric development here.

COLOGNE, MINN.—An electric lighting and power plant will be installed here before May 1.

HARTLAND, MINN.—Bonds have been voted for the construction of a municipal electric lighting plant.

ST. PAUL, MINN.—J. P. Garvey, 1230 Thomas Street, is president of the West Thomas Street Improvement Association, which is planning a new electric lighting system.

CEDAR RAPIDS, IOWA.—The Iowa Railway & Light Company has begun the construction work on its new power house, to be built on North First Street.

FAIRFIELD, IOWA.—The City Council has passed an ordinance granting a 20-year franchise to the Fairfield Public Service Company, and it will be submitted to the voters of the city at the election April 10.

PERRY, IOWA.—The Iowa Railway & Light Company, owners of the local electric light and heating plant, have made definite announcements of plans for the construction of a new power plant, to be erected here during the coming summer, to cost about $100,000. Perry will be made the hub of the district, which includes the towns of Rippey, Grand Junction, Dana, Paton, Bouton, Woodward and Coon Rapids, and the power for those towns will be generated here and transmitted over high-tension lines. Other towns will be added to the list as soon as the plant is built. Work on the new plant will begin in a few weeks.

RANDOLPH, IOWA.—An election will be held April 10 for the purpose of voting $4,500 bonds to secure electric service here.

ROCK RAPIDS, IOWA.—About $25,000 will be expended for improvements to the electric-lighting system and waterworks.

WEBSTER CITY, IOWA.—The Fort Dodge, Des Moines & Southern Interurban Railway Company has purchased the Crooked Creek Railroad, and will electrify it and make connections with interurban railway at Fort Dodge.

MEMPHIS, MO.—Bonds in the sum of $25,000 have been voted for the purpose of constructing an electric lighting and power plant here.

ROCKVILLE, MO.—Plans are being discussed for establishment of an electric lighting plant.

ST. LOUIS, MO.—The Union Electric Light & Power Company has completed plans for the addition of five stories to its building at Twelfth and Loomis Streets, at a cost of $250,000. The building, when completed, will be ten stories, and will contain the general offices, sales, engineering, accounting and various other departments of the company. Arrangements are being made for flood-lighting the building.

ASSARIA, KANS.—The Assaria Light & Power Company has been organized with a capital of $3,000, to furnish electric service here.

BLAIR, KANS.—Ways and means are being considered by city officials for securing an electric lighting plant.

DIGHTON, KANS.—A combined electric lighting and water system may be installed here. W. B. Rollins & Company, Kansas City, Mo., are preparing the plans.

FORD, KANS.—The Midland Water, Light & Ice Company, of Dodge City, Kans., has received the first shipment of steel poles to be used in the construction of an electric line between Ford and Dodge City, and work on the new line is now under way.

GARDEN CITY, KANS.—It is reported that the electric lighting plant at Marsh, Kans., which was recently damaged by fire, will be taken over by the Garden City municipal plant. A transmission line will be erected to connect the two plants if present plans materialize.

LANGFORD, KANS.—The Council is planning ways and means to secure electric-lighting service here.

MEADE, KANS.—Improvements to the local electric lighting plant are now being made. These include additional generating equipment and a new building to house the same.

ROSSVILLE, KANS.—The R. B. Fegan Lighting Company, of Junction City, has secured a franchise to install an electric lighting plant here, and work on the installation will begin soon. The Fegan company will install systems this spring at Dwight, Riley and Harveyville.

WICHITA, KANS.—Bids will be received April 17 for the erection of a four-story telephone building for the Missouri & Kansas Telephone Company. L. F. Duggan is district commercial superintendent.

SCOTT CITY, KANS.—J. W. Lough, state irrigation commissioner of Kansas, has completed contracts for the installation of a $50,000 electric pumping plant to irrigate his 5,000-acre ranch near here. The material for the construction of the plant has been purchased, and the plant will be completed by June 1.

SCOTTS BLUFF, NEB.—The Intermountain Railway, Light & Power Company, of Colorado Springs, Colo., has completed negotiations for the purchase of the electric power plant here. The company owns the plants in Laramie, Wyo., Lamar and Los Animas, Colo., and Crawford and Holdridge, Neb. Among the transmission lines to be erected during the summer is one from Lamar to Wiley, Colo. E. C. Van Diest is president of the company.

SUPERIOR, NEB.—The electric lighting plant of the Southern Nebraska Power Company was entirely destroyed by fire recently.

SIOUX FALLS, S. D.—A petition is being circulated here calling for the issuance of $350,000 in bonds for the construction of a municipal electric lighting plant.

HAZELTON, N. D.—The local electric lighting plant is planning to make additions to its generating equipment.

MARMARTH, N. D.—W. R. McKenzie, proprietor of the Bowman Electric Light & Power Company, Bowman, N. D., will install an electric lighting plant at Marmarth this spring. A 25-year franchise has been secured.

DATES AHEAD.

American Society of Mechanical Engineers. Spring meeting, New Orleans, La., April 11-14. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York City.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis, May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

ASHLAND, KY.—Ashland business men have filed incorporation papers for the Ashland-Greenup Traction Line. It is proposed to build a trunk line railway between Ashland, Russell and Greenup, a distance of 11 miles. C. W. Means is interested in the project.

BEREA, KY.—Berea College has purchased two Westinghouse turbogenerators, switchboard and motors to change its entire equipment and power plant from direct to alternating current.

ELIZABETHTOWN, KY.—The Horse Cave (Ky.) Light & Ice Company has been incorporated with $25,000 capital, resulting from amalgamation of the Horse Cave Light Company, owned by J. P. Todd, of Elizabethtown, and the Horse Cave Ice Company. Besides Mr. Todd, the incorporators include C. F. Smith, A. Vial, L. Hawkins and W. C. Davis, all of Horse Cave.

MURRAY, KY.—On May 20 the question of issuing $20,000 electric lighting bonds will be submitted to vote.

BRISTOL, TENN.—The Davis Hosiery Mills Company, of Chattanooga, will build a plant at Bristol to cost about $200,000. It will be operated with electric drive. G. H. Miller is president of the company.

CHATTANOOGA, TENN.—A white way will be established on Ninth Street, from Chestnut to A Streets, and will be completed about May 1.

JACKSON, TENN.—The Illinois Central Railroad Company is making improvements to the amount of $200,000 here, including a power plant.

BIRMINGHAM, ALA.—With a capital of $5,000 the Birmingham Interurban Development Company filed articles of incorporation, the purposes of the company being to build an electric railroad from Birmingham to the Warrior River and Jasper, by way of Dora and Cordova. W. W. Shortridge is secretary.

BOONEVILLE, MISS.—J. K. Kaye, of Okolona, Miss., has purchased the local electric lighting plant and will make improvements.

GOODMAN, MISS.—The city will issue $5,000 in bonds to construct an electric lighting plant.

FORT SMITH, ARK.—The Fort Smith Light & Traction Company is planning extensive improvements to its generating equipment and lines, to be made during the coming summer.

GLENMORA, LA.—S. Farmbacher, of Baton Rouge, and P. Joseph and L. Levy, of White Castle, are to erect an electric lighting plant here at an estimated cost of $12,000.

VERDEN, OKLA.—The Town Board has granted a 25-year franchise to the Chickasha Gas & Electric Company, to furnish electric service here, subject to the approval of the voters. A ten-mile transmission line would be necessary for the purpose.

BIG SANDY, TEX.—The Big Sandy Electric Light Company has purchased land for a new power plant. Some of the machinery in the present plant will be used, but a number of improvements are being planned.

CUERO, TEX.—Plans are being made for an ornamental lighting system here.

DENTON, TEX.—The municipal ornamental lighting system here will be extended.

HOUSTON, TEX.—Plans for a white way on Texas Avenue are nearly completed. An agreement has been made with the Texas Lighting & Power Company whereby that company will install the ornamental lamps.

KENEDY, TEX.—The Kenedy Light & Power Company has been incorporated here with a capital stock of $10,000, for the purpose of building and operating an electric light and power plant by E. B. Fehrenkamp, M. A. Naecher and others.

KNOX CITY, TEX.—The Haskell (Tex.) Light & Ice Company is constructing a high-tension power line to Knox City, for the purpose of furnishing the town with light and power. The line will be 42 miles long.

SHINER, TEX.—The Council is considering plans for constructing an electric-lighting plant.

WESTERN STATES.

MILES CITY, MONT.—The Miles City Hospital will receive bids until April 15 for the construction of a hospital and power house and equipment of power house. Plans and specifications may be obtained at the Miles City Chamber of Commerce.

MAGDALENA, N. M.—The electric light and power plant of the Magdalena Electric Light Company has been purchased at receiver's sale by George Keith and Edward Wayne, of Socorro, N. M. The new owners will make improvements to the plant.

ORGAN, N. M.—Phelps, Dodge & Company, of New York, who recently purchased the Bennett-Stephenson and other mines in the Organ district for a total consideration of $1,500,000, plan to build an electric power plant and make a number of other improvements.

SALT LAKE CITY, UTAH.—The County Commission has voted to give the Utah Power & Light Company permission to extend its transmission lines from Midvale to the West Jordan district to supply power to

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the new sugar factory and light to the residents.

BOISE, IDAHO.—A movement is under way to organize a company to construct an electric railroad from Boise to Bruneau and Wickahoney.

HAILEY, IDAHO.—Several improvements, including gates, repairs to reservoir, etc., are to be made in the immediate future by the Hailey Electric Company.

MULLAM, IDAHO.—The Carney Copper Company is negotiating for electric power.

POCATELLO, IDAHO.—The Pocatello Traction & Interurban Company has been granted a franchise to construct a street railway.

WALLACE, IDAHO.—The Reindeer Queen Mining Company has recently reached an agreement with the Carney Copper & Carbonate Hill Mining Company whereby the Reindeer Queen will install a power plant and supply electric current to operate compressor plants, and other equipment of the three mining companies. The plant, it is understood, will be installed on Willow Creek, where the Reindeer Queen owns a water right.

ELLENSBURG, WASH.—The sale of the $100,000 electric light utility bond issue to the Sidney-Spitzer Company, of Toledo, O., has been ratified by the City Council.

OLYMPIA, WASH.—Ordinances have been filed cancelling three franchises for an electric lighting plant, electric lighting and steam heating given to Wilbur B. Foshay, Portland, Ore. The agreement to start work on the proposed plant was not fulfilled.

SEATTLE, WASH.—The installation of the necessary underground ducts for the underground system of wiring on Yesler Way from Western Avenue to Fifth Avenue has been completed by the city lighting department, and Superintendent Ross states the underground cable, transformers, and other necessary equipment will be placed underground in this section as soon as the materials are purchased.

SHELTON, WASH.—The plant of the Shelton Electric Company has been purchased by Charles A. Harmony, former city electrician of Centralia, Wash., who has changed the name of the plant to the Shelton Light & Power Company. The plant, at the present time, has a capacity of 150 horsepower, which, it is reported, will be increased.

SPOKANE, WASH.—Judge George Turner, president of the Constitution Mining & Milling Company, of Spokane, reports the company has under contemplation the construction of an electric smelter in Spokane for the treatment of zinc ores. Experts have estimated the cost of a plant capable of handling 100 tons per day at $425,000. The proposed plant would develop about 600 horsepower.

SUMPTER, ORE.—To insure continuous telephone service between Sumpter and Austin, 30 miles of telephone wire is to be strung between the towns, on the poles of the Pacific Telephone & Telegraph Company, by the United States Government.

WALDPORT, ORE.—L. H. Evans has been granted a franchise to operate an electric-lighting and power plant here.

EL CAJON, CAL.—The Board of Trustees has ratified the engineer's report submitted recently, containing plans and specifications of the proposed district to be assessed for the maintenance of an electric-lighting system, and has set the time for hearing protests in relation to the proposed improvement for April 10.

FRESNO, CAL.—The Fresno Interurban Railway Company is asking the Railroad Commission for authority to issue $150,000 bonds and $60,000 of stock to cover the cost of construction of a main line to the Centerville citrus district and to issue $150,000 certificates of indebtedness at 6 per cent.

MADERA, CAL.—The San Joaquin Light & Power Company is spending over $20,000 on extensions in the Raymond, Knowles and Coarse Gold districts of Madera County. Two new substations are being put in by the company, one at Knowles and the other at Coarse Gold. The Coarse Gold station is being put in for the operation of the mines, and will, it is expected, also serve the town in the near future. The Knowles station will serve the quarries, and a 10,000-volt line is being run to Raymond to serve the town, which has never had electric service.

MODESTO, CAL.—The County Supervisors have ordered the formation of the Hughson Lighting District.

OROVILLE, CAL.—The sale of the Oro Electric Corporation of this city to the Pacific Gas & Electric Company has been announced as a probability of the near future. The transfer of ownership is expected to be made within six weeks if the plans made by officials of both companies at a conference here are carried out.

REDDING, CAL.—The California-Oregon Power Company, operating in Shasta County, Cal., and Southern Oregon, has applied to the California Railroad Commission for authority to operate as a public utility under the franchise granted it by Trinity County in January, 1915. This franchise gave the company the right to run its lines through parts of Trinity County, and the transmission lines now extend as far as Castella, Shasta County, from which point it is desired to extend them through Carville to Trinity Center.

RIVERBANK, CAL.—Ways and means are being considered for a new electric-lighting system.

SAN FRANCISCO, CAL.—Soliciting subscriptions for the lighting of Market Street was begun in earnest the past week with the distribution of folders among the property owners and merchants along Market Street detailing the benefits that would accrue from the proposed system. Merchants are being asked to contribute $2 a foot toward the project.

TURLOCK, CAL.—Engineer Meikle has submitted to the Turlock Irrigation Board a preliminary estimate of the cost of producing power in the district for drainage purposes which totals $169,000.

VENTURA, CAL.—The City Trustees have appointed a committee to investigate the feasibility of municipal ownership of the local electric-lighting system.

WOODLAND, CAL.—J. W. Coons, local manager of the Pacific Gas & Electric Company, is co-operating with the City Board of Trustees in planning an improved lighting system here.

New Incorporations

HILLSBORO, ILL.—Saline Electric Company. Capital stock increased from $2,500 to $25,000.

CARSON CITY, NEV.—Static Electrical Company. Capital, $10,000,000. Incorporators: William Muller, P. E. and J. G. Ellis.

ST. LOUIS, MO.—Doxsee Electrical Company. Capital, $10,000. General electrical business. Incorporators: A. S. Doxsee and others.

PROVIDENCE, R. I.—Peerless Electric Company. Capital, $10,000. Electrical contracting and supplies. Incorporators: A. A. Drabble, E. W. Ham, Paul Fielden and O. F. Ham.

NEW YORK, N. Y.—Cadillac Electric Company. Capital, $5,000. Incorporators: J. D. Vance, G. J. Van Mater and A. Vance, all of 824 St. Nicholas Avenue, New York City.

BIRMINGHAM, ALA.—Alabama Transportation & Development Company. Capital, $2,000. Build and operate transportation lines. Incorporators: W. S. Bell, S. J. Erckert and others.

WORCESTER, MASS. — Star Electric Company. Capital, $10,000. Electrical manufacturing and contracting. Incorporators: A. A. Drabble, E. W. Ham, Paul Fielden and O. F. Ham.

NEW YORK, N. Y.—Whiteside & Company. Capital, $50,000. Electrical dental apparatus, dynamos, etc. Incorporators: R. W. Schuette, C. F. Novotny and A. A. Meschutt, 5 Nassau Street.

NEW YORK, N. Y.—Electric Directory Company. Capital, $75,000. Manufacture electric device known as "The Electric Directory" and other appliances. Incorporators: H. Straus, P. Heygel and M. C. Weller.

JERSEY CITY, N. J.—Electric Liquid Operator Company. Capital, $50,000. Manufacturing electric signs. Incorporators: A. E. Williams and John Blohm, of Jersey City, and C. H. Blohm, of Palisades Park, N. J.

NEW YORK, N. Y.—Bartlett-Yates Insulation Company. Capital, $10,000. Electrical supplies, insulating materials, etc. Incorporators: H. N. Bartlett and E. L. Bartlett, 312 Park Street, Westfield, N. J., and John S. Yates, 381 West End Avenue, New York City.

Financial Notes

March earnings of Boston Elevated will show an increase in gross of $3,000 per day or better than $90,000 for the month.

Columbia Railway, Gas & Electric Securities Corporation, series "B," convertible six-per-cent secured notes have been called for payment on April 1, at 101 and interest.

Kings County Electric Light & Power Company has certified to the Secretary of State at Albany, N. Y., that its capital stock has been increased from $14,000,000 to $16,500,000. This increase is to take care of the $2,500,000 of the company's bonds which became convertible on March 1.

Marconi Wireless Telegraph Company of America, in its annual report for year ending December 31, 1915, shows income from investment of surplus funds, $87,010.01; interest on stock subscription, $17,922.96; net profits for the year, $177,316.51, an increase of 18.3 per cent over 1914; surplus, $541,887.52, and reserve set aside against depreciation, $373,415.34.

American Public Utilities Company has sold to Philadelphia bankers $1,600,000 20-year secured bonds which are being offered at 98 and interest. The new bonds are secured by the deposit of common stocks of subsidiary companies and the authorized issue is $3,500,000, of which $900,000 are reserved to retire $900,000 six-per-cent notes maturing March 1, 1918, and $1,000,000 for future corporate requirements.

Alabama Power Company, a subsidiary of Alabama Traction, Light & Power Company, has sold to New York bankers $4,000,000 first mortgage, 30-year five-per-cent bonds due March 1, 1946. Proceeds of the bonds, which are the first sold under an authorized mortgage of $100,000,000, will be used to retire the $2,000,000 first mortgage three-year six-per-cent bonds due February 1, 1918, to retire two small issues of divisional bonds and for extensions, improvements and additions to the generating and transmission systems of the company. Earnings of the company for the 12 months ended February 29, 1916, were $1,029,768 gross, with $607,306 net.

Dividends.

	Term	Rate	Payable
Asso. Gas & Elec., pf.	Q	1.5 %	Apr. 15
Boston Sub. Elec., pf.	Q	$1	Apr. 15
Edison, Boston	Q	$3	May 1
New Eng. Pw., pf.	Q	1.5 %	Apr. 15
Niagara Falls Pw.	Q	$2	Apr. 15
No. States Pw., pf.	Q	1.75%	Apr. 15
Ottumwa Ry. & St., pf.	Q	1.75%	Apr. 15
Pac. Gas & Elec., com.	Q	1.25%	Apr. 15
Pub. Serv., No. Ill., com.	Q	1.5 %	May 1
Pub. Serv., No. Ill., pf.	Q	1.5 %	May 1
Puget Sound Trac., Lt. & Pw., pf.	Q	.75%	Apr. 15
West. States Gas & Elec., pf.	Q	1.75%	Apr. 15

Reports of Earnings.

CAROLINA POWER & LIGHT.

Carolina Power & Light Company, together with its subsidiaries, Yadkin River Power Company and Asheville Power &

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Apr. 3	Mar. 27
American Tel. & Tel. (New York)	127	130¼
Commonwealth Edison (Chicago)	146	146
Edison Electric Illuminating (Boston)	243½	246½
Electric Storage Battery common (Philadelphia)	61½	61⅞
Electric Storage Battery preferred (Philadelphia)	61½	61⅞
General Electric (New York)	166	167
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	7	8
Massachusetts Electric preferred (Boston)	35½	35½
National Carbon common (Chicago)	180	—
National Carbon preferred (Chicago)	122	—
New England Telephone (Boston)	136	137½
Philadelphia Electric (Philadelphia)	—	27⅝
Postal Telegraph and Cables common (New York)	78¼	78
Postal Telegraph and Cables preferred (New York)	68	67½
Western Union (New York)	91	89½
Westinghouse common (New York)	65	65¾
Westinghouse preferred (New York)	74	75

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Light Company, reports as follows for the fiscal year ended December 31, 1915:

	1915	1914
Gross earnings	$1,363,693	$1,284,985
Expenses and taxes	673,731	673,589
Net earnings	689,962	611,396
Interest on bonds	361,300	345,958
Other interest and disbursements	51,215	46,590
Surplus	277,447	218,848
Preferred dividends	91,591	86,384
Balance	185,856	132,464

AMERICAN POWER & LIGHT.
(Combined earnings of subsidiary companies.)

	1916	1915
February gross	$ 691,989	$ 620,957
Net after taxes	327,018	283,410
Six months' gross	3,998,367	3,804,794
Net after taxes	1,941,961	1,840,554
Twelve months' gross	7,450,235	7,093,449
Net after taxes	3,522,716	3,329,770

KEYSTONE TELEPHONE.

	1916	1915
February gross	$117,725	$108,719
Net	59,183	54,461
Surplus	31,730	28,125
Two months' gross	234,834	218,606
Net	117,894	109,400
Surplus	69,288	62,976

CUMBERLAND TELEPHONE & TELEGRAPH.

The Cumberland Telephone & Telegraph Company reports for the year ended December 31, 1915, compared as follows:

	1915	1914
Operating revenue	$7,886,374	$8,048,552
Expenses and taxes	5,833,647	6,247,817
Operating income	2,046,727	1,800,735
Other income	133,940	153,697
Total income	2,180,667	1,954,432
Charges	1,300,089	1,269,230
Surplus	880,578	685,202
Dividends	664,809	664,809
Surplus	215,769	20,393
Miscellaneous deductions	102,096	150,777
Surplus	113,673	*130,384

*Deficit.

PACIFIC LIGHT & POWER.

Pacific Light & Power Company reports income account for fiscal year ended December 31, 1915:

	1915.	1914.
Gross earnings	$3,049,745	$2,825,263
Expenses and taxes	983,385	1,027,175
Net earnings	2,066,360	1,798,078
Interest funded debt	1,095,074	965,992
Interest on floating debt	201,175	292,964
Amortization	61,525	49,524
Surplus	708,586	489,868

Improvement in revenue, the annual report says, was largely attributable to the efforts of the new business department as shown by a gain of 22.41 per cent in commercial light earnings over the preceding year. Further economies in operating expenses were effected, of which about $75,000 was due to operation of the Big Creek hydroelectric development.

AMERICAN GAS & ELECTRIC.

American Gas & Electric Company, for the year ended December 31, 1915, reported the following income account:

	1915.	1914.
Gross of subsidiaries	$5,006,020	$4,368,883
Balance subsidiary earn. accruing to American Gas & Electric after deductions	1,307,942	1,016,919
Other income	452,829	113,920
Total income	1,760,771	1,130,839
Int. and other charges	708,657	335,636
Preferred dividends	101,283	100,884
Surplus	*950,831	694,319

*Equivalent to 25.6 per cent on the common stock, as compared with 19 per cent in 1914.

ILLINOIS NORTHERN UTILITIES.

Illinois Northern Utilities Company reports income account for the fiscal year ended December 31, 1915:

	1915.	1914.
Gross earnings	$882,554	$886,882
Expenses and taxes	500,413	547,575
Net earnings	382,142	339,307
Interest charges	216,954	176,154
Preferred dividends	108,480	108,480
Surplus	56,707	54,673
Previous surplus	116,598	
Common dividends, 1915	46,350	
Power and light surplus December 31, 1915	126,956	

Causes of decreased earnings for 1915 were depressed business conditions, unfavorable crop conditions in the territory served, and the quarantine for the foot-and-mouth disease in cattle. In the year 1,200 new customers were added and four street-lighting contracts secured. Additions of 14 miles to the transmission lines and 1.5 miles to the street railways were made. The outlook for 1916 is stated to be most promising.

AMERICAN CITIES COMPANY.

The American Cities Company has issued its report for the year ended December 31, 1915. The combined income account compares as follows:

	1915.	1914.
Gross earnings	$14,203,898	$14,822,105
Expenses and taxes	9,171,021	9,133,582
Net	5,032,877	5,688,523
Interest, etc	3,651,442	3,480,973
Surplus	1,381,435	2,207,550

The income account of the American Cities Company, proper, for the year ended December 31, 1915, compares as follows:

	1915.	1914.
Total income	$1,405,089	$1,928,677
Expenses, taxes, etc	227,259	94,868
Net	1,177,830	1,833,808
Interest	500,000	500,000
Surplus	677,830	1,333,808
Preferred dividends	616,605	1,233,210
Surplus	61,225	100,598
Previous surplus	291,465	194,994
Miscellaneous deductions	.....	4,127
Total surplus	352,690	291,465

WESTERN STATES GAS & ELECTRIC COMPANY.

An increase of 8.2 per cent is shown in the net earnings for the year ended February 29, 1916, as compared with the corresponding period of the previous year, while the increase in gross for the twelve months was 5.7 per cent. Comparative figures are reported as follows:

	1916.	1915.
Gross earnings	$1,198,253	$1,134,114
Net earnings	581,589	537,095

CANADIAN WESTINGHOUSE.

The Canadian Westinghouse Company, Ltd., reports for the year ending December 31, 1915, compared as follows:

	1915	1914
Net earnings	$ 860,628	$ 386,111
Interest	.....	5,626
Balance	860,628	380,488
Dividends	449,343	349,489
Surplus	411,285	31,000
Previous surplus	1,562,490	1,531,491
Total surplus	1,973,775	1,562,490
Written off property and plant	150,000	.....
Profit and loss surplus	1,823,775	1,562,490

PUBLIC SERVICE CORPORATION.

The Public Service Corporation of New Jersey and affiliated companies report for the year ended December 31, 1915, compared as follows:

	1915	1914
Gross revenue	$41,242,110	$38,760,260
Expenses, taxes and amortization	22,094,678	21,196,317
Net revenue	19,147,432	17,563,943
Charges, etc	17,176,180	15,938,606
Surplus	* 1,971,252	1,625,337

*Equal to 7.88 per cent earned on $25,000,000 capital stock against 6.5 per cent earned on same stock previous year.

Proposals

ELECTRIC LIGHTING AND POWER SYSTEM.—Bids will be received until 10 a. m., April 18, for the erection complete of a waterworks and electric lighting and power system at Lake Norden, S. D. Address R. C. Byrde.

WIRE AND CABLE.—Sealed proposals will be received by the South Park Commissioners, Fifty-seventh Street and Cottage Grove Avenue, Chicago, Ill., until April 12, for lead-covered cable and rubber-covered wire, to be used in connection with the lighting of Grant Park. J. F. Neil, secretary of the South Park Commissioners.

MOTORS.—Sealed proposals will be received April 11 at room 406, City Hall, Chicago, Ill., for furnishing and delivering to the Marshall Boulevard Municipal Plant, West Thirty-first Street and South Sacramento Avenue, 13 direct-current, shunt-wound, 230-volt motors, and one direct-current, compound-wound, 115-volt motor, according to plans and specifications on file in the office of the Department of Public Works. W. R. Moorhouse, Commissioner of Public Works.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9476, Philadelphia, Pa., 14 remote-control starting appliances; Boston, Mass., one motor-generator set; Brooklyn, N. Y., two motor-generator sets. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

New Publications

RAILROAD ELECTRIFICATION.—The Chicago, Milwaukee & St. Paul Railway has issued an attractive pamphlet entitled "The Dawn of the Electrical Era in Railroading." This gives an illustrated description in popular style of the electrification of the mountain district of this railroad between Harlowton, Mont., and Avery, Idaho.

ELECTRIC RAILWAYS. — Technologic Paper No. 62 of the Bureau of Standards, Washington, D. C., is entitled "Modern Practice in the Construction and Maintenance of Rail Joints and Bonds in Electric Railways" by E. R. Shepard. Data have been collected from a large number of operating companies and analyzed, and some experimental tests are given. No. 63 is entitled "Leakage of Currents from Electric Railways" by Burton McCollum and K. H. Logan. This subject is discussed mathematically and the resulting equations interpreted.

PHOTOMETRY AND LIFE TESTING.—The Bureau of Standards, Washington, D. C., has issued several scientific papers dealing with these subjects. No. 264 is entitled "Photometry of the Gas-Filled Lamp" by G. W. Middlekauff and J. F. Skogland. This tells of the special problems involved in handling this type of lamp. No. 265 deals with "Life Testing of Incandescent Lamps" and describes the methods and equipment used at the Bureau. No. 263 gives a formula for calculating the illumination at any point received from a radiating disk. The author is Paul D. Foote. No. 261 is entitled "Studies of Instruments for Measuring Radiant Energy in Absolute Value," by W. W. Coblentz and W. D. Emerson.

Electrical Patents Issued March 28, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,176,739. Junction-Box. C. W. Davis, assignor to Standard Underground Cable Co., Pittsburgh, Pa. For multiple-conductor cables.

1,176,759. Telephone-Key. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Combination of plungers and rocking-lever operating sets of contacts.

1,176,762. Electric Spot-Welding Apparatus. L. S. Lachman, New York, N. Y. Transformer arrangement.

1,176,767. Trolley-Operated Contact. J. F. McElroy, Albany, N. Y., assignor to Consolidated Car-Heating Co. Mounted on wire suspension and operated by upward pressure of passing trolley.

1,176,794. Ignition Device. H. W. Uhl, Freeport, N. Y. Interrupter structure.

1,176,801. Insulator. W. H. Williams, Carey, O. Cleat.

1,176,805. Magneto Machine. H. H. Wixon, assignor to Stromberg Motor Devices Co., Chicago, Ill. Movable inductor, with stationary armature winding which can be easily removed.

1,176,809. Automatic Fire-Alarm. H. Barton and F. Barton, Endicott, N. Y. Circuit controlled by tilting mercury contactor normally restrained by combustible cord.

1,176,814. Electric Heater. F. O. Bul-

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lis, assignor to Lektric Sales Co., Louisville, Ky. Special casing and support.

1,176,824. Telegraphic Typewriting System. P. Etienne, St. Imier, Switzerland, assignor of one-half to B. Burchardt, Berlin, Germany, and one-tenth to F. Aldendorff, Schmargendorf, Germany. Operated by current impulses.

1,176,829. Motor-Controller. C. T. Henderson, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Combination of master and reversing switches with power-operated main switch.

1,176,900. Sanitary Telephone Mouthpiece. E. M. Jenkins, Italy, Tex. Specially adapted for treating with disinfecting fluid.

1,176,908. Safety Cranking-Device for Engines. G. A. Kuntz, Des Moines, Iowa. Prevents connection of crank when spark advanced.

1,176,919. Timekeeper Device. D. Nemeth, New York, N. Y. Clock sound and buzzer recorder by phonograph.

1,176,925. Apparatus for Radio Communication. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., Boston, Mass. Receiver testing apparatus.

1,176,927. Pin for Electrical Work. M. C. Rosenfeld, Cleveland, O. For supporting insulators, etc.

1,176,941. Automatic Switch. W. L. Bliss, assignor to The United States Light & Heat Corp., Niagara Falls, N. Y. Electromagnetically operated.

1,176,942. Electrical Terminal Connection. W. L. Bliss, assignor to The United States Light & Heat Corp. For batteries.

1,176,943. Automobile Tail-Signal Switch. F. Bollinger, Akron, O. For controlling pair of tail-lights.

1,176,944. Electrical Switching Apparatus. E. W. Brackett, assignor to The Garford Mfg. Co., Elyria, O. Telephone key.

1,176,960. Time-Stamp Construction and System of Operation for the Same. C. I Hall, assignor to Minerallac Electric Co., Chicago, Ill. Electric time-recorder, comprising a constant-speed motor.

1,176,970. Secondary Battery. J. O. Luthy, San Antonio, Tex. Dry battery has paste of plaster-of-paris and sulfuric acid as electrolyte.

1,176,984. Electric Switch. A. C. Philpott, Bucyrus, O. Details of electromagnetic switch.

1,177,016. Switch. H. W. Cheney, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Oil switch.

1,177,043. Ignition Apparatus. W. B. McLaughlin, Brooklyn, N. Y. Structure of spark plug.

1,177,044. Multiple-Brush Switch. J. L. McQuarrie, assignor to Western Electric Co. For telephone exchange.

1,177,047. Machine for Transmitting Sound Over Long Distances. W. Opel, Leipzig, Germany. Special heat-insulated microphone.

1,177,076. Lamp. W. H. White, Kenosha, Wis. Special enclosing structure for incandescent lamp.

1,177,081. Railway-Signal Apparatus. J. H. Alandar, Chicago, Ill. Vehicle signals operated by track devices.

1,177,082. Electrical Cooking Utensil. A. B. Antisell, assignor to H. B. Gibson Co., New York, N. Y. Has heat-insulating vacuum chamber. (See cut.)

1,177,119. Composition of Matter and Process of Making the Same. A. J. Liebmann, New York, N. Y. Electric contact containing powdered tungsten.

1,177,139. Perforator for Master Sheets. L. R. Roberts, assignor to Underwood Typewriter Co., New York, N. Y. Electromagnetically operated.

1,177,180. Grounding Device. W. R. Garton, Brooklyn, N. Y. For lightning rods, etc.

1,177,211. Combination Level and Flash-Light. T. W. Ridpath, Kansas City, Mo. Special arrangement of battery, lamp, etc.

1,177,227. Stop Mechanism for Phonographs. F. S. Boerries, Paris, France. Disk controls motor circuit.

1,177,229. Time Switch. C. E. Campbell, Lynn, Mass. Clock-controlled.

1,177,239. Attachment for Pull Electric-Lamp Sockets. T. W. Fitzgerald, Boston, Mass. Guide for chain extends from socket.

1,177,241. Searchlight for an Umbrella or Cane Handle. S. S. Gay, Sedro Woolley, Wash. Arrangement of lamp, switch, etc.

1,177,253. Electric Heating Device. J. Lawrence, assignor to S. G. Ranger, New York, N. Y. Structure of stove top.

1,177,254. Electric Heater. J. Lawrence, assignor to S. G. Ranger, New York, N. Y. Special structure of heating unit.

1,177,260. Apparatus for Electric Welding. T. E. Murray, New York, N. Y. Resistance type, having roller electrode.

1,177,271. Telegraph System. P. M. Rainey, assignor to Western Electric Co., New York, N. Y. Automatic call-distributing system at central office.

1,177,279. Time Switch. F. Smid, Jr., Philadelphia, Pa. Clock-controlled.

1,177,280. Automobile Torpedo. B. H. Scott, Mishawaka, Ind. Exploded by electric arc.

1,177,286. Telephone-Pad Attachment. C. B. Starbird, New York, N. Y. For securing pad to desk set.

1,177,307. Switchboard Connecting-Cord and the Like. P. P. Craven, Charlton-on-Medlock, Manchester, England. Connection of plug to cord.

1,177,310. Fuse Box. H. F. Fisher, Columbus, O. For high-tension conductors.

1,177,312. Spark-Coil Vibrator. M. Fulton, assignor to Jefferson Electric Mfg. Co., Chicago, Ill. Details of vibrator and contacts.

1,177,315. Insulator. W. G. Gee, Kansas City, Mo., assignor of one-half to W. A. Snapp, Dunlap, Mo. Pin type.

1,177,319. Electric-Lamp Socket. G. W. Goodridge, and G. B. Thomas, assignors to The Bryant Electric Co., Bridgeport, Conn. Special with one-piece metallic casing.

1,177,324. Refracting and Diffusing Container for Incandescent Lights. P. C. Hewitt, Ringwood Manor, N. J. Structure of bulb.

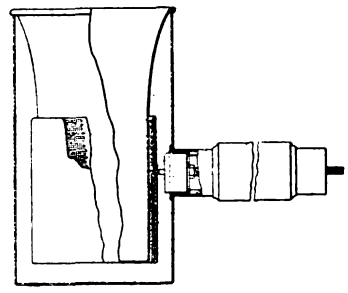
1,177,325. Refracting Container for Illuminating Means. P. C. Hewitt, Ringwood Manor, N. J. Modification of above.

1,177,326. Method of Making Refracting and Diffusing Containers for Incandescent Lights. P. C. Hewitt, Ringwood Manor, N. J. Related to above.

1,177,328. Electric Storage Battery. H. H. Hirsch, Philadelphia, Pa. Details of construction.

1,177,334. Protective Device. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Transformer disconnecting arrangement.

1,177,335. Electrolytic Lightning Arrester. R. P. Jackson, assignor to Westinghouse Elec. & Mfg. Co. Comprises two electrolytic cells connected in different relations.



No. 1,177,082.—Electric Cooking Utensil.

1,177,336. Lightning Arrester. R. P. Jackson, assignor to Westinghouse Elec. & Mfg. Co. Horn-gap device.

1,177,346. Coil Terminal. J. E. Mateer, assignor to Westinghouse Electric & Mfg. Co. Details of single-piece device.

1,177,349. Induction Regulator. C. B. Mills, assignor to Westinghouse Elec. & Mfg. Co. Motor arrangements for adjusting regulating member.

1,177,354. Line Insulator. D. P. Ronsom, Woodstock, Vt. Suspension type.

1,177,370. Electrical System for Autovehicles. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Combination of lighting and ignition generators.

1,177,377. Railway Signaling. J. P. Buchanan, Cleveland, O., assignor of one-half to F. B. Wiegand, Cleveland, O. Relay arrangement for block system.

1,177,392. Sheathed Wire Terminal. J. T. H. Dempster, assignor to General Electric Co., Schenectady, N. Y. Terminal for insulated armored wire.

1,177,400. Support for Electric Wires. R. B. Duran, Torreon, Mex. Trolley-wire suspension.

1,177,416. Electromagnetically Controlled Mercury Vapor Lamp and the Like. J. Jonas, assignor to Aktiengesellschaft Brown Boveri & Cie Baden, Switzerland. Arc manipulated by magnetism.

1,177,420. Signaling Horn. J. A. Lannert and E. L. Lannert, East Cleveland, O. Diaphragm operated by electromagnet.

1,177,421 and 1,177,422. Electric Towing-Locomotive. C. W. Larson, assignor to General Electric Co., Schenectady, N. Y. First patent: Frame structure, gearing, etc. Second patent: modification.

1,177,427. Electromagnetic Switch. R. H. McLain, assignor to General Electric Co. For alternating-current circuits.

1,177,444. Electric Meter. W. H. Pratt, assignor to General Electric Co. Structure of damping magnet.

1,177,447. Lamp. G. Richards, Downsville, Wis. Magnetically operated flame extinguisher for oil lamp.

1,177,448. Fraud-Preventing Device. J. H. Rosko, Johnstown, Pa. Handcuffs grip operator when alarm box is used.

1,177,455. Telephone. H. Thompson, Baillieboro, South Monaghan, Ontario, Canada. Has signal auxiliary to ringer.

1,177,485. Telephone Signal. DeForrest Champeon, Houlton, Me. Audible signal near transmitter controlled by receiver arm.

1,177,496. Ignition System for Hydrocarbon Engines. L. Davis, Rich Hill, Mo., assignor of one-half to I. L. Wierick, Rich Hill, Mo. Details of timer, coil, etc.

1,177,517. Trolley Mounting. G. E. Henry, Vincennes, Ind. Harp structure.

1,177,530. Motor-Vehicle Signal. B. A. Melvin, Sacramento, Cal. Lamp mounted on signal blade.

1,177,547. Storage Battery. A. H. Snyder and R. L. Buck, assignors to Gould Storage Battery Co., New York, N. Y. Structure of jar cover.

1,177,548. Rectifier. J. E. Southwick, Atlantic, Iowa. Centrifugally controlled commutating arrangement.

1,177,551. Electric Railway System. J. B. Strauss, Chicago, Ill. Surface contact system.

Reissue 14,096. Automatic Trunking System. E. A. Mellinger, assignor to Automatic Electric Co., Chicago, Ill. Original No. 1,110,071, dated Sept. 8, 1914. For telephone exchanges.

PATENTS EXPIRED.

The following United States electrical patents expired on April 4, 1916:

622,207. Driving Mechanism. H. B. Collins, Fulton, N. Y.

622,210. Apparatus for Illustrating Phenomena of Thunder and Lightning. W. Dodd and A. D. Struthers, Des Moines, Iowa.

622,214. Trolley Wheel. S. W. Fletcher, Lowell Mass.

622,225. Water Guard for Trolley Ropes of Poles. T. Hawken, Rockand, Me.

622,230. Controlling Switch for Electric Motors. R. Hutchinson, Mobile, Ala.

622,268. Telephone Switchboard System and Annunciator. G. B. Rodgers, Knoxville, Tenn.

622,328. Magneto Ear-Phone. F. H. Collins, Everett, Mass.

622,355. Electric Elevator. T. W. Heermans, Evanston, and N. Whichello, Chicago, Ill.

622,369. Controlling Switch for Electric Motors. R. Hutchinson, Mobile, Ala.

622,392. Method of and Means for Operating Electric Motors. C. J. Reed, Philadelphia, Pa.

622,298. Electric Steering Apparatus for Vessels. G. Sautter, Paris, France.

622,412. Telephone Cabinet and Support. P. W. Bossart, Marietta, Pa.

622,413. Granular Electrode and Process of Treating Same. P. W. Bossart, Marietta, Pa.

622,430. Electric Elevator. T. W. Heermans, Evanston, and N. Whichello.

622,450. Insulating Material. J. DeLong, New York, N. Y.

622,452. Magneto-Electric Motor-Dynamo. F. H. Donaldson, Garvanza, Cal.

622,466. Electric Railway or Tramway. J. J. Geilmann, Paris, France.

622,472. Typewriting Machine. W. T. Hoofnagle, Baltimore, Md.

622,481. Means for Securing Electrical Unity of Systems of Metallic Pines or Mains. D. C. Jackson, Madison, Wis.

622,596. Apparatus for Holding and Connecting Guard Wires of Electric Cables or Other Wires. R. Bostock and F. A. Cheetham, Brighouse, England.

622,606. Contact for Controllers. G. H. Condict, New York, N. Y.

622,607. Electrical Advertising Machine. H. W. Cox, Nottingham, England.

622,609. Carbon Brushholder. R. E. Crockett, Michigan City, Ind.

622,618. System for Overhead Electric Wires. W. Glasgow, Chicago, Ill.

622,627. Resistance and Contact Apparatus for Electric Currents. H. Lyon, Glasgow, Scotland.

622,628. Resistance and Contact Apparatus for Electric Currents. H. Lyon.

622,629. Multiple Telegraph. E. J. P. Mercadier and H. R. J. Periquin, Paris, France.

622,636. System of Multiplex Telegraphy. H. A. Rowland, Baltimore, Md.

622,639. Electric Meter. G. A. Scheeffer, Peoria, Ill.

622,645. Electroharmonic Signaling Apparatus for Telephone Systems. F. H. Brown, Chicago, Ill.

622,646. Electric Signaling Apparatus for Telephone Systems. F. H. Brown.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, APRIL 15, 1916. No. 16.

EDITORIALS

CREDIT.

In any business the question of granting credit is an important one, and the electrical jobber or supply house is no exception. Modern business is done largely upon a credit basis, and to attempt to eliminate this feature of trading is to at once bar out a large block of possible business. The real question is to so control and limit the extension of credits as to exclude those accounts which will result in ultimate loss without turning away reliable and responsible customers whose business would represent a profit.

The article by Mr. W. B. Parker on another page of this issue, emphasizes the proper basis for consideration of credit accounts. The two important elements are honesty and ability to pay. If either is lacking the account may end with a loss. Many an electrical contractor starts out with the best intentions in the world, but through ignorance of costs or unforeseen contingencies fails to accumulate the expected profits and winds up some large contract (or fails to complete it) with no cash left after paying his men, but with a large bill for material staring him in the face. Perhaps the contract was taken at less than cost, the bid being figured with the idea of cutting under the other fellow.

Much of the bidding under cost by inexperienced contractors has been blamed upon the jobbers who supply such disturbers with the wherewithal to do the work. If such a one risks his own capital and goes to the wall, he is the principal sufferer. But where such business is done on credit, the loss must be borne by the industry. In addition to this, every contract taken at less than cost helps to demoralize prices. There is reason, then, in the claim that the jobber should not extend credit without thorough investigation as to the reliability of a customer, as the indiscriminate financing of inexperienced contractors is likely to result in loss to all concerned. Careful scrutiny of all credit accounts, before rather than after the credit is extended, should be the rule in any business.

The only way to avoid the gambling on contracts referred to above is to have definite information as to costs. The cost of material is easily obtainable. Labor and overhead costs can only be determined with certainty from actual records of work performed. Every contractor should keep such records and should analyze them at intervals to see whether his costs are changing. The jobber is justified in refusing credit to any contractor who does not keep cost records, for such a one is taking risks which are likely to end disastrously to both himself and his creditors.

FUSE ABUSES.

If a doubt exists in the mind of any one as to the danger involved in overfusing or in replacing fuse elements by other conductors, it should be dispelled by a contemplation of the report of a fire which occurred on the premises of the Toronto Wood Specialty Company, in Toronto, about six weeks ago. According to the fire marshal, this fire was due to the substitution for the proper fuses of other fuses bridged with copper wire and hence too large in capacity for the circuit to be protected.

The object of the fuse is to protect circuits from overloading, which means overheating. Its general employment has attached a sense of security to the use of electric service. When a fuse is improperly replaced, this protection is removed, without, perhaps, the knowledge of those using electrical devices connected to the circuit. Reliance may still be placed upon the automatic prevention of the delivery of too much power for safety, but the sense of security has now become a false one. Through carelessness, ignorance or accident, a dangerous amount of power may be concentrated at a point where it cannot be controlled, with resulting injury to persons and property.

Overfusing a circuit is exactly analogous to setting the safety valve of a steam boiler for a higher pressure, and replacing the fuse with copper wire or its equivalent is analogous to tying the valve down. In both cases the protection, which is depended upon to prevent disaster, is removed. The practice is indefensible. One might expect to find it confined to the ignorant, the mischievous and the criminal. But this is not the case. It is usually those who are familiar with matters electrical who are responsible for instances of this kind. They find the protection works inconvenience at times, so they do away with it altogether, and take a chance that something disastrous will happen. The chance is usually a small one, and after several chances have been taken without serious result, the growth of a habit has been started. The seriousness of the resulting condition is realized only by those who come in contact with the resulting disasters.

Perhaps one thing which has encouraged the growth of this practice has been the custom of fusing circuits for a smaller current than the actual carrying capacity. For instance, circuits capable of carrying 15 amperes may have been supplied with six-ampere fuses because it was expected that the connected load would not be greater than this. When an appliance of greater capacity was attached to the circuit, and the fuse was blown,

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a larger fuse, of say 10 amperes, was used to replace it. Again, one carrying 12 or 15 amperes has been used, the person making the replacement knowing that the circuit was not being overloaded. To others, however, his example may convey the message: Whenever a fuse blows, put in a larger one. And this is where mischief begins. Possibly it would have been better to fuse initially for the capacity of the circuit, and let it be understood that the limit was already reached. But it is too late to start such a practice now. The only hope of reform is in spreading a better realization of the value and proper use of fuses and the dangers arising from their abuse.

The fire referred to above may lead to legislation aimed at correcting this bad practice in that particular locality, and perhaps it would aid inspectors and others interested in safety if overfusing were universally made a misdemeanor, punishable at least by a fine. By pressing a few cases and giving publicity to the results, a deterrent influence could be exercised and attention focused upon the danger involved.

MAGNETIC PERMEABILITY INDISPENSABLE.

The important part which the magnetic properties of iron play in modern life is realized by few besides the electrical expert. Nearly all electrical machinery makes use of these properties, so that except for the high permeability of iron we should be without the dynamo and motor, and nearly all the industrial applications of electricity would fail. If iron were non-magnetic the electric lamp, the trolley car, the telephone and the telegraph would not be commercial possibilities. The electric bell, the annunciator, and most forms of electric signals could not operate in their present form. Motor vehicles would be inoperative, whether electric or gasoline, since the latter depend upon magnetos. The mariner's compass of the older type would be useless, and the gyroscopic compass would be incapacitated for lack of its driving motor. X-ray apparatus in its present forms would cease to operate. In fact, nearly all the activities of modern life would be interrupted. Even steam railroads would be temporarily deranged, since their operation is dependent upon electrically operated signals, the telegraph and the telephone; and the newspapers would have scant news. The effects of strikes and even war are moderate in comparison.

The above indicates in some measure what the world owes to the electrical engineer, for all of these developments have been worked out in his domain. Modern civilization, especially urban civilization, is dependent upon his efforts. The unfamiliar force of a century ago is the basis for most of the conveniences of today. Electrical current is the modern servant, yet with the magnetic permeability of one of our most abundant metals lacking, we should feel helpless in our inability to utilize it. Nature has many wonderful secrets, but none is more wonderful than that of ferromagnetism, which so far has defied the efforts of scientists to explain.

ELECTRICITY IN SHOE FACTORIES.

The use of electrically heated shoe machines is a form of industrial application of electricity which is of growing importance. There are now no less than a score of such machines, all of which are recognized by the factory operators as of great serviceableness and efficiency. Two factory-equipment manufacturers, at least, produce shoe machines with electric heating units, some of which are separate devices and some attachments for existing machines. Central-station men in shoe-manufacturing centers will do well to cultivate this class of business, as its introduction means a valuable day load.

The tendency in modern factories is to install electric drive in small groups, by this means it being possible to run each department without operating the whole driving equipment.

This means a considerable saving, as it is well known that shaft drive from a steam plant involves large power losses in transmission. In one case it was found that in transmitting steam power by belts from the engine room to the seventh floor there was a loss of 80 per cent in power. Electric power is delivered to the machines with a minimum of waste, while electric heating devices obviate the risk of damage to shoes which the use of gas-heated devices involves. The resultant work with the electric machines is vastly superior, and the health and comfort of the operatives is another important consideration.

ELECTRIC POWER IN SILK MILLS.

The first electrical installations in textile mills were for the purpose of illumination, and the earlier motor applications were incidental and were usually fed from the lighting circuits. Today electric drive is recognized as the most ideal for this class of work, and especially for silk weaving, where slight variations in speed or other irregularities in operation are sufficient to snap the slender threads and introduce imperfections in the finished product. An article in this issue describes the process of silk manufacture, shows the advantages of electric drive, and illustrates the application of central-station service.

Individual drive possesses the greatest advantages for loom work, but considerations of investment expense have directed the installation of group drive in many factories. The use of belts is a recognized evil, as slipping is decidedly disadvantageous, and chain drive between motor and shaft is being widely adopted. Chain drive is also finding favor in place of gearing in the machines. Uniform speed is highly important in all textile work, and perfection of output depends upon the accuracy with which it is maintained. As silk is a costly material, the financial importance of good speed maintenance reaches its culmination in this industry.

Accurate maintenance of speed, as attained through motor drive, also results in maximum output. It is not safe to exceed a certain specified speed, yet within

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this limit output is approximately proportional to speed; consequently the likelihood of large variations in speed requires the adoption of a lower average speed. Other objections to the use of belting and shafting are the same as those encountered in other industries: obstruction of light, liability to accidents, expense of maintenance, possibility of oil stains on the goods, etc.

Three-phase motors are the most desirable for this work, as they represent the nearest attainment to constant speed and have the best starting characteristics. Fluctuations of voltage will not appreciably affect the speed with this type.

Since electric drive is found to improve both the quality and quantity of output, it would be a valuable innovation at increased cost. When the power salesman can demonstrate that the cost will be decreased or even kept on a par with steam drive and shafting, he should have no difficulty in convincing the prospective customer. That the load of a silk mill is a desirable one for the central station is shown by its excellent load-factor.

PROGRESS AMONG CONTRACTORS.

The success which has attended the methods of the California Association of Electrical Contractors and Dealers not only in organizing its own members, but in dealing with the jobbers and central stations, has not only attracted wide attention, but has stimulated activity among others. The first evidences of this have been noted in the neighboring Pacific States. The electrical contractors of Oregon and Washington have set themselves the task of some real accomplishment along lines that may well be considered in other parts of the country. Co-operation among all the elements in the electrical industry is bound to bring better results than indiscriminate, individual effort, and the first requirement for this co-operation is the organization of each element in a way that will permit joint action. Collective effort and mass action are essential to large accomplishment.

The electrical contractor has represented the weakest link in the electrical chain. His status is rapidly being improved, however, although progress sometimes seems slow. Results are not always immediate, and patience and perseverance are necessary for realization of ideals. Only by co-operative and persistent effort can great accomplishments be achieved. The contractor who fails to join with his fellows in an organization for mutual benefit is standing in his own light. When the contractors in any community are well organized, they are then in a position to deal with the representatives of jobbers, manufacturers or central stations in removing causes of friction or remedying conditions which at present seem detrimental to their interests.

We trust that not only the contractors of Oregon and Washington, but those of other states will proceed to push matters after having had such a demonstration of possibilities as has been given in California.

MAKING CONSTRUCTION NEWS INTERESTING.

A real opportunity for helpful publicity exists on many central-station systems supplying communities in which the local press is alive to the interest of construction developments. Much has been said about the benefits of cultivating the good will of reporters by a readiness to impart information of news value, and many central-station managers put this into practice when the decision to purchase new equipment or to alter the plant is made. This done, the possibilities of news material being produced while the work of installation and construction is under way are often completely overlooked.

When the work under way can be connected with affairs of general interest, as in the following example, the popularity of the item is sure to be greatly increased. Thus, in an Eastern city a local daily recently carried a story to the effect that a new substation in an adjacent town served by the lighting company had been much delayed in its completion by the freight embargoes on various materials used on the interior of the building. It was pointed out that the installation of the switchboard and other equipment was progressing well, but that about two months more work on the substation would be necessary before regular service could be inaugurated Now all this is easy material to supply the local press. It requires no editorial skill on the part of the busy central-station manager; keeps the public posted on the progress of the local improvement, in which it is interested in inverse proportion to the size of the town; and adds to the constant playing up of electric service which is valuable in the development of central-station business. Mention was made in the item above cited of certain temporary arrangements for the supply of electricity and the success with which these had been accomplished without perceptibly affecting the consumers, all of which redounded to the credit of the management, and lent attractiveness to the reading matter.

When new machinery arrives, a kodak view of the heaviest piece as it is being unloaded from the cars, coupled with a few figures as to the number of horses a power-producing unit of this type offsets, makes good copy for the local daily or weekly. There is always a large number of local newspaper readers who are interested in machinery, and a few words about a design new to the town will not come in amiss. When, as occasionally happens, some town has the engineering honor of making the first use in the world of some new apparatus of novel design, there should be no difficulty in serving it to the readers as a front-page story, provided the local manager makes its significance known to the editors, as he can generally do without much trouble. The best thing about all such material is that it is almost always available for the reading pages without a cent's outlay. Moreover, such material does not have to appear on a particular date, and conflict with important news can easily be avoided.

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Happenings in the Industry

Dallas Voters Approve Model Franchise for Utility Companies and Authorize Bond Issue for Municipal Plant—Safety Code and Electrolysis Are to Be Discussed at Atlanta Meeting—Discussion of Motor Design Before Lynn Section—Dr. Steinmetz Addresses New York Section, I. E. S.—Miscellaneous News

AMENDMENTS TO DALLAS CHARTER CARRY BY SMALL MARGIN.

Result Is Really a Victory for Traction and Lighting Companies.

One of the most hotly contested elections ever held in the city of Dallas, Tex., ended on April 4, the final count, as noted in our last issue, showing that the voters favored the proposed franchise amendments to the city charter. These amendments provide for a "service-at-cost" feature and a fixed rate of return on a definite fixed valuation. At the same election $500,000 of bonds were voted for the construction of a municipal electric light plant, these bonds to be used in case no acceptable terms could be arrived at with the Stone & Webster interests which operate the local electric light plant.

The franchise charter amendment received a majority of exactly 81 votes and this is so small that the election is considered in many circles as really a victory for the central station and traction interests. The fact that a large number of qualified voters did not express their opinion on the subject is construed as meaning that the entire subject is one which the people as a whole do not understand. It furthermore indicates a sense of justice on the part of the people, as opposed, in part at least, to the proposed franchises on account of the fact that they are not fair to the operating companies.

Regardless of the general sentiment, however, future action will be based largely on the course taken by the Mayor and Board of City Commissioners. The Mayor was the sponsor for the "model" franchises and was supported by the majority of the city commissioners. It has been stated that action will be taken at once to put the mandate of the people into effect. The bond issue for the municipal lighting plant will no doubt be used as a club to force the operating companies to accept the franchises if they continue the stand taken before the election, namely, that the valuations fixed were entirely too low and the rate of return not sufficient to provide for extensions to service and future growth. If the Mayor and Commissioners persist in the course which it was indicated they would take, the entire matter will no doubt be carried through the courts to a long and expensive settlement.

What the Franchises Provide.

The franchise ordinance which was passed "grants a franchise covering existing street-railway systems consolidated in one ownership and fixes the valuation of the properties thereof at $4,790,124.14, with an addition of $48,000 for working capital, and providing for an interest fund of $150,000, and fixes the maximum rate of return to the franchise holder at 7 per cent on such valuations and on future additions thereto for improvements made under city supervision, and provides that such part of the receipts of the business as remain after deducting such sums as are necessary and proper for operation, taxes, maintenance, renewals and replacements and the rate of return specified shall be applied to the reduction of fares; provides how such fares may be reduced; and provides for strict supervision and control by the city over service and over the affairs of the franchise holder; and provides how such supervision and control shall be exercised."

It has been brought out that the operating company (Stone & Webster) is agreeable to the "service-at-cost" plan embodied in the franchise, but does not agree on the valuation as fixed and further contends that a return of 8 per cent should be allowed.

The lighting ordinance "grants a franchise covering the existing electric light, heat and power system operated by the Dallas Electric Light & Power Company and fixes the valuation of the properties thereof at $3,485,964.42, with an addition of $75,000 for working capital and provides for an interest fund of $150,000 and provides as a maximum rate of return during the first eight years of the franchise at 8 per cent on such valuations and additions thereto for permanent improvements made under city supervision; and provides as a maximum rate of return, after such period of eight years 7 per cent on said valuations and additions; provides that such part of the receipts of the business as remains after deducting such sums as are necessary and proper for operation, taxes, maintenance, renewals and replacements and such maximum rates of return shall be applied to the reduction of rates and provides for strict supervision and control by the city over service and affairs of the franchise holder, and how such supervision and control shall be exercised."

In this case also the operating company is agreeable to a fixed rate of return and a reduction in rates when possible, but does not agree to the valuation fixed nor the rate of return specified.

The majority of the press favors a compromise of the situation and a settlement out of court. It is pointed out that since the mayor and commissioners now have power to take action, they should use this power to bring about a mutually agreeable compromise rather than resort to long and costly litigation.

Contrary to the general custom which has characterized recent controversies of this kind, no paid advertising was used by the operating companies to place their views before the public. With the vote as close as it was there seems little doubt that a strong publicity campaign might have changed the result of the election. The next steps in the matter will be taken when the officials of the lighting company appear before the Board of Commissioners to show why they should not make an immediate reduction of two cents per kilowatt-hour in the lighting rate.

Conference at Atlanta on Safety Code and Electrolysis.

At the invitation of the Technical Committee of the Affiliated Engineering Societies of Atlanta, Ga., the Bureau of Standards will hold a conference in that city from May 2 to 4 for the purpose of discussing the work of the Bureau in connection with the National Electrical Safety Code and the prevention of electrolysis of gas and water pipes, cable sheaths, and other metallic underground structures. The conference will be participated in not only by the technical societies of Atlanta under whose auspices it is to be held, but also by city electricians, engineers of public-utility corporations, consulting engineers, and others interested, and a large attendance is expected from Georgia and the neighboring states.

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The conference will occupy three days. The first day, May 2, will be devoted to the consideration of the National Electrical Safety Code. At this session representatives of the Bureau of Standards will outline the work that has been done on the code and give a statement of the principal features of the code and the main changes that have been made in the course of its last revision, after which a general discussion of the code will be held.

At the second session on May 3, an account of the work of the Bureau of Standards on electrolysis prevention will be presented, including the laboratory researches and field studies and surveys that have been made, and giving a discussion of the proper methods of procedure in making electrolysis investigations and in the mitigation of electrolysis troubles. This paper will also be followed by an open discussion.

At the third session, on May 4, the subject of grounding of low-voltage light and power circuits will be discussed. As in the other sessions, the discussion will be preceded by a paper setting forth the essential provisions of the National Electrical Safety Code regarding the grounding of circuits and explaining the advantages of grounding, the methods of grounding, and the reasons which have led to the adoption of the code requirements.

The chief purpose of the conference is to bring the cities and the public-utility corporations of the South into closer touch with the work of the Bureau of Standards in connection with public-utility problems. All persons interested in the safe construction and operation of electrical lines and equipment and in the mitigation of electrolysis of underground pipe and cable systems are invited to attend the conference.

Dr. Steinmetz Addresses New York Section, Illuminating Engineering Society.

Attendance records were broken at the meeting of the New York Section of the Illuminating Engineering Society held on the evening of April 6 at the Engineering Societies Building, New York, there being over 300 present.

Chairman D. Mc. Farlan Moore introduced the speaker who was Charles Proteus Steinmetz, president of the Society.

In his opening address Dr. Steinmetz attacked the selected subject, "General Problems of Illumination Design," by stating that illumination was not simply a branch of applied science, as the effects have to do with our physical well-being and success or failure—a mental condition. Continuing, he said that the variety of uses to which light was put was very well exemplified in domestic lighting, where we wanted low-intensity general illumination to provide a restful condition, high-intensity general illumination when we desired to find something and high-intensity local plus low-intensity general illumination for reading.

The three objectionable features of lighting were named as glare, fatigue and association. Glare is objectionable due either to excessive intensity of luminous area, either actually or relatively. Fatigue may be produced in a number of ways, overexertion for a short period, too extended a period of ordinary use, not enough light and too much diffusion, shadows being eliminated. The lighting conditions that are best arranged so that fatigue be avoided are those providing sufficient illumination, shadows and contrast. Association termed as an objection means color effects that bring to our mind something unpleasant.

Color was said to be the least studied of the phenomena of lighting. With the new gas-filled lamps the efficiency is relatively so high that absorption glasses or other screens may now be used at a reasonable cost. In nature, yellow, brown and reddish brown are the colors which predominate, and therefore are the ones that are most restful.

Successful lighting must include a source that contains a sufficient proportion of the ordinary colors found in nature so that proper color values will be reflected back to the eye of the observer, the light must be of sufficient intensity, be shaded and have direction so that shadows and background will give ease of vision and proper proportion.

Preston S. Millar announced that the lectures on "Illumiating Engineering," to be given under the joint auspices of the Society and the University of Pennsylvania, would begin on September 21, following immediately after the annual convention of the Society.

Lecture on Motor Design Before Lynn Section of the A. I. E. E.

The fourteenth and concluding lecture of the fall and winter lecture series of the Lynn (Mass.) Section of the American Institute of Electrical Engineers was given on April 5 by Louis E. Underwood, a motor engineer of the General Electric Company. The subject treated was "Progress in the Art of Motor Design and Manufacture," and consisted of an historical survey, and a technical elucidation of present-day motor applications. The talk was illustrated by lantern slides and models.

Beginning with Faraday's fundamental experiments in 1830, when the source of power was direct current generated by primary batteries, the speaker traced the evolution of the art in the use of both direct and alternating current through the work of many inventors such as Pacinnoti, DeMeritans, Gram, Edison, Thomson, Bentley, Knight, Sprague, Tesla, VanDepoele, Eickmeyer, etc. So completely did these inventors and other notable pioneer experimenters cover the field that progress during the last 20 years has been along the line of improved applications of manufacture and refinement of details leading to efficiency rather than to basic discovery. Today there is little haphazard work, everything being first calculated from an engineering standpoint and then standardized in manufacture. The quality of such materials as the steel and iron used in the magnetic circuit, the quality of copper in commutators, and of the carbon in brushes, are all found to be of vital importance.

The processes of motor manufacture, as shown by the lantern slides, illustrated how each move in construction is a study of efficiency in bulk operation. In connection with some of the interior views of Building 74 of the River Works plant of the General Electric Company, at Lynn, it was stated that this is the largest building in the world exclusively devoted to motor manufacture.

Power Sales Bureau of N. E. L. A. to Give Dinner.

Final arrangements are being made for the "get-together" dinner of the Power Sales Bureau of the National Electric Light Association to be held in Chicago, Ill., May 23, which will be during the national convention. It is expected that over 200 power salesmen will be in attendance. The program of the evening will consist of a number of short talks by power men from various parts of the country, together with a goodly number of entertainment features.

The committee in charge of the local arrangements consists of: George H. Jones, Commonwealth Edison Company, chairman; W. T. Dean, General Electric Company; Stephen Gardner, Westinghouse Electric & Manufacturing Company; Sidney Vigo, Middle West Utilities Company; C. W. PenDell, Public Service Company of Northern Illinois; R. G. Hunt, H. M. Byllesby & Company, and William Ott, Commonwealth Edison Company.

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Miscellaneous NEWS NOTES

State Commission Sides with Utilities.—Rates under which energy for street lighting in the cities of Gadsden, Alabama City and Attalla, Ala., is furnished cannot be lowered at the option of the city government, according to an opinion of the Public Service Commission.

To Transmit Students' Wireless Messages.—The Harvard University Wireless Club has arranged to transmit students' messages from its wireless station at Cambridge, Mass., free of charge, to amateur stations on working relations in a zone bounded by central New Hampshire on the north and New Jersey on the south.

Mechanical Engineers to Discuss Industrial Preparedness.—Among the papers to be presented at the spring meeting of the American Society of Mechanical Engineers, at New Orleans, La., April 11 to 14, is one by Spencer Miller, on "Organizing for Industrial Preparedness." The whole of the first session will be devoted to a discussion of this subject.

School for Firemen Effects Coal Economy.—The electric plant of Topeka, Kan., carrying 285 kilowatts the first three months of 1916 against 260 the corresponding period in 1915, used only $1,924.06 worth of coal, or $248.74 less than in January, February and March, 1915. While the renovation of the boilers and the addition of a damper in the stack were instrumental in the saving, the largest factor was a school for firemen in the art of stoking.

Illinois Fire Marshal Appeals to Electrical Industry.—Walter H. Bennett, state fire marshal of Illinois, was the speaker at the weekly meeting of the Electric Club-Jovian League of Chicago on April 6. Mr. Bennett called attention to the enormous fire loss which occurs annually and which could be appreciably reduced by the exercise of greater care. He appealed to the electrical fraternity of Chicago to use all influence possible to guard against the use of electrical equipment in such a way as to prove hazardous from the standpoint of fire.

North Carolina Power Sites in Litigation.—Because the trial judge erroneously found the facts in ordering a perpetual injunction, there must be a new trial in the case of the Carolina-Tennessee Power Company vs. the Hiawassee River Power Company, according to a ruling delivered by the Supreme Court of North Carolina. The case involves very valuable Hiawassee River power plant sites near the Tennessee line. The defendant corporation was obtaining titles to lands to which the plaintiff held prior claims, and the overthrow of the perpetual injunction reopens the fight for control of the power sites in dispute.

Louisville Jovians Hear of Plans for New Power Development.—Louis S. Streng, superintendent of the power department of the Louisville (Ky.) Gas & Electric Company, featured the last meeting of the Louisville Jovians, with a brief sketch of the plan of extension of the company's Waterside plant. It will ultimately mean about four times the present power capacity and will represent the latest developments in the way of the electric power plants. Speaking of the amount of water used, Mr. Streng stated that now, with present requirements, the company pumps every day twice as much water as the Louisville Water Company, while when the additions are completed the water volume will be quadrupled. Construction of the tunnels to the river, the intake and the outlet tunnels, will involve some of the most unusual engineering work ever done around Louisville. These tunnels are 700 feet long, extend 35 feet into the river and will be constructed in the bottom of a trench to be dug. Greatest depth of excavation will be 45 feet and the open caisson system of construction will be employed.

Electrically Driven Barge Launched.—The first of thirty-six steel, electrically driven, quadruple-screw barges projected by the Inland Navigation Company, has been launched at the Howard Shipyards, at Jeffersonville, Ind. The power is generated by five internal combustion engines, and a wireless equipment is provided. The maximum draft is 3.5 feet and maximum capacity is 1,500 tons.

Injunction Issued Against Memphis Utility Bond Issue.—Although Chancellor Fentress, at Memphis, Tenn., has held the city authorized under the bond issue act to build or buy, as it chooses, an electric-lighting plant, at the same time an injuction has been issued against the issuance of $1,500,000 bonds on the ground that sufficient legal notice of the election was not given. If the higher courts sustain this finding, it is stated, another election will be necessary. The city proposes to buy the plant of the Merchants Power Company.

Los Angeles Jovians Entertain Riverside Delegation.—At a meeting of the Jovian Electric League of Los Angeles, Cal., held April 5, a delegation from Riverside, representing the Southern Sierras Power Company, was welcomed. Short talks were made by A. S. Cooper, assistant treasurer, and H. R. Day, purchasing agent. The principal speaker of the day was I. B. Potter, attorney for the company, whose subject was "Co-operation." He pleaded for a wider and more useful effort and stated that the possibilities for usefulness by co-operative work on the part of the Jovian Electrical League could not be measured, and that the main thing was to extend and perfect the organization—its sphere of usefulness was unlimited. A. E. Morphy, of the Southern California Edison Company, presided, and K. E. Van Kuran, of the Westinghouse Electric & Manufacturing Company, was chairman of the day.

Kansas City Company Issues House Organ.—The publicity department of the Kansas City Light & Power Company has issued the first number of "Electricity," the monthly house organ, for distribution to the employees and the public. It is 9 by 6 inches, 32 pages and cover, and profusely illustrated. There are brief editorials under the heading "Short Circuits"; two pages of notes on "Electricity in Many Climes"; a page of "Selling Points," applicable to any business, mostly helpful for selling goods by the aid of electricity; a page of notes on electrical devices, headed "Do It Electrically"; a page of recipes for electric cooking; two pages devoted to the Kansas City section of the N. E. L. A., which has made the publication its official organ; two pages of notes about employees of the company; the beginning of a series of cleverly-written biographies of employees under the heading "Who's Who and Why They Are—Light Celebrities"; and articles by department heads. The magazine has the sub-title "Regeneration of the Home."

Arrangements for Manufacturers' Exhibits at Chicago N. E. L. A. Convention.—H. G. McConnaughby, secretary of the Exhibition Committee of the National Electric Light Association, is busily engaged in completing plans for the exhibition to be held coincident with the convention in Chicago on May 22 to 26. The main exhibit space will be in the Auditorium Theater, adjacent to the official hotel, where ample facilities will be provided for exhibits of any character. A circular letter and application blanks for space have been sent to all Class D members and the early responses indicate one of the best representations of any so far held. In spite of the large space provided for exhibits, however, Secretary McConnaughy cautions manufacturers to make early reservation in order to secure desirable space and to guard against any possibility of a disappointment because of no room.

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Code Requirements of Electrical Apparatus

Some Suggestions for the Small Manufacturer That Will Aid in the Production of Electrical Apparatus and Material That Meet Code Requirements

How should a new piece of electrical apparatus or machinery be constructed that it may be safe as to insulation, acceptable in that its use in a building will not introduce a fire hazard, and so constructed that it will meet the requirements of standard engineering practice?

These queries are not difficult for the large electrical organization, with a corps of expert engineers and a well equipped testing laboratory, to answer.

Of the numberless devices brought out every month to do something a little better or to do a new work in the home, office or factory, a large percentage are the work of the individual or of the small company.

While the older and larger electrical companies fail in some particulars to build a new machine that will stand criticism, the individual inventor and the small company fail most frequently in designing and constructing a piece of apparatus that does not require considerable changing to bring it up to the right standards.

As an inspector for insurance interests for a number of years, it was the writer's good fortune to be asked many times to look over new electrical appliances and to give the builder some suggestions as to whether or not the apparatus in question was built to meet city inspection bureaus' and underwriters' requirements. As these organizations rely very largely upon rules laid down in the National Electrical Code this article will, with Class D of the Code in mind, point out common faults, some of which are found in nearly every new piece of electrical apparatus, indicate construction that should be avoided, and suggest at the same time good construction.

In some instances, inspection of an electrical device discloses the use of fiber as the material upon which current-carrying parts are mounted. The use of hard fiber for this purpose has not been considered good practice for some time, because its dielectric strength is not high, and on account of its sensitiveness to humidity, trouble arising from absorption of moisture. It is true that by slow drying it will regain some of its initial qualities, but if in a location where a high temperature dries it out it loses its elasticity. Its use, therefore, in electrical work is confined to the insulating of small current-carrying parts in such devices as plug fuses, sockets, receptacles, and as bushings for pin contacts, etc., where large pieces of the material are not necessary. Its employment in this manner was brought about some years ago when the cost of mica became so high that a substitute was sought. It should be emphasized, however, that its use as a substitute for porcelain or slate as a base for mounting current-carrying parts has not met with favor and from the results of experience the National Electrical Code specifies that such parts must be mounted on non-combustible, non-absorptive insulating bases such as slate or porcelain. Examples of devices where bases of this kind are required are switches, fuse blocks and in general all electrical current-carrying parts. An exception to this rule has been made in permitting the use of such materials as transite ebony, asbestos board, hemit, gummon and bakelite-micarta as proper for panelboards.

In mounting current-carrying parts, such as knife switches and fuses, on bases as in building a panelboard, certain spacing of parts of opposite polarity should be observed, care being taken that these distances are not less than a minimum as required in Class D of the Code. Note should be made also that parts in the air may be closer together than these same parts, carrying the same voltage, are permitted to be where mounted against the same surface.

Code requirements as to spacing of current-carrying parts for some of the more common electrical fittings may be found under the following rules in the 1915 Code; knife switches, rule 65*k*; snap switches, 65*l*; fuses or cutouts, 67*j*; panelboards, 69*b*; sockets, 72*q*.

In connection with the mounting of current-carrying parts of switches, it is quite frequently found that the bolts or screws through the material upon which the switches are mounted are left flush with the under side of this base. In all cases where these bolts, screwheads or nuts are alive, they should be countersunk into the under side of the base at least one-eighth inch and should then be covered or sealed with some good waterproof compound that will not melt when subjected to a steady temperature below 150 degrees Fahrenheit. Several of these compounds are on the market. This construction applies as well to screws used in the mounting of current-carrying parts of circuit-breakers, cut-outs, rosettes, etc. In porcelain pieces, such as sockets, all screws which can be sealed firmly must be sealed with a waterproof compound which will not melt below 200 degrees Fahrenheit.

The reason for countersunk and sealed construction is found in the fact that many fittings, particularly switches and cut-outs, are often mounted directly on the back of a metal cabinet or inclosure where exposed live screwheads or nuts on the under side of mountings would come in contact with the metal of the cabinet and thus afford a direct means for forming a ground.

Should devices such as panelboards be mounted out on posts or brackets, away from the back of the cabinet, this countersinking and sealing need not be observed, the spacing and means of support providing the needed security against the contact of current-carrying bolts and screws with the metal of the cabinet. To be more specific, exposed live metal parts on the back of the panelboard should be spaced at least 0.5 inch from the metal of the cabinet in which the board is mounted.

A common fault found in many appliances is the lack of proper means of securing the wires, from the source of current supply, to the device terminals. If the current taken by the appliance is more than 30 amperes, regular lugs should be provided into which the ends of the wires can be soldered. These lugs should be screwed or bolted to the terminals. The most common example of these lugs can be found on any standard knife switch rated to carry more than 30 amperes. For terminals taking 30 amperes or under, either of two ways of securing the wires may be employed. The first is by means of two brass washers held under a nut, the wire being placed between the washers, thus affording two flat surfaces bearing against the wire. The second and more common method of holding wire is by providing an upturned edge or lug, the upturned end projecting slightly beyond the edge of the nut and a washer. When the wire is placed under the washer and the nut turned down the wire is kept from sliding out from

WHAT THIS ARTICLE TELLS YOU

How a new piece of electrical apparatus or machinery should be constructed that it may be safe as to insulation.

How it should be constructed so that its use in a building will not introduce a fire hazard.

How it should be constructed so that it will meet the requirements of standard engineering practice.

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under the washer by the upturned lug and the washer provides a flat, tight contact. While considering the matter of connections, it should be emphatically stated that the old-style set-screw connections, such as may be found on the terminal posts of ordinary dry batteries are no longer acceptable, the reason being that a set screw turned down upon a wire gives a contact at only one point, is very apt to become loose, and in practice has been found to invariably cut the wire in two.

A point which should be taken care of by the builder of a device taking current through a portable cord, is to provide some means for preventing a pull upon the cord from being transmitted to the terminals to which the cord is attached. A porcelain cleat clamping the cord inside the device may be used for a strain relief and in other cases where the cord passes out of the case of the device through a bushed hole, a knot in the cord upon the inside is acceptable. If a length of portable cord is supplied with the apparatus, it should have wires of a carrying capacity large enough to carry the current required and as specified in the Table of Allowable Carrying Capacity of Wires, rule 18 of the National Electrical Code. Further attention to the kind of portable cord used should be given to see that the cord is the kind specified for the particular purpose under rule 51 of the Code.

A further requirement, as to connecting to the supply circuit where a plug is used, is to provide a plug rated for the voltage and current that the device to be operated requires.

Where pressing irons or elecric air heaters are concerned, the plug must be of the separable type so that when it is pulled out either at the heater or at the receptacle on the supply circuit, the projecting blades will be "dead." Further, ordinary reinforced cord is not suitable for supplying current to heaters, in that it is rubber insulated. A special standard asbestos-covered wire is on the market for this purpose.

Referring again to knife switches, the mounting of which has already been considered, the following points should be met in their construction. The hinges and jaws should be mounted so that they cannot turn or be twisted about. Dowel pins or square shoulders set in the mounting, or two screws instead of one to hold the part may accomplish this. There should be enough metal in the current-carrying parts of the switch so that under its rated load the rise in temperature will not be more than 50 degrees Fahrenheit. Between the blade and the jaws and also at the hinges 75 amperes per square inch of surface should be approximated and a cross-section of the blade should be figured at the rate of 1,000 amperes per square inch. Spring washers are required at the hinges to make a steady, tight contact. Knife switches should carry without any ill effects a 50-per-cent overload at 25 per cent above the rated voltage. Minimum spacings and dimensions for various currents and voltages are given in rule 65*k* of the Code.

When 30-ampere, panelboard, spool or combination handle switches for any piece of apparatus are mounted in a cabinet, the cabinet should be deep enough so that the door will close when the switches are in any position.

In many instances manufacturers buy the parts of knife switches and mount these parts on a base, then place this base on the apparatus. Besides the suggestions already offered, care should be taken in drilling holes for supporting screws of the switch base either to countersink or locate the holes so that there is at least one-half inch between the head of the screw and the nearest current-carrying part.

Illumination being a recently much studied field, electric fixtures are being placed on the market by numerous concerns. Aside from sturdy construction, one of the most important things to consider in building these is to be sure to provide a smooth race-way for the wires, so that when these are pulled in, they will not be drawn around sharp corners or over burs and the insulation be scraped off the wires and a chance for a ground or short-circuit provided. In fixtures designed for show cases where the heat radiated by the lamps will be transmitted to the fixture and the likelihood that a temperature of 120 degrees Fahrenheit will be reached about the wire, slow-burning wire is required. This feature is given special notice in rule 35*d* of the National Electrical Code dealing with the high temperature liable to be reached in fixtures within buildings and designed for gas-filled incandescent lamps. Slow-burning or asbestos covering on the conductors is required where the temperature to which the wire is subjected at any point exceeds 120 degrees Fahrenheit. In designing fixtures for gas-filled lamps in which the lamp or lamps are close to the ceiling and outlet, the fixtures should be so ventilated or arranged as to keep the temperature of the wire of the branch circuit (which is rubber-covered) below the temperature just noted.

No splices or taps are permitted in arms or stems of fixtures. In chain fixtures the wire used must be flexible; that is, not solid wire, but made up of several small strands equivalent in carrying capacity to the solid conductor which would be required. In this type of fixture the reason for the use of flexible wire is obvious.

The old style of canopy "bugs" which could be readily loosened or removed from the canopy, are no longer acceptable. Hard fiber may be used as an insulator of the canopy from surfaces and must be secured to the canopy by rivets or screws. Rule 77*c* of the Code covers the dimensions of fiber canopy insulators and the details of securing them.

A new section entitled "Garages," added to the 1915 Code as rule 42, contains some construction requirements as to electrical charging equipments. Devices, such as switchboards or charging panels, should be so built that they can be mounted or located at least four feet above the floor, or surrounded by vapor-proof enclosures. In the matter of charging sets, the motor and dynamo if of the fully inclosed types may be located on the floor of the garage. Motors even if installed four feet above the floor of a garage if not of the fully inclosed type must have the openings covered by a wire screen of not less than No. 14 mesh at the commutator end. The point as to these requirements is to guard against arcing of switches or commutators near the floor of a garage where there is the greatest danger of heavy gasoline vapors being present in a very fit condition for ignition by arcs or sparks.

The installation of motors in motor-operated appliances requires careful consideration. One of the present-day practices which is more and more being observed both by manufacturers of motors and by builders of motor-driven devices is to favor the motor having no exposed terminals. Such motors have wires running into the frame through bushings, the connection terminals being inclosed. These bushings may be of soft rubber unless so placed that oils, grease or other substances having a destructive effect on rubber are present. In picking a motor for such a location see that these bushings are of hardwood having a moisture repellant filler. Porcelain or micanite are also suitable materials for bushings where oil is in evidence. Again, motors of the inclosed type or especially those having the commutator end inclosed are preferred. A case in point is the installation of a motor in an electrically driven piano-player. Motors in these instruments should be placed so as to be readily accessible and inasmuch as they will probably lack proper maintenance such motors should preferably be of the inclosed type, so that any breakdown, which it is quite possible may be the only time the motor will be given attention, may occur without subjecting the wood interior of the instrument to sparks. The same construction here cited will apply to the numerous motor-operated household appliances that are constantly being brought out.

All electrical apparatus must be built so as to withstand certain high-voltage tests. The conditions under which these tests are made are stated in the Standardization Rules of the American Institute of Electrical Engineers.

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The builder of apparatus should have in mind in general the high-voltage test to which his device will be subjected and plan the insulation accordingly.

High-voltage tests are made at the temperature the device attains under normal operation. For example an electric pressing iron would be tested for its insulation when, with the current on, the iron has reached a constant temperature.

The test voltage is applied between each electric circuit and all other electric circuits and grounded metal parts or the frame.

The standard test for all classes of apparatus, with some exceptions, is twice the normal voltage of the circuit to which the device is connected, plus 1,000 volts. Some of the more common exceptions are household apparatus, bell-ringing transformers, switches and circuit control apparatus above 600 volts. Household apparatus taking not over 660 watts and intended only for operation on supply circuits not exceeding 250 volts must stand 900 volts, except in the case of heating devices. These shall be tested with 500 volts at operating temperature. Bell-ringing and toy transformers must withstand for one minute the application of 2,500 volts alternating current between high and low-voltage coils and between high-voltage coil and core or case. Switches and circuit control apparatus above 600 volts must stand a test using 2.25 times the rated voltage, plus 2,000 volts.

The builder of electrical apparatus who provides good insulation with acceptable material goes far in avoiding trouble when bringing his equipment forward for the consideration of its fire hazard by the fire insurance interests.

A final requirement as to any electrical device is that it carry a name plate bearing the name and address of the manufacturer together with the rating in watts or amperes and the voltage of the circuit upon which it is intended for use.

Photometry of the Gas-Filled Lamp.

The new high-efficiency gas-filled lamp introduces variables not hitherto encountered in the photometry of incandescent electric lamps. This matter has been made the subject of a study by the Bureau of Standards, and the results are published in Scientific Paper No. 264.

On account of the comparative broadness of the filament spiral and the dissymmetry of the filament mounting, there is considerable irregularity in the distribution of the light about the vertical axis. Consequently, when the lamp is rotated, as is commonly done in rating lamps at the factory, the light as seen in the photometer flickers so excessively as to render accurate measurements of candlepower practically impossible without the use of auxiliary apparatus. However, as is sometimes done, if two mirrors inclined to each other be placed back of the lamp, the flickering is so much reduced as to permit accurate candlepower measurements even at very low speeds of rotation.

But this expedient does not eliminate the most serious trouble caused by rotation. It was found that at constant voltage both the current consumed and the candlepower are different when the lamp is rotating than when it is stationary, the current changing in one direction and the candlepower always in the opposite direction; that is, there is a change in the operating efficiency of the lamp. Furthermore, this change in efficiency may be either positive or negative, depending upon the speed, and it is about twice as great when the lamp is rotating tip up as when it is tip down.

Fortunately, from the standpoint of photometry, there is for each lamp in either position a particular speed at which the current and the candlepower have the same values, respectively, as when the lamp is stationary. Hence, with the lamp rotating at this speed, its candlepower can be measured with accuracy in spite of its rotation. The speed for the above condition is practically the same for all lamps having the same number of loops in the filament; but, for lamps having different forms of filament mounting, it varies from lamp to lamp, being greatest for those having the smallest number of loops in the filament.

If the above precaution as to speed adjustment is not observed and lamps are rated while rotating at speeds ordinarily used in photometering vacuum lamps, the errors which enter may amount to as much as 1 to 2 per cent in current, or watts, in one direction, and as much as 15 to 20 per cent in candlepower in the opposite direction. Hence, the voltage found for a desired operating efficiency may be so much in error as to give a lamp on test at this rated voltage a fictitious life value three or four times as large as the lamp would give if it were operated stationary at a voltage corresponding to that efficiency which during the rating was only apparent. That is, the lamp may be given credit for a much longer life than it really deserves. On the other hand, the speed may be such as to cause errors in the opposite direction resulting in a lamp life much shorter than would be expected from the apparent efficiency rating.

Another peculiarity of the gas-filled lamp is that while it burns the blackening occurs, not all over the bulb in approximate proportion to the light distribution as in the vacuum lamp, but principally at the top of the bulb, because the volatilized material is carried upward by the gas. Hence, in making a life test, a true measure of the reduction in total light during the life of the lamp cannot be obtained, in the usual manner, by mean-horizontal-candlepower measurements, but by determinations of the total flux or mean spherical candlepower. This is accomplished most rapidly and conveniently by means of an integrating photometer, such as the Ulbricht sphere, in which the lamp is measured stationary, and thus all the complications arising from rotation are entirely avoided.

As to the cause of the variations observed in candlepower and efficiency when the lamp is rotated, it is concluded from the results of a number of special tests that the whole effect is produced by a change in the convection currents of the gas, a consequent variation in the temperature distribution in the bulb, resulting in a change in the resistance, and therefore a variation in the current and candlepower of the lamp.

Inclusions in the Silver Voltameter Deposits.

The results of a careful series of measurements to determine the amount of impurity contained in deposits of silver made in the silver voltameter have just been published by the Bureau of Standards, Department of Commerce, in its Scientific Paper No. 271.

The silver voltameter is the international standard for the precise measurement of electrical current. The importance of measuring the inclusions arises partly from its use as a primary standard and partly because it is important from an electrochemical standpoint to determine what difference there is between the value for the electrochemical equivalent of silver as defined for the purposes of electrical measurement and the absolute value. The present work indicates that under the best conditions the impurities in the silver deposits are about four thousandths of one per cent. The results of this work permit a correction to the value of the faraday, which is an important constant in physical chemistry and certain branches of theoretical physics.

Copies of the publication, entitled "Inclusions in the Silver Voltameter Deposits," will be sent free to persons interested upon request to the Bureau of Standards, Washington, D. C.

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Electricity in the Manufacture of Silk

A Description of the Process of Manufacture in a Typical Mill with Data on a Number of Plants in Easton, Pa., Purchasing Power from the Local Utility

Industrial Power Series—Article No. 161

The manufacture of silk, while a simple manufacturing operation, is very interesting and a most important industry from a central-station standpoint.

The largest number of silk mills are in the vicinity of Easton, Allentown, Scranton and Wilkes-Barre, Pa., and Paterson, N. J., where a good supply of female labor exists, and also near the large silk market to be found in New York City.

Most of the raw product comes from China, Japan and Italy, and the preliminary operations after taking the silk from the cocoon is done by very cheap labor and by hand in those countries. Unwinding the silk, the ends or fine fibers are taken up and twisted or joined together to make continuous threads which are formed into skeins, baled and shipped to the mills. Although the best quality of silk is produced in Italy, the supply is not as great as that of China and Japan. The single threads are twisted about 1.5 to 3.5 turns per inch and comprise from two to six ends as they are termed, depending on the grade of the finished product.

Process of Manufacture.

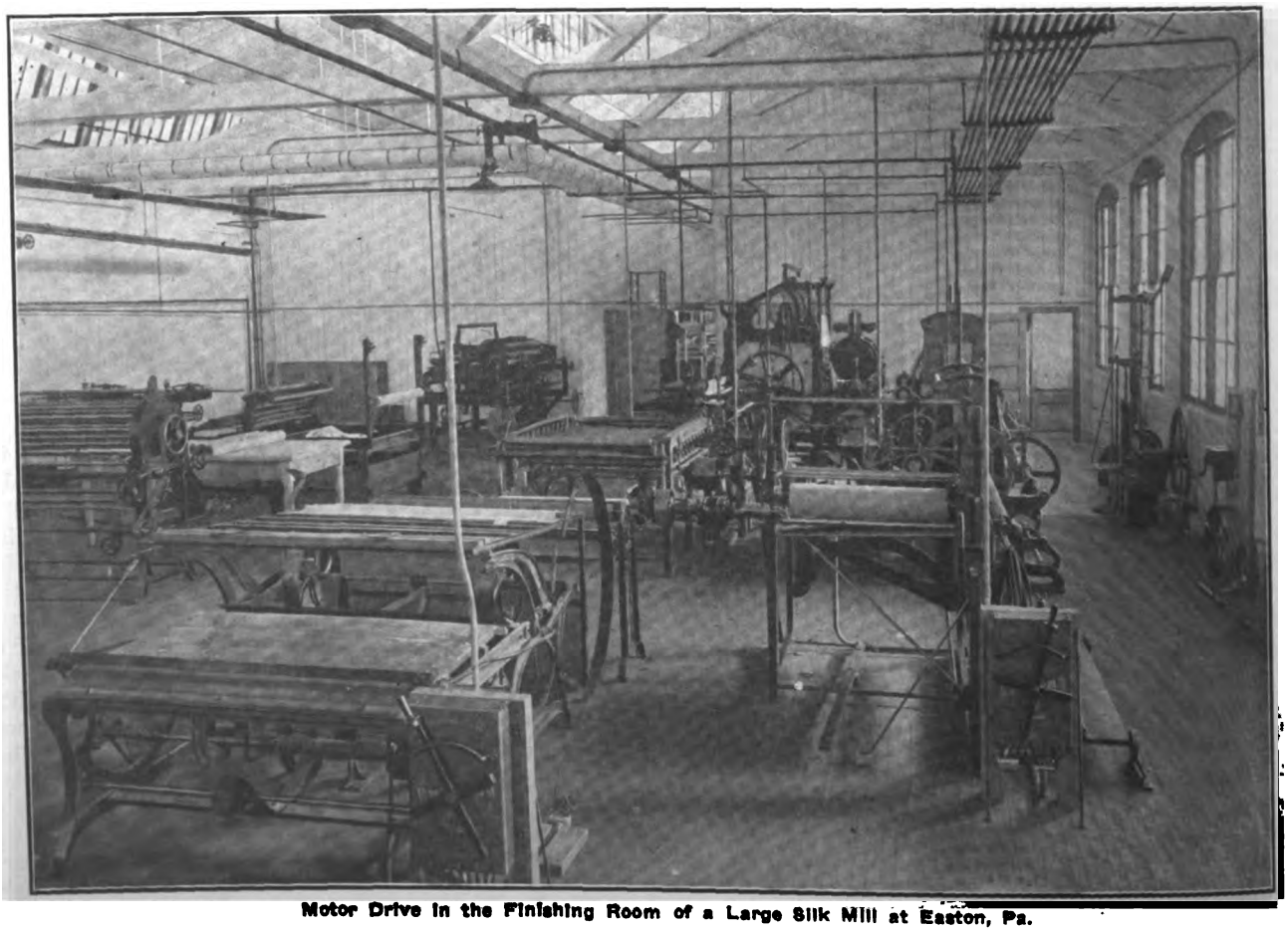
Before the silk is sent to the throwster it is immersed into a bath of soap and oil to soften the fiber and wash the impurities. It is then dried and taken to the "swifts," and run on the bobbins. These "swifts" comprise a hexagonal frame with six wooden pegs on which the skein of silk is placed. From the "swift" the silk now on the bobbin is placed on a vertical spinner, which is known as the first-time spinner, and is spun at 8,000 to 12,000 revolutions.

After this operation is complete the bobbins are taken to the "doubling machines." Here two more threads are put together; this operation simply winds the threads together. The silk is then taken to the twisters, or second-time spinners, and the machines are similar to the first-time spinners, but are equipped with what is known as "flyers." The "flyer" is a piece of steel wire attached to a leather or wood washer on the spindle shaft. At the end of the wire which extends about four inches from the shaft is an eyelet through which the silk thread passes and is twisted about each other.

In this machine the silk is twisted for the various kinds of silk, and if it is being prepared for smooth plain silk, the flyers operate at 8,000 revolutions per minute, but if for crepe, will operate as high as 12,000 revolutions per minute. The high speed gives the silk a hard twist, and when woven into the cloth gives that crepe or irregular effect.

That part of the process above described is done in throwing mills which in turn send their product to the weaving mill, but there are many mills which carry on the complete manufacture from the raw silk to the finished product. Such a mill is shown in the accompanying illustrations.

After the silk is prepared in the throwing mill, it is taken to the looms and woven into the cloth or finished product. This is a most important operation, as defects in



Motor Drive in the Finishing Room of a Large Silk Mill at Easton, Pa.

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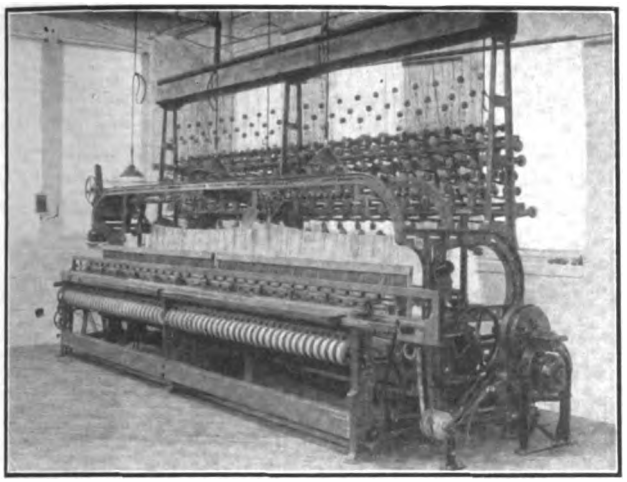
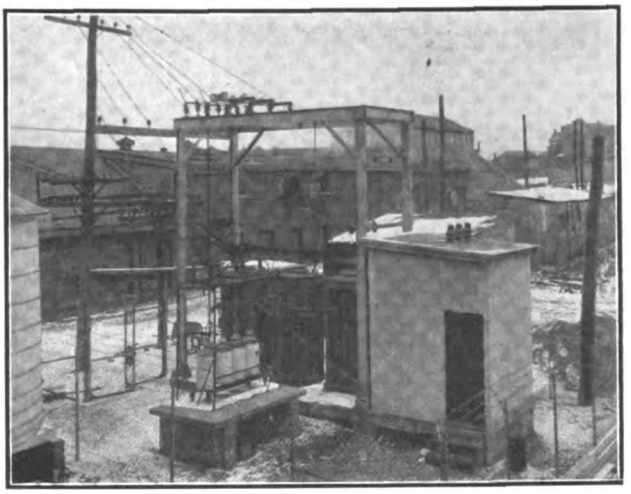


Five-Horsepower Motor Driving Silk Loom Through Friction Clutch.



Substation of Stewart Silk Company, Easton, Pa., Using Central-Station Service.

the piece of silk as it comes from the loom are costly, the work requiring skilled weavers.

The silk is placed on reelers, a machine which looks much like a ferris wheel, and here the threads are laid in parallel lays. This is the foundation upon which the loom operates. It is then placed on the loom where every other thread in the lay is worked up and down and the bobbin or shuttle is thrown through the lays. After each time the shuttle passes across the loom a frame comes forward and lays or packs the thread from the shuttle solid in place, which is the final machine operation.

Power Requirements.

From a central-station standpoint, silk mills are a most desirable business. The mills vary in size from a 20-horsepower connected load to 1,000 horsepower, and the load-factors run high in proportion to the demand as will be seen by referring to the tabulation.

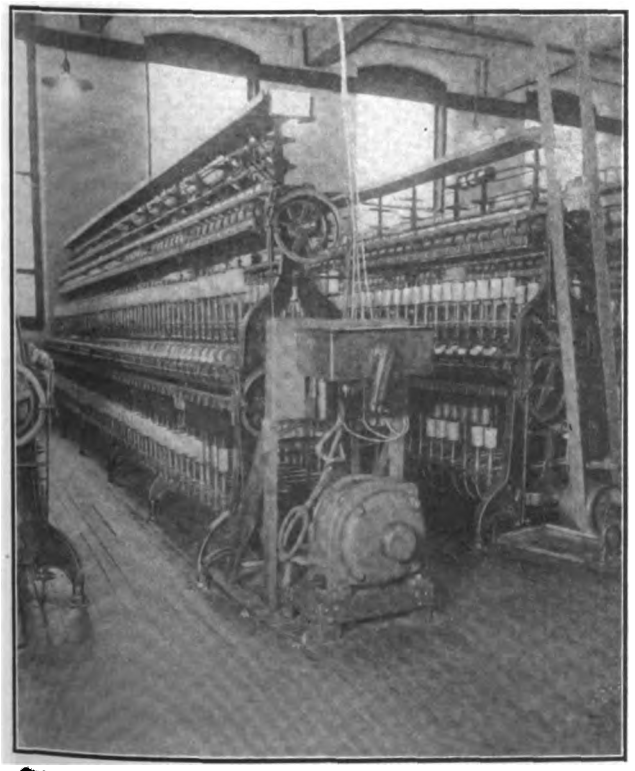
The mills are often spoken of as either "throwing mill" or "weaving mill." The throwing mill only prepares the silk for the weaving mill, and from the foregoing description of the process it can be readily seen what part each mill plays in the operation.

Mill.	Preparation.	Horsepower Connected.	1-Hour Demand, Kilowatts.	Average Monthly Kilowatt-hours.	Load-Factor.
A	Throwing	70	44.5	24,551	75.5
B	Weaving	25	11.1	2,927	36.5
C	Throwing and Weaving	65½	62.36	11,610	25.5
D	Weaving	44½	35.7	15,520	59.6
E	Throwing and Weaving	700	443.0	141,715	43.8
F	Weaving	35	15.6	2,934	25.8*

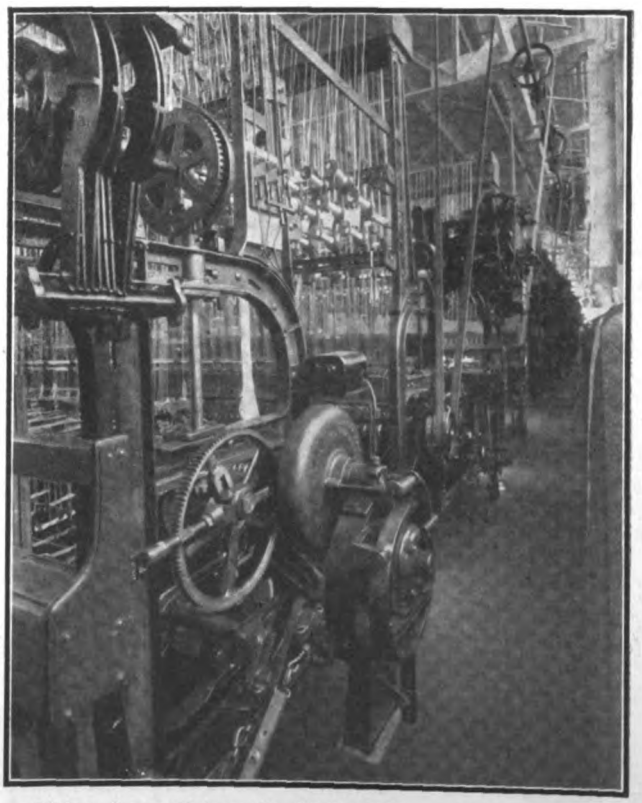
*Half the number of looms.

It can be seen that motors in a silk mill operate to capacity. A test on one 20-horsepower motor, chain drive to shaft, equipped with roller bearings, driving ten 106-spindle frames on first-time work, at 10,200 revolutions per minute, eight frames being operated at the time of test, showed a motor input of 20.6 horsepower or an average of 2.44 horsepower per 100 spindles, and with nine frames operating 25.7 horsepower or 2.69 horsepower per 100 spindles.

On second-time work a test made on one 10-horsepower



Group of Spinning Frames in Silk Mill Driven by Individual Motors.



Ribbon Loom Driven by 4.5-Horsepower Motor Through Centrifugal Clutch.

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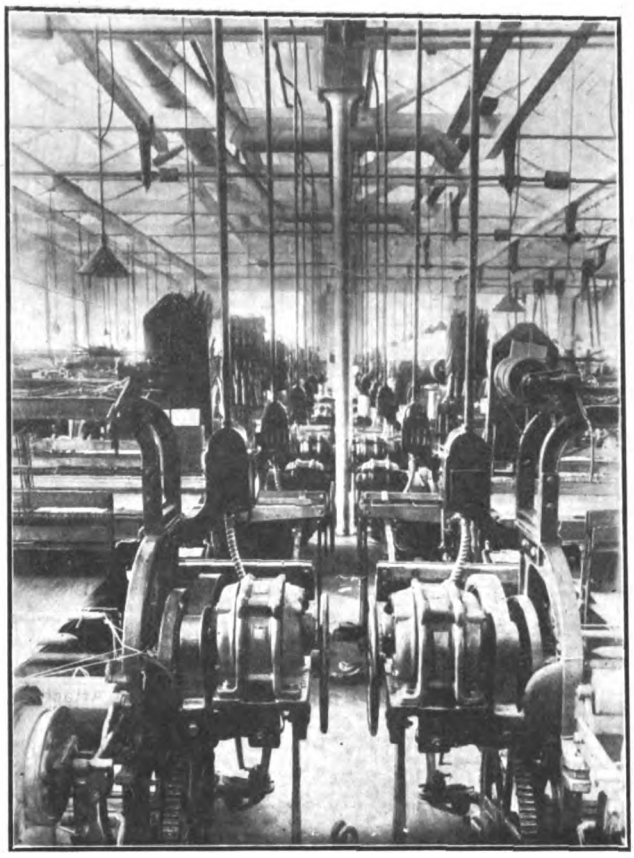


Dobby Loom in Easton Silk Mill Driven by 4.5-Horsepower Motor.

motor, chain drive to shaft, equipped with roller bearings, driving six 86-spindle frames, at 8,500 revolutions per minute, showed a motor input of 11.5 horsepower or 2.22 horsepower per 100 spindles.

The machines in throwing mills are compact and can be placed in a relatively small space and their high speed permits the use of high-speed motors.

During the recent years of rapid development of central-station generating and transmission equipment, silk mills have changed from steam drive to purchased power. One important reason has been the uniform speed that motor drive maintains, and the reasonable cost for power. Uniform speed in silk mills is important as it reduces the "voids" or imperfections in the finished product; it being a very expensive article of commerce it can be readily seen to lose even a small percentage of production due to such imperfections increases the cost of manufacture.

In one very large mill purchasing central-station energy at 11,000 volts, doing its own transforming, the entire plant is equipped with graphic frequency meters, graphic watt meters and graphic volt meters, so it can be readily seen that the silk manufacturer keeps a very close check on the regulation of his source of power.

Many mills are coming to chain drive on line-shaft drive, reducing slip and increasing the efficiency, and results have proven that this form of drive is very satisfactory. Individual drive is also extensively used, and is to be preferred, and chain drive is also coming into common practice in place of cut gears.

Wireless Achievements at Tufts College in Massachusetts.

The transmission of music by wireless with a small amount of power, giving a range of more than 100 miles, so that ships at sea have picked up tunes, has been brought about at the station of the American Radio & Research Corporation, at Tufts College, Mass., of which Harold J. Power is general manager. The mere fact of sending music to the distance mentioned is not in itself a remarkable feat, but by means of a novel method of introducing the sounds in the radiated waves, resulting in articulation and loudness in the waves received, a marked gain has been achieved.

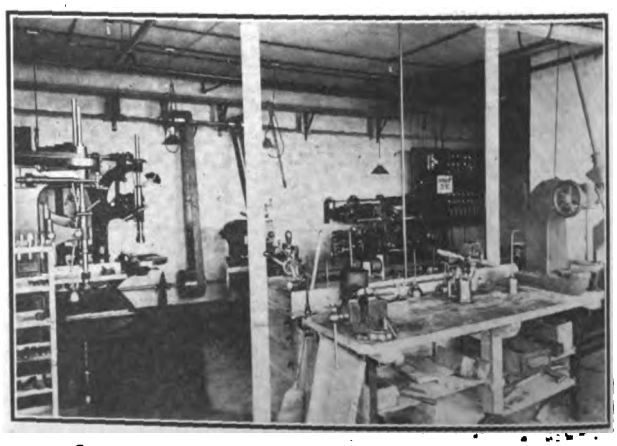
To provide the high-frequency current necessary Professor Power employed an oscillion bulb, the invention of Lee De Forest, of New York.

It is recognized that there are two important factors in the successful transmission of wireless telephone messages. One is the generating of high-frequency currents and the other its modulation in accordance with the voice or the music to be transmitted. It is the latter of these two problems that Professor Power is especially interested in, because the De Forest oscillion is recognized as a perfect means of generating the needed high-frequency current. It has been possible for some time to obtain sufficient power to transmit telephone messages to any distance, but how to introduce the voice at high-power stations in a practical manner, is the great problem of radio telephony, and to this branch of work Professor Power is now devoting much attention. His device for introducing the voice is far from perfected as yet, but successful results have been obtained, from reports thus far received.

Operators at several stations on Cape Cod have reported recording the strains of well known popular airs produced by a phonograph, and in two instances steamers entering Boston reported picking up the music more than 100 miles out from port.

The radio station's equipment is one of the most complete in the country. Students in Tufts College have the facilities at their disposal for experimental work, though the plant is owned by a private corporation. A number of valuable results have been developed by members of the Tufts Wireless Club.

Experimental Room of Wireless Station at Tufts College.



Corner of Machine Shop at Tufts Wireless Station.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Effective Color-Tab System for Light and Power Records.

A simple and effective card contract record with color-tab key system has been devised by the Consumers Electric Light & Power Company, New Orleans, La. This system presents a means of valuable service and assistance for complete and immediate reference to current or past business, affording the particular information necessary to handle any condition that may arise in the course of the day's work. Through a simple symbolic card clip, one is able to trace in systematic form the history of any customer's relations with the company, character of service rendered, installation and operating data, and the like.

A card contract form has been adopted for all classes of electric service; these cards are 4 by 6 inches and carry concrete particulars of different features of the agreement between company and consumer, while the reverse side sets forth the various rules and regulations of the contract. The cards are filed in accordance with city location, viz.: alphabetically under street name and corresponding street number. They are of three different colors—white for regular residence service; blue for electric energy to be supplied to business establishments; and yellow for general contracts for electric power for manufacturing plants.

Each salesman has his particular city territory, and is identified in the office files by a color tab-clip which is used in connection with the contract card. These tabs are blue, red, green, yellow, etc., and, attached to the card

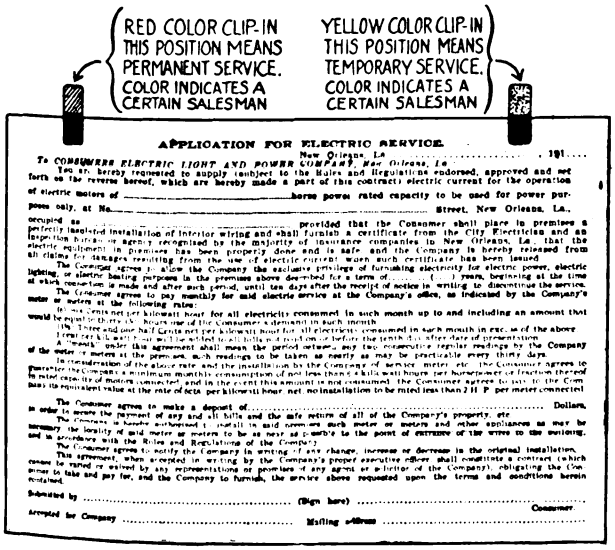

Fig. 1.—Contract Card Showing Application of Color Tabs.

as shown in Fig. 1, are readily located in the file at a glance. Thus the name of the salesman securing the business is always available without necessity for further reference.

The position of the tab-clip on the card also carries a certain significance relating to existing conditions of electric service. The city ordinance provides that electric installations may be effected and continued in service temporarily for three months, during which time an official inspection must be made before final approval for continued service is granted. The salesman's clip on the right hand side of the card indicates the first condition—that temporary service is operative; when final permission is given for permanent service, the clip is transferred to the left side, completing the contract and installation record.

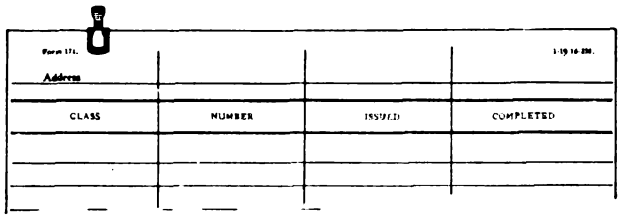

Fig. 2.—Card for Customers' Data With Color Tab Attached.

When electric service has been discontinued for any cause, these particular contract cards, kept in the same file with the operative accounts, are designated with master clip-tabs of different colors, which give the necessary discontinuance data. These clips are attached to the center of the cards and automatically describe conditions along the following lines: Yellow shows that the house or establishment is now vacant; blue, that the customer is using gas; pink, that the consumer is now using competitive electric service; and plain double clips, that service has been discontinued through non-payment of bill. The colors on the tabs are arranged of varying shades so as not to conflict in any way with those employed for the salesmen.

In connection with this contract record file, a duplicate card system, with cards 6 by 9 inches, ruled both sides, is used for the operating department. This card covers the following data: Occupant of house or establishment, installation, meter number, size, type, constant, transformer number, size of transformer, on one side, and on the other: class of service, house number, order issued, and order completed. These are filed alphabetically in accord with street name and number, and each such card represents a contract in the contract file.

When a contract is signed and required meter deposit made, it is turned over by the commercial manager to a record clerk, who makes out the large card with the necessary information for the operating department. This card upon filing is affixed with three clip-tabs, indicating that the final contract is pending, subject to official approval of installation by the city. These tabs of different colors show the period of the monthly terms that final connection is contingent upon the city authority. For the first two weeks of the first month, the card carries three blue tabs, for the second two weeks, three yellow tabs, and so on.

As soon as the necessary permit is received, and the meter and service orders issued, two of the tabs are removed from the card. When such office orders are returned completed, the remaining tab is taken off and the

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card marked with the date of completion of order, etc. This card form, with clip tab, is shown in Fig. 2.

The simplicity and value of this color-tab system is at once apparent. Its distinguishing features render immediately available all necessary data for the prompt conduct of business, and without any searching through miscellaneous mass of records. The commercial and operating departments are linked together with a sure and positive identification system for the avoidance of errors, and one which can be readily handled and kept up to date by record clerks, devoting their time exclusively to this work and becoming thoroughly familiar with its various functions. A glance through the files at any time affords the company officials a concrete guide to these important features of the business.

Unit Wiring Prices in Gardner House-Wiring Campaign.

Unit prices for wiring, in both old and new houses, were agreed upon between the central-station company and local contractors as a preliminary to a house-wiring campaign now being conducted by the Gardner (Mass.) Electric Light Company. Wiring prices in old houses are:

1 outlet	$ 5.00	6 outlets	$17.00
2 outlets	9.00	7 outlets	18.00
3 outlets	12.00	8 outlets	19.00
4 outlets	15.00	9 outlets	20.00
5 outlets	16.00	10 outlets	22.50

Between 10 and 20 outlets $2.25 each; over 20, $2.00 each.

Hardwood floors	$2.00	Cutouts	$0.40
Pipe entrance	5.00	Snap switch	.25
Ground wire, per ft.	.10	Flush switch	1.00
Ground pipe, per ft.	.06	Flush switch, 3-way	1.75
Entrance switch	1.00		

Figure two wiring outlets to cover 3-way switches.

Pipe-entrance charge covers cutouts and entrance switch.

Open wiring in basement is figured as inclosed work in house.

Rates for fixtures in houses already wired are:

Ceiling plates	$0.10	Ground wire, per ft.	$0.10
Wall case, plus switch	.25	Cutouts	.40
Snap switch, no case	.25	Main switch	1.00
Pipe entrance	5.00	Ground pipe, per ft.	.06

Figure on ground pipe from shutoff to rafters.

Figure 35 cents per fixture for hanging, including cords.

Figure in plates on all fixtures with canopies.

Fixtures to be reckoned at schedule prices.

Prices for new work are on the following basis:

First 20 outlets	each $1.25
20 to 30 outlets	each 1.20
30 to 40 outlets	each 1.15
40 to 50 outlets	each 1.10
Pipe entrance	5.00
Cutouts	.40
Entrance switch	1.00

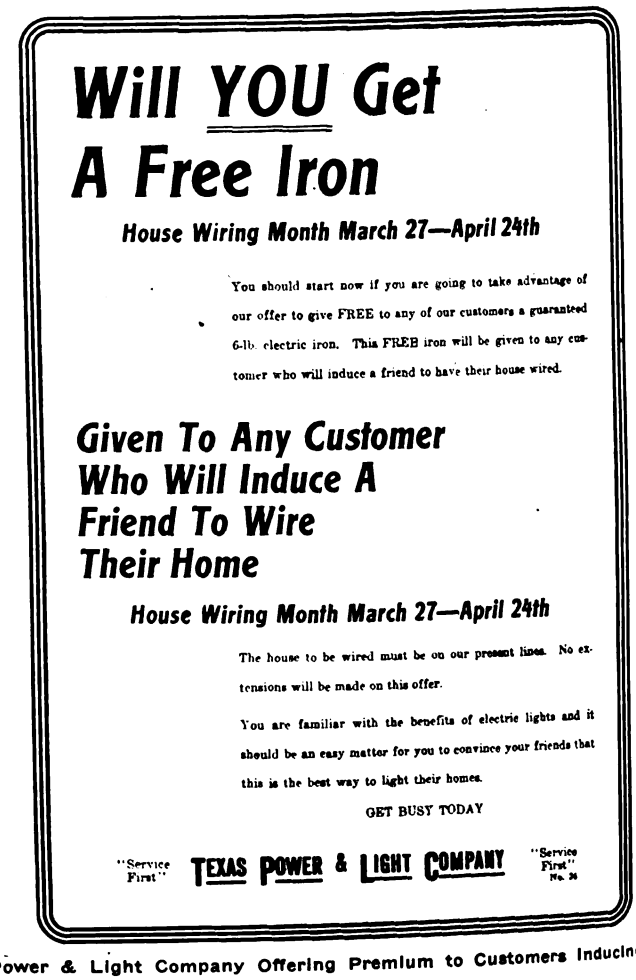
Ground wire and pipe are figured 10 cents and 6 cents per foot, respectively.

Customers make an initial payment equal to 20 per cent of the cost, the remainder being paid in 6 monthly instalments. The company has thus far secured 15 contracts, 26 meters, amounting to a little over $1,000.

Campaign for Inducing Customers to Solicit Business.

As an inducement to present customers to persuade their neighbors to talk electricity to their friends who have unwired houses, the Texas Power & Light Company is offering, during Wire-Your-Home Month, an electric iron free to any customer who will secure a wiring contract for an existing unwired house on the company's lines.

Only one advertisement had been run at the time this was written, yet many inquiries had been received in reference to the offer. The first two ads in the campaign are reproduced herewith.



First Two Advertisements of a Series Published by the Texas Power & Light Company Offering Premium to Customers Inducing a Friend to Wire for Electricity.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

TALKING POINTS FOR CENTRAL-STATION POWER.

By J. H. Schakne.

Electrical drive for industrial establishments of all kinds has so many advantages over other methods of applying power that manufacturers who give careful attention to its merits usually decide in its favor. To operate with the greatest degree of economy, necessitates the use of electric motors to drive all types of machinery. This point being decided, the prospect must install either an isolated plant for generating electricity or purchase service from the central station in the vicinity. A hasty consideration of the condition often leads to a decision which is regretted afterward. The results of a wrong decision have sometimes proved so disappointing that expensive changes had to be made, which might easily have been avoided if the various elements of the problem had been more carefully considered originally.

Sometimes a manufacturer feels reluctant to make a change from a power plant of his own to another not his own, and a long distance away. But an analysis of the situation shows that even in his own plant the responsibility for power supply rests with his engineer as in the central station plant it rests with the central-station engineer. In either case, he must depend upon someone else, and his real control over the reliability of the power supply is no more remote in the latter case than in the former. The daily records of service will prove that the central station is more reliable. The central station's reason for existence is to sell power and if power is off when demanded, it not only loses money, but also injures its reputation, and its chances for securing additional customers.

In laying out a new plant or in calculating the electric power required to operate machines in an existing plant, an error common to those unfamiliar with the application of motors to machines is to overestimate the cost at central-station rates. The requirements of each machine should first be determined and the average requirement of the factory then found by multiplying the aggregate capacity of all the motors by a load-factor determined by experience with machines of similar characteristics in similar industries.

An isolated plant must have overload capacity at least enough to cover the maximum power requirements; to insure continuous service the plant must have enough duplicate equipment to allow part of it to remain idle in case of breakdown. In many cases some provision must also be made for future enlargement of factory with its consequent increased power requirement.

Very frequently when considering the installation of an isolated plant, the inclination is to overlook features of considerable importance. Below some of the points to be considered in determining the cost of present and future power are mentioned:

1. Cost of installation, including prime movers, generators, switchboards and auxiliary apparatus. If insurance against failure of power is required, spare machinery must be installed, that is, capital invested in machinery which will be idle, except in the case of an emergency.
2. Cost of floor space or land for power plant.
3. Cost of fuel and other supplies for operating the plant.
4. Cost of labor and superintendence.
5. Cost of repairs to all machinery.
6. Investment in repair parts.
7. Interest on all money invested on account of power plant.
8. Depreciation on value of buildings and apparatus.
9. Cost of delays in factory operation, owing to shortage of fuel, as just recently happened when the natural gas supply was shut off in many plants in Pittsburgh.
10. Cost of making changes in size of plants to keep pace with necessary factory changes.
11. Cost of operating the entire plant on account of overtime work on a few machines.

On the other hand, the central station makes a business of supplying a large number of diverse interests with electricity enough to take care of all overloads. The diversity-factor, by which we mean the absence of a demand for maximum power simultaneously by all of the diverse interests, enables the central station to operate with higher station load-factor than can the isolated plant. High station load-factor means low investment per unit output. Fuel and other supplies are contracted for by the central station in large quantities; the number of units installed is always enough to allow one or more to remain idle for repairs without crippling the service. A high class of labor is employed and the number of operators is sufficient to insure continuous operation.

After careful consideration of all phases of the problem, the decision, if made according to the evidence, must, with very few exceptions, be in favor of the central-station supply. The arguments in favor of this decision may be summed up as follows:

1. Smaller investment; no capital is tied up in plant equipment and supplies.
2. Reliability of supply.
3. An accident to any one machine localizes the trouble without affecting other parts of the plant.
4. Availability of supply at "all" times and cost of power always in proportion to the amount of work to be done.
5. Ample overload capacity.
6. Good voltage regulation.
7. Freedom to locate factory anywhere and to relocate at any time without reference to power supply.
8. Ability to enlarge factory capacity at any time without expensive changes in the power plant.
9. Decreased insurance rates, owing to decreasing fire hazard.
10. Absence of all noise, heat, dirt and smoke incident to a power plant in a factory building.
11. Ability to work overtime with power charge only in proportion to the work done.

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Talks to Central-Station Power Salesmen

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

This is the third of a series of articles by Mr. Stevens in which he discusses the salient features of power-sales work. This installment deals with the various fixed charges on an isolated generating plant, showing how these charges affect the unit cost of power. Another article by Mr. Stevens will appear in an early issue.

In the preceding article reference was made to the analysis which must be made of the heating requirements of a plant to be changed over to central-station service and to the fuel requirements under isolated-plant operation and when using purchased power.

Initial Cost of Equipment.

If the proposition be one where a new building is to be erected and it is a question of a private plant or central-station service, the initial cost of the equipment is a matter which should receive very careful consideration. It very often happens that the customer's first estimates are based on an elaborate basis, and such as would operate at the highest efficiency. The prices on this equipment must necessarily be high, and the boiler evaporation and steam consumption of the engines, water rates, etc., are such as would give the best results obtainable. However, as soon as competition becomes keen between the other manufacturers of plant apparatus and when the central-station company gets into the field the customer finds that the fixed charges on such an equipment amount to a great deal of money and he gradually cuts down the cost of this equipment and therefore the quality. But, in such instances he very seldom considers that as soon as he cuts down the cost of his apparatus, the efficiency of the same must necessarily go down in proportion. In other words, the manufacturer may originally figure on a 500-horsepower plant consisting of water-tube boilers with superheaters and automatic stokers, compound condensing engines, economizers, etc., and on such an equipment receive certain estimates on the number of pounds of steam to produce a horsepower-hour. He gradually cuts down on this equipment until he is receiving estimates on a plant which may consist of boilers without superheaters and high-speed simple non-condensing engines. The price of this original plant was $80,000 and his estimate on steam consumption was 16 pounds per horsepower. He has now brought the cost of the equipment down to perhaps $40,000, but the chances are more than ever that he has not taken into consideration that while the price of equipment has been going down the steam consumption has been going up in proportion. It is part of the power salesman's job to show him that he has increased his steam consumption 100 per cent while he has been reducing his initial cost.

Fixed Charges.

Interest, Depreciation, Taxes and Insurance.—Under this heading both the private plant advocates and the central-station salesman will usually agree that a value should be given to each item. However, there is usually considerable divergence of opinion as to the percentage of total plant investment each should bear. It is of course highly essential these be given true values and every argument must be used to convince the prospects of the plausibility of the values assigned.

Interest, Taxes and Insurance.—The bearing which the items taxes and insurance have on the proposition are of course dependent entirely on the initial cost of the plant and the local tax and insurance rates. Ordinarily the rates covering boiler, liability and fire insurance will amount to two per cent of the plant valuation. The current tax rates, together with the scale of valuations, can be obtained from local civic authorities.

Interest on investment of course depends on the local money market and the credit of those considering the installation of the plant, five per cent being a common rate in the east. These three items frequently total more than eight per cent of the plant valuation, and represent an expenditure which is largly eliminated if power is purchased from an outside source.

Fair Profit.

In connection with the plant investment there is not only interest, depreciation and taxes to be considered in the fixed charges, but there is very often another item which is sometimes overlooked, and which, in many plants, has an important bearing upon the yearly cost.

This item of "Fair Profit" represents value of capital over the normal or banking rate of interest to a growing concern if invested directly in the business itself. For instance, a growing manufacturer may be making 20 per cent on the money invested directly in the business operations. Owing to its rapid expansion, he may have urgent need of all the capital that he can raise. If this same manufacturer should invest $50,000 in a private plant at this time, when central-station service can be purchased at approximately the same cost per kilowatt-hour as the cost by private generation, he should not only charge five per cent interest in his yearly costs of making power, but he may properly charge off 15 per cent per year under the heading of "fair profit."

This manufacturer necessarily wishes to invest every dollar he has available in that part of his business which is lucrative. The power plant is only a means to generate power and not a necessary means if central-station power is available at reasonable rates. The money invested in it is fixed, and bankers regard it as a poor basis of credit as it is not quickly negotiable. Also, as such investment charges are fixed, they have a greater effect upon the cost per unit on the yearly output than most any other element entering into the cost of production.

The ratio of investment between private generating plant and equipment for operating on central-station energy is roughly seven to one. Hence, if central-station service is used, six-sevenths of the capital, which might be tied up in fixed investment, is available as working capital, on which a reasonable percentage of profit may be earned.

Depreciation and Obsolescence.

The life of any plant is dependent not so much by when it bcomes physically useless as by when it becomes obsolete, at which time it should be replaced by a more effective and economical source of power. Therefore, not only depreciation but also obsolescence must always be taken into consideration. This is usually a bone of contention, and care must be taken to impress upon the prospective customers its true weight. Users of internal-combustion engine plants will usually give a fair value to this item, but its importance is apt to be overlooked by the users of steam-driven plants.

It is common practice for a manufacturer to allow five per cent of the total cost of investment to this item of

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"depreciation and obsolescence," and at the end of a few years he may entirely discontinue making any charge. Ten per cent is a fair figure to allow for interest and depreciation, especially when we consider the rapid strides made in the past ten years in boiler and prime movers, and the modern prospective manufacturer will usually accept this as being a fair and conservative figure.

Operating Costs.

Under operating expenses stress may be laid on the fact that the cost of labor and fuel have constantly increased for several years, and that under most favorable conditions no decrease may be expected, while central-station rates for energy have very materially decreased in the past few years, and it is only reasonable to suppose they will continue to do so. This point may be borne out by a comparison of curves showing the increased cost of fuel, the increased cost of labor, and the decreased cost of central-station service covering a period say of ten years.

Executive Attention.

Plant supervision or executive attention is very frequently overlooked, and still it has a direct bearing and a certain value which should be considered as part of the labor cost.

The manufacturer and his staff should direct all their attention to making and marketing their product and should not have to devote valuable time in the supervision of a power plant. This is a responsibility, and a serious one, that is assumed through the installation of a private generating apparatus. The executive's time has a definite value and due charge should be made against the operation of the private plant for such of his and his assistants' time as it requires. This does not necessarily mean that the salaries of these individuals would be decreased if central-station service is adapted, but their time would be devoted to other branches of the business where it would be of more direct value in producing profit.

When central-station service is adopted this responsibility is placed with others who are highly specialized in this particular work and whose business and future is based upon their capacity for rendering a reliable and constant supply of power.

This is an age of specialization. If one wants the best service of any kind, he goes to the specialist. The same applies to users of power. If they wish a reliable, constant and cheap power, it should be purchased, if possible, from those who have specialized in that particular line.

Value of Space Occupied by Plant.

In bringing to the manufacturer's attention the true cost of installing and operating a private plant, there is the cost of creating space and value of space to be occupied by the private plant. Many times the plant is located below the regular basement of the building, and therefore this space is the most expensive to create. In some localities the space which a plant would occupy is of great value, so great in fact as to almost preclude its installation, but in all instances the space occupied should be duly considered. The housing of a plant has a definite value and in most cases could very profitably be used for business purposes.

It is hoped the foregoing superficial treatment of a very broad subject, each sub-head of which would require much space to properly treat, will bring out some points which will be of help to those engaged in selling power. There are many other arguments which can be used and advantages in favor of central-station pointed out; such as, ability to increase factory capacity at any time without extensive changes in the power plant; availability of power supply at all times and cost of power proportional to work done; ample overload capacity without additional investment on the part of the manufacturer; absence of the fire hazard and of vibration, noise, smoke, heat and dirt occasioned by a power plant, etc.

HOW ONE CRACKER BAKERY TURNED TO ELECTRIC DRIVE.

Many Advantages of Central-Station Service Demonstrated When Steam Plant Was Destroyed by Fire.

One of the model cracker bakery plants of the country is the new plant of the Grocers' Biscuit Company, Louisville, Ky., where every wheel that turns is turned electrically. Aside from the fact that there are some interesting points which can be made in connection with this particular power sale, the statement is important in another way. All that is necessary to substantiate such an assertion is to quote from John J. Jacklon, superintendent of the plant, who stated:

"Out of a thousand or so first-class cracker bakery establishments in the United States, probably 800 of them are still run by steam."

This fact alone is enough to make the proposition something that the power salesman should look into. Undoubtedly those 800 remaining plants are located where they are available prospects for "converting" if the central-station missionaries would go out and seek them.

A cracker bakery, it may be said, is a specialized proposition. It turns out a product or a variety of products different from bread. It works in sponges more extensively than in doughs; it turns out small cakes, cookies, snaps of one type or another, soda crackers and oyster crackers, cracker dust, etc. Sweet goods constitute rather an important part of the output. Except for this, however, its machinery, oven, heating and similar requirements are not greatly different from those of a bread bakery. An engineer who is familiar with operations in one, would be able to handle them in another without a great deal of study.

The Grocers' Biscuit Company plant in Louisville was ten years old when fire practically wiped it out. It had been from the outset steam operated, probably for the reason that when it was equipped electrical progress had not reached the stage where power salesmen were especially active in closing contracts. From time to time, however, as the years passed, representatives of the Louisville Gas & Electric Company, or its predecessors, had gone over the ground with the superintendent of the plant and had made proposals for its electrification to the owners.

Now, as most power salesmen know, a bakery is a rather difficult proposition for conversion when there is nothing happening to bring matters to conclusions. Any bakery plant which operates with power requires steam for various purposes. In the winter the plant has to be heated; in some of the processes it is customary to spray the product with steam while it is in the ovens; steam is required or at least most used to heat water, of which large quantities are used in a plant like the Grocers' Biscuit Company. In addition steam serves better than most other means for cooking of the icings which are extensively used, the syrups and the fillings and the jellies. Many of the larger establishments make their own flavorings and steam is useful there.

So where a plant is equipped and operating, engine installed and shafting and coupling up and running and the whole establishment organized on a steam-driven basis, the first cost of changing over to electricity has been a stumbling block for many a power salesman. That was what it proved for the power salesmen of the Louisville company in this case. However, the management was very much in favor of electricity, was convinced, as it were, of the greater desirability of that character of power, but balked at the first cost of making the transition.

Files of the Louisville company show that a number of separate propositions had been made for changing the

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system over. Interviews with Mr. Jacklon and officials of the company disclosed that the company was fully aware of the disadvantages of the old-style method of operating with steam. However, it was at length determined to continue on the existing basis for the present, although it may be observed that the objectionable features continued to make themselves noticed.

And this is a point which is worth consideration and following up where the power salesman has once figured and specified an electrification of a job. Once he has dilated on the superior merits of the electric drive, its absolute cleanliness, economy, convenience, dependability, etc., and compared these points with conditions as they are, he can go away and be sure that the old equipment will keep on working in his interest. In a cracker factory, for instance, every time a belt broke and fell into a broad ribbon of dough, destroying it for normal uses, everybody around would have an object lesson in the advantages of electrical drive. Every time some man's shirt sleeve caught on a pulley set screw and broke an arm, every time the engine failed, every time an overhead oil cup dripped on a tray of finished goods, every time any of the various minor casualties which are always happening in a steam power plant occurred, electricity would get the benefit.

This was the situation at the plant of the Grocers' Biscuit Company when the fire destroyed it. This is not to say, and it would not be fair to say, that things had to wait on that fire. In fact, it is morally certain that electricity would have prevailed anyway in due course. But the fire did come and the answer to the fire was the new plant and its electric drive equipment. After the fire the Gas & Electric Company salesman, A. S. Witmer, who handled the transaction, did not have much to do but to go down and sign the contract. He had already done the selling.

The company fitted out a temporary plant adjoining the sister plant, the Grocers' Baking Company, and equipped it electrically. Then it set to work on rebuilding the old plant. It was made larger and provision was made for expansion later on, and the plans specified electricity all the way through. If it had needed anything to convert the company to electricity the experience in the temporary plant would have done it.

Nor was the proposition altogether one sided. One of the pieces of equipment left from the fire without suffering any particular damage was an almost new 200-horsepower Corliss engine, which is still on hand and being taken care of, so that it could be put into service if it should prove necessary. Another part of the equipment includes two 100-horsepower boilers. It is obvious that these constitute the nucleus of an isolated power plant. In all probability, if such a plant were to have been installed, it would have been an isolated electrical plant, but the fact remains that the equipment, apart from the electrical installation, is on hand ready to use.

The boilers are used alternately and in the winter months operate nearly to capacity for the uses of steam which have been mentioned. In the summer months, however, a 30-pound pressure is sufficient to take care of the demands of the plant. This, of course, is an advantage in favor of the central-station service, although not as great as might be anticipated. In the winter no more fuel would be required to operate the engine than is now required to keep up a sufficient head of steam. It would take from 70 to 80 pounds of pressure to operate the engine, it is stated. This is more or less incidental, however, and probably would be offset by the cost of employing an engineer and fireman under normal circumstances.

The connected load of the Grocers' Biscuit Company is 174 horsepower and there are altogether 23 motors, ranging in horsepower from 3 to 20. It is a unit drive proposition throughout, with the exception of a few icing beaters which are in constant use and which are grouped and driven by a five-horsepower motor.

Several of the motors, it may be noted, are incidentally, over-size. For instance, two cake mixers of equal capacity stand side by side. One is operated by a five-horsepower motor and its twin by a 7.5-horsepower motor. The purpose is to provide a sufficient amount of power to take care of a very stiff batter, which uniformly goes into the more powerful mixer. In several other cases, at the suggestion of Mr. Jacklon, oversize motors have been installed, he preferring to operate with a cool motor below capacity than with a heating one nearly or at full capacity. All the motors are three-phase, variable-speed, which is in several cases further controlled by additional attachments.

Mr. Jacklon is a strong booster for electric power and for the unit drive. He stated to the representative of the ELECTRICAL REVIEW and WESTERN ELECTRICIAN that he would be glad to have any central-station power salesman refer a prospective baker to him. And the power man may be sure that he will give the electric drive a good "character." He enumerated some of the reasons why he preferred the electric drive, from the operating angle alone, unit drive being considered.

They included safety gained by the absence of belting, set screws and shafting, the motors in this case being uniformly direct-connected. Gain in cleanliness—belting accumulates dust, shafting means grease and oil, generally overhead, and thus likely to fall into the dough. Dependability—with the steam equipment something was frequently going wrong. Belts broke, the engine slowed up under low heads of steam and there was loss of time. Uniformity of speed—under the old system there was frequent variation in the speed, according to the load put on the engine. Suppose a batch of cakes were going through the icing process. Passing through the vessel of icing with the steam drive they accumulated more icing than desirable when the speed slackened.

From the economical standpoint there is the usual long list of advantages to be cited in favor of electricity. Detailed figures are not available, but it is stated at the plant without hesitation that the unit cost of production on any basis whatever is lower under the present system of operation than was the case before. In the first place it used to be necessary, under the old regime, to keep an engineer on duty all night long in order that he could get up steam for the sponges at 3 o'clock in the morning. Now the night watchman keeps up the small amount of steam required without trouble.

Cost of Electric-Truck Operation.

The accompanying figures on the cost of operating an industrial electric truck were presented by C. E. Ogden, Cincinnati manager of the Walker Vehicle Company, at a recent meeting of new-business managers of Ohio companies:

	Per Day
Depreciation at 10 per cent	34 cents
Interest at 6 per cent	15 cents
Tire renewals	14 cents
Battery renewals, lead cells	40 cents
Battery renewals, nickel-iron cells	28 cents
Electric energy at 4 cents	20 cents
Repairs at $10 per year	4 cents

These figures were based on 300 days per year use of the truck. The electric industrial truck referred to in Mr. Ogden's paper is considered the successor to the hand truck, and has found a wide field of usefulness in railway terminals, on wharves and in many factories.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING ABOARD SHIP BY THE ONE-WIRE OR SHIP'S RETURN SYSTEM.

By George R. Strombom.[1]

The one-wire system of wiring aboard ship is commonly called "the ship's return" and is not a new system in the eyes of marine men, but is rather a traditional wiring system considered preferable to any other from an economical standpoint. In writing upon this subject, I particularly refer to the "tramp" variety of steamships from 1,500 to 2,500 registered tons and of British build, as I have not had experience enough with other foreign-built vessels to permit me writing of them. I have as yet to see the American-built vessel that has adopted this system, although I have heard of a few.

In construction which takes the form of rewiring, we use lead-covered wire as a rule. We need not depend on the sheathing as a conducting agent, as a good ground is generally available at all points with but few exceptions, and for that specific reason the hull has been selected to perform the function of a return conductor which, in the other case, would fall to the sheathing. We do, however, in some instances, use the sheathing as a conductor, but that is the exception to the rule. Its chief function is to protect the insulated wire from water, although, from a mechanical standpoint, its protection is rather inferior compared to our ordinary conduit systems.

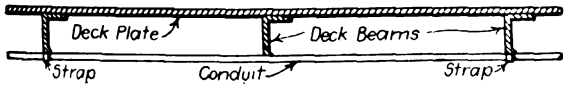

Fig. 1.—Run of Conduit Under Deck Beams With a Strap on Every Second Beam.

In some cases the wires are boxed in and this is considered sufficient protection, but in places such as the between decks and coal bunkers, I prefer to have them run in conduit. This is the safest way and as cheap, especially if it is a new run.

When running lead-covered wires we space our straps from six to eight inches, and when consideration is taken of the fact that the steel hull must be drilled and tapped for practically every strap, you will find it expedient to run a conduit line under the deck beams with a strap on every second or third beam, as shown in Fig. 1. This saves the drilling or burning of holes in the deck beams which would otherwise be required, as in Fig. 2, as it is neither permissible nor practical to loop the wires under the beams, as in Fig. 3.

The insulation of a single wire in this system is the same as for 110-volt circuits, and in adopting this system the total insulation is cut in half. Therefore, a 65-volt generator has been the standard machine used, the cut in voltage corresponding somewhat in the same proportion to the cut in insulation value.

These generators are not equipped with voltage regulators or rheostats, as there is generally only one machine on the ship, and this seldom exceeds its rated voltage and when it does it is governed by means of the throttle. Generally these ships are equipped with carbon-filament lamps and can withstand considerable excessive voltage. The positive terminal of the generator feeds the switchboard and the negative is permanently grounded, as shown in Fig. 4, to the hull.

Consider a load of twelve 32-candlepower carbon lamps.

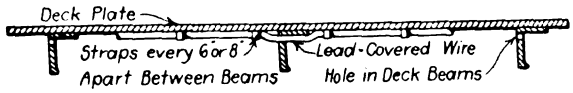

Fig. 2.—Method of Running Conduit Requiring Drilling of Holes in Deck Beams.

In our standard 110-volt system a No. 14 B. & S. wire would care for this load, but as a 32-candlepower lamp at 65 volts takes close to two amperes, we must allow a No. 10 B. & S. wire, leaving a margin of one ampere for rubber insulations and six amperes for other insulations. When a conductor with a greater carrying capacity than that of a No. 12 B. & S. is required, we use stranded wire. English contractors never use solid wires aboard ship. Solid wires are used for bell work, however.

In grounding this system each lamp, as shown in Fig. 5, has its own individual ground (with some exceptions) the object being to reduce the amount of wire used. This can be done in almost all cases as a good ground is generally always available. In cases where it is of advantage to have two or three lights on one ground this is done, but not otherwise, for, should the ground connection corrode off, which it often does, all lights on that ground would suffer, as in Fig. 6, and not only one, as would be the case in Fig. 5.

We experience great trouble in our efforts to keep these ground connections intact, as the moist ocean air and salt water take great pleasure in attacking them and oftentimes it does not take long before their victory is won. It is customary to red-lead and paint the ground connections, but it does not in any marked degree prevent corrosion.

In considering the possibility of short-circuits, it will be well to remember that in such places as the state-

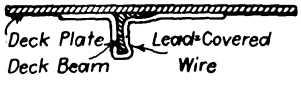

Fig. 3.—This Method of Looping Wires Under Beams Not Permissible.

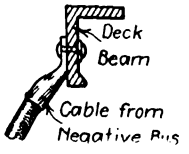

Fig. 4.—Negative Terminal Grounded to Hull.

rooms, chart room, pantry and wheel house, molding is often used, and in that event single-braid or preferably double-braid wire is used. It is a common occurrence for water, through one cause or another, to penetrate the molding and attack the insulation, the chief of these causes being leaky decks. Nine times out of ten it is salt water and it does not require any great length of time before the insulation is penetrated, opening a new and shorter path for the current to take. The greater the amount of

[1] Marine electrician, Hudson Navigation Company, New York, N. Y.

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current passing through this new path, the dimmer the lights controlled or rather fed from that particular line.

It is obvious that the current passing through this path causes heat to develop, which will, if the current be heavy enough, finally char the insulation and molding, the danger of a fire being great. This is what might be called a

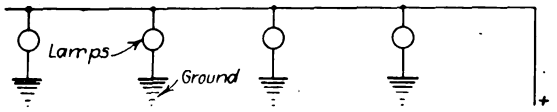

Fig. 5.—Individual Ground for Each Lamp.

leakage condition, as it is not a "dead short" and does not blow the fuse.

The only means we have of knowing when such a condition exists is by the dimmed condition of the light or lights, characteristic of that particular trouble. The dimmer the lights the greater is the advancement of this leakage condition. It is, therefore, advisable to use lead-covered wires at all times throughout the installation and reduce the chances of this condition to a minimum.

In places where the wires are subject to mechanical injury, they should be either boxed in or, better yet, run in a conduit, as the lead sheathing is easily punctured and short-circuits are generally the result.

I have often gone aboard a ship and found copper wire of no mean size substituted for the fuses, and when asking the reason for this practice, the invariable answer would be "The fuses blow out too often," which amounts to a case of "A poor excuse is better than none."

Considering the system as a whole, the best that can be said of it is that it is the simplest as far as construction goes, it has no complications and but one wire in the majority of cases to keep your mind on, as in ordinary cases, if no switch is required, the ground wire is but six or seven inches long, just long enough to enter into the fixture and grounds right alongside of the fixture block.

The system has not been adopted in this country as it is considered an unsatisfactory installation, is always full of small inconveniences, has ground connections frequently corroding off, current losses in cases of water-soaked molding and insulation or punctured lead sheathings, and therefore unsatisfactory lights, due to the cause mentioned above. The only redeeming features I can personally find with the system are its simplicity and the initial cost of installing is a trifle below that of our standard 110-volt system with conduit.

One might suggest that BXL cables be used to insure proper protection against mechanical injury to the lead sheath, but in that event it would prove just as economical to use conduit throughout, running only one wire in same, of course. Marine electricians have not proven themselves very anxious to work on these systems, as it is generally with a long face that they start off for one of these jobs (the writer, five or six years ago, being one of them).

I believe there is little fear of us losing our good old,

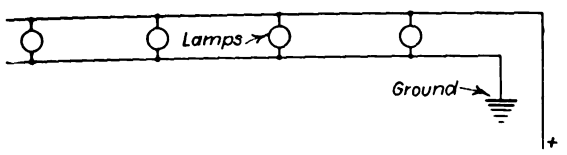

Fig. 6.—Common Ground for All Lamps Not Desirable in Ship Wiring.

tested 110-volt multiple system aboard ship. It has proven its worth and any ship that is fortunate enough to get a water-tight conduit system installed throughout, with the never-failing 110-volt, direct-current generating set, equipped with rheostats and with Mazda lamps in every socket, has a system that requires some going to beat.

Among the Contractors.

G. A. Hill & Brother, proprietors of the Electric Shop at Maysville, Ky., have sold their business to the Maysville Gas Company, G. A. Hill going to Detroit, Mich., and E. H. Hill to Springfield, O., where they will engage in the electrical business.

The Tuohey Company, Springfield, Mass., had an attractive electrical booth at the Good Homes Exposition held in that city. A large assortment of portable, bracket and hanging lamps and a number of domestic appliances were shown. The Eureka vacuum cleaner and electric washing machine were features.

The Olson-Boettger Electric Manufacturing Company, 200 West Third Street, St. Paul, Minn., reports that its present volume of business is taxing the company's facilities, and that the outlook for future business is very promising.

The Johnson Electric Company, Cincinnati, O., has obtained the contract for furnishing electric incandescent lamps for the state capitol at Frankfort, Ky.

The Robert B. Randall Electric Company, 1315 Walnut Street, Kansas City, Mo., was awarded a $12,000 contract for the wiring of the new German Hospital, at Kansas City, the work including elaborate signal systems for three buildings, telautographs, interphones and light and power wiring. There will be about 25 motors, ranging from 0.5 to 45 horsepower, not included in the contract. Original provision was for a power house, but plans now call for use of central-station energy.

Ralph Melzard, Swampscott, Mass., has been awarded the contract for electric installation in the new Public Library Building. He recently wired the Neighborhood Club, Phillips Beach and large residences in the Magnolia summer resort section.

The Frazer & Morrel Company, Lexington, Ky., has been awarded the contract for the electrical work in the new Gilcher Hotel which is under course of construction at Danville, Ky., and which will cost approximately $100,000.

The Central Electric Company, San Francisco, Cal., has moved from 618 Mission Street to larger quarters at 175 Jessie Street, and has added a small stock of fixtures to its business. This company recently secured wiring contracts for the Women's Athletic Club, a four-story building.

Kriwanek Brothers, Denmark, Wis., have increased their capital stock from $25,000 to $50,000 and the company will engage in electrical and general contracting.

The Board of Education, Trenton, N. J., has awarded a contract for the installation of new electric lighting fixtures in the Junior High School to M. Fleron & Son, Trenton, N. J.

The Florida Electric Machinery Company, Lakeland, Fla., has secured the contract for the wiring of the new power house to be erected by the municipality for electric light and water supply.

George E. McGrath, of Monmouth, Ill., has been awarded the contract for the electric fixtures for the new Monmouth City Hall on his bid of $1,065.

The Common Council, of Newark, N. J., has awarded the contract for the installation of a new electric lighting system in the City Hall to Harry R. Jackson, of Newark, at a cost of $15,773.

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A Unit Time-Card and Pay-Roll System

By George W. Hill

This article, the sixth of this series by Mr. Hill, emphasizes both the desirability and limitations of unit cost data, particularly labor costs. Valuable suggestions are given for keeping such costs accurately and conveniently and a form is described that has been found entirely satisfactory. Pay-roll records are also discussed. As usual, Mr. Hill includes considerable philosophy on business success. In subsequent articles Mr. Hill will discuss other features of accounting for electrical contractors.

Owing to the great amount of gambling in estimating, there has been a decided effort on the part of those who are interested in better conditions to find some means of eliminating it, and many different time cards and pay-roll blanks have been designed in the hope that it might be possible to arrive at a unit cost of installing certain materials under similar circumstances. It is admitted that, no matter how carefully selected, there will never be two jobs which will be exactly alike. While they may be strikingly so, there will be some phase of one job which will make it somewhat different from the others. It may be the weather or it may be the manner in which the material is delivered on the job, or it may be in the men who do the work. There are so many different elements entering into labor costs that there might be a vast difference in the cost of two jobs which would appear almost identical. The only method which has been suggested to date is to keep a comprehensive record of all work performed, both as to the whole job and parts of each particular job, as to material installed in a given length of time at different seasons of the year, and different kinds of material intended for the same purpose on different classes of work.

The writer has been confronted with the question many times in his travels among the contractors, "What is the average cost to install one-half-inch conduit in steel and concrete construction?" or "What is the average cost of stringing 1,000 feet of wire in a knob-and-tube residence job?" These are truly difficult questions to answer, for while there has been an effort made to ascertain this information, it has been so scattered and such a wide difference of opinion has developed as to how it should be obtained, that there has never been anything obtained which would in the opinion of the writer answer the purposes of all contractors.

So it remains in the case of obtaining the unit cost as it does in obtaining overhead percentages. It's up to the individual contractor to obtain this information based upon his own experience and not upon the experience of others. There are no doubt men in the contracting business who can by certain good management secure a much lower unit cost than others, and while the average would be of some assistance to the contractor, if he could not obtain

PAY ROLL

Starting Month	Day	Year	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total Hours	Rate	Non Prod. Labor	Productive Labor	Total Amount Earned	Draws	Due	Received Payment

*Use ten lines of double space for Non-Productive Labor

Pay-Roll Sheet Which Can Be Used for Either a Collective or Individual Pay Roll.

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the same results by his management it would be of no advantage to him. He might figure a job according to the average and the actual results would prove vastly different owing to his management, to the class of men he employs, to the inefficiency of the superintendent, or to many other conditions which existed in his business which did not exist in the business of another contractor. What he should have is his average cost based upon his own experience.

In the absence of anything like a comprehensive statement it has been suggested that each contractor obtain results from his individual experience. A unit time card has been designed which, if properly operated and a comprehensive record of the results obtained is kept, will prove at least a guide to the contractor in figuring future work; however, this cannot be absolutely relied upon, for while one man will do a given piece of work in a given time, another man will require more or less time.

The purpose of this card and the record of the results is to squeeze as much of the gambling out of estimating as possible and to give the contractor some idea of what it is going to cost him in the future to do certain pieces of work or to install certain units of material under certain conditions, knowing of course that there will never be two jobs just exactly alike.

A reproduction of this card is given herewith. By carefully observing it you will see that the number of the job is given, the name of the job, the hour when work was begun and when finished, a check space for the bookkeeper or timekeeper, a space for entering the amount of work performed or units installed, and another space for the name of the helper. This card will not only establish a unit cost but has a tendency to specialize the men in the employ of the contractor, for it will be observed that certain men will do a certain class of work much faster and better than certain other men, and without the knowledge of the men the contractor is enabled to specialize his employees. In case it develops that John Jones can install more half-inch conduit in concrete construction than any other man employed, then it would seem most natural that the contractor would give this man all of this work or as much of it as was possible for him to do. He would no doubt be better satisfied, for it usually follows that a man will do more of the work which he likes than that which he dislikes, and harmony among the men is more likely to exist. And let me say to you that harmony is as essential to good results in labor as it is to good music.

This card is designed to take the place of cards designed for a similar purpose, which have been produced with the hours of the day and the subdivisions of the hours into fifteen-minute spaces printed on the margin of the card. The men object seriously to the cards with the time of day printed on them, as they claim that this is too much like punching the clock. While the card represented here produces the same result, it does it in a slightly different manner and does not seem to be so obnoxious to the men required to handle it. The fact that a unit time card is kept on the journeyman and not on the helper does assist in obtaining the unit cost, for the helper's time must necessarily be figured in the unit cost. The fact that a certain amount of labor is required to do a certain job does not answer, but the records must be so kept that it will show the actual amount of labor required to perform the whole job and the unit of material entering into the job. This record will then be a guide to a contractor in estimating jobs which are similar; I say similar because there are no two jobs just alike.

With this record it is possible for the contractor to estimate very closely the amount of labor which will be required to install certain units of material under certain circumstances, and while the records will possibly never be the same on any two jobs it will undoubtedly have a tendency to throw considerable light on the cost before the job is taken, instead of doing, as many of us are more or less inclined to do, look the plans carefully over, measure up all the material and check it over several times to be absolutely sure that we have the proper survey of the material, and then say when it comes to the estimate of the labor, "Well, this building is 150 feet long, 80 feet wide and four stories high, and it should, on a good guess, require Tom, Dick and Harry about 30 working days to do this work."

Right here is where the contractors cause each other to look like a bunch of horse thieves when they hand in their figures on the same job. This is what causes the customer and the architect to lose confidence in the electrical contractor as a business man. They simply see as plain as the nose on a man's face that there is something radically wrong, and the only conclusion is that they are either gambling on the proposition and do not know their costs, or they have gotten together to hand this job to one certain contractor, while as a matter of fact it is simply due to the gambling element which is being injected into the electrical contracting business rather than an effort to eliminate it.

There will always be a certain amount of gambling in the contracting business, owing to the very nature of the business, but instead of men in the business making the conditions worse they should be making a decided effort to get on a business-like basis, where they will have the confidence of their customers as well as the jobbers and others who sell to them. Let us get down to brass tacks in this business, like the men do in other branches of industry. Let us find out what it costs us to put in a foot of half-inch conduit in concrete construction, what it costs us to install certain outlet boxes under certain circumstances and let us base our future figures on our own experience and see if we cannot get somewhere near a business basis. There are hundreds of men who are doing this and they are successful; but while we find one hundred who are doing so we find a thousand who are not doing it. I want to say again, and this will bear repeating, "There is a big difference between making a professional success of your business and a business success of your profession." Repeat this and think it over.

If you insist upon gambling, why not get into the horse-race business. It's more sport and you won't lose any

DAILY TIME CARD

Workman ..... Date 19

Job No.	Job Name	Hours	Quan.	Hours	Lb.	Material Installed	Assisted by

Workman's Daily Time Card.

more money on horses than you can in gambling in the contracting business, and you will have a lot better time spending your money.

In this connection I desire to call your attention to a pay-roll blank, which was designed by C. A. Walker, of Rock Island, Ill., and which is in the opinion of the writer one of the most unique and satisfactory records ever produced for the purpose of recording men's time and their settlements for wages.

In many cases the contractor does not separate his productive from his non-productive labor, but simply figures.

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it all in as the cost of labor. This is not a fair basis, for in almost every case there is a certain amount of non-productive labor performed by the men which cannot be charged to any particular job, but which must be thrown into the overhead or operating expense and spread over the entire amount of business done by the contractor in the overhead percentage added to the cost of productive labor, material and other costs.

It will be noticed by closely examining the reproduction of this pay roll, that this blank may be used for either a collective or individual pay roll. It has been found desirable in many instances to keep each man's pay roll and settlement sheet separate, for in case this is not done when settlement time comes or pay day arrives, and the men come to the office to sign a receipt for their pay, they have the opportunity of seeing the settlement sheet of other men, who by the way may for good and sufficient reasons be receiving more money than others, and in very many instances when others find this out they cause some disturbance. I have known of many a good union man being brought up on the carpet at the union for drawing more money than other men working with him. This should not be an offense, but nevertheless it is so considered and for that reason I have always advocated that it is better to keep each man's time and settlement on a separate sheet, for when he comes to draw his pay the book is opened to his name, and he simply sees his own settlement and not that of the other men.

If this pay roll is to be used as a separate record for each man, then the man's name is written on the line at the upper left-hand corner, and the date that he begins work for the concern is recorded under the heading "Started" where the month, day of month, and year is written in the three spaces provided for that purpose. After thus taking up the headings as they appear from left to right, it will be seen that the first seven spaces are for the days of the week, the eighth is for the total hours, the ninth for the rate per hour, the tenth for the amount of non-productive labor, the eleventh for the amount of productive labor, twelfth for the total amount earned, the thirteenth space is left for recording any amounts which may have been drawn in advance of the pay day, and the last heading is for the amount due after such deductions, if any, are made; the final wide column to the extreme right of the pay roll is space provided for the workmen to sign a receipt for their settlement. Some men claim that it is not necessary to keep such a comprehensive record of time, but in face of the laws which are being enacted in nearly every state in the union with relation to labor hours, settlements, etc., an employer cannot be too careful of his labor records.

By carefully examining this pay-roll blank, it will be seen that there is a double space for the hours' work performed each day. The top space is for the non-productive labor, the bottom space for the productive labor and, since we have a column for the productive and non-productive labor cost, it is an easy matter to add up these columns and get the net result, which by the way might surprise some who have not been keeping such records. It may develop that their overhead would be considerably more than they have previously figured when they come to know the amount of non-productive labor which cannot be charged to any job, but is a part of the general operating expense.

These sheets may be punched and kept in an ordinary post binder of standard size, and they will make a valuable record for the contractor, as well as for the inspector who may call any day and desire to see such a record.

Convenient Electrical Key for Electrical Inspection Bureaus.

The 1916 edition of the "Electrical Key" has been published by Washington Devereux, Bullitt Building, Philadelphia, Pa. It is a book of 141 well-printed pages, of which the major part consists of a convenient key, comprising 962 separate items for the use of electrical inspection bureaus in advising electrical contractors, wiremen, etc., of corrections required so that installation will conform to the National Electrical Code and municipal regulations. The key affords a ready means of communication from the inspection department having jurisdiction to the contractors making the installation. The numbered items indicate the remedy for defects which are most likely to be found upon inspection of an electrical equipment.

Numerous tables and formulas, resuscitation rules, etc., are also included in the pamphlet. In the latter part of the book 54 pages are devoted to the changes made in the National Electrical Code in 1915 (which were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of February 19, 1916) and to some errors and discrepancies in the 1915 edition of the Code, particularly in its index.

Copies of the Electrical Key can be obtained from Mr. Devereux for 25 cents.

Record for Louisville Wiring Permits.

Electrical construction permits in Louisville, principally permits for installation of electric light wires, are being taken out at the office of the City Building Inspector at the rate of from 50 to 100 a day, more than have ever before been applied for in the history of the office. The principal explanation is that on the first of May the regulation providing for all-metal construction goes into effect and contractors and property owners are trying to get in on the lower scale. Under ordinary conditions the transition to metal conduit work throughout would not, it is stated, have made it necessary for the contractors to increase the price of the work appreciably, but with material prices up it is stated that construction of this kind after May 1 will amount to an average increase of $4 or $5 for each house.

PRACTICAL ASPECTS OF ALTERNATING-CURRENT MOTORS.

Although there has been much written on the subject of alternating-current motors, there has been felt among the ever increasing class of men dealing with the repair and installation of such machines, a need for a concise, practical treatment of the subject that would explain specifically, present-day problems that are continually arising. Beginning with the issue of April 22, we shall publish a series of articles by Justin Lebovici dealing with the practical aspects of alternating-current motors. The early articles will treat of the principles underlying the performance of all electric motors, with a classification and brief description of the various types of alternating-current motors. Subsequent articles will deal with the theory and practice of windings and with the relations existing between the windings and such requirements as output, voltage, speed, frequency, etc., thus enabling the repair man or electrician in charge to meet changed conditions.

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DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Ladle for Use in Soldering.

In rural districts and the smaller towns we find that electricians are not familiar with the use of a ladle in soldering joints, especially when hanging fixtures or making condulet connections. In these cases the work can be very greatly simplified by making a pig-tail joint, and then dipping it into melted solder kept in a ladle on the torch. This

Handy Soldering Ladle.

makes a well tinned and firm, as well as neat joint, and saves smoking up ceilings and walls in places where this would be objected to.

Probably the handiest and cheapest ladle can be made out of a large gas-pipe cap, say one inch to one and one-half inch in size; drill a hole in the side for a rod as a handle, and put on the end of the rod a wood handle from an old file or other tool. This simple arrangement is shown in the accompanying sketch. Such a ladle should be kept on the torch when making soldered joints of the type described, so as to be ready for dipping these joints into melted solder without delay.

Carl W. Newman.

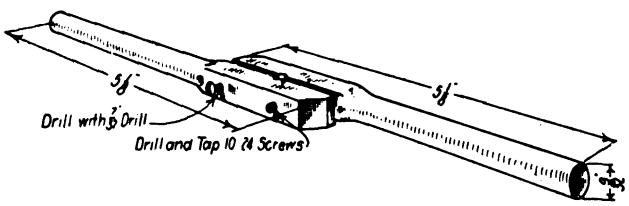
To Locate Conduit in Walls and Floors.

Many times wiremen wish to locate a run of conduit beneath an oak floor, and do not care to take up more of the floor than is necessary. The writer has had excellent success in locating conduit in floors and walls of considerable thickness by the use of a compass. Many wiremen are not aware of this simple test. The approximate position of the pipe is determined and then the compass is moved back and forth across the floor or wall until a position is located where the needle is deflected in neither direction. The conduit will be found to lie directly beneath the compass.

L. E. Baldwin.

Handy Tap Wrench.

A handy tap wrench can be made as follows: Procure two pieces of five-sixteenths-inch square key steel, each a little over five inches long. Turn the handle ends in a



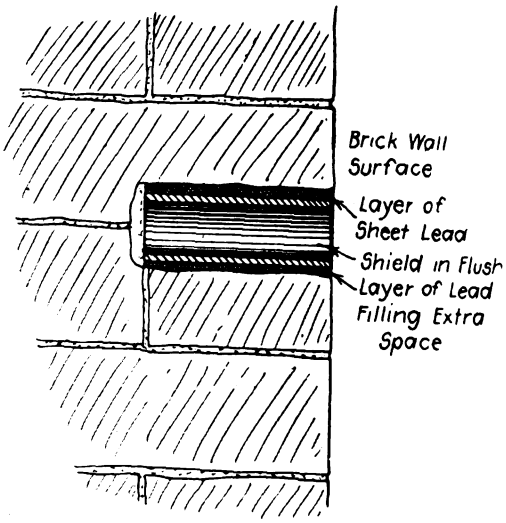
A Handy Tap Wrench Which Can be Used for Several Sizes.

lathe as shown in the sketch. Drill the inner holes with a seven-thirty-seconds-inch drill. Then drill the outer holes and tap for 10-24 machine screws. Screw the two pieces together and find and mark the exact center. File a rectangular notch in each piece at this point for holding the tap. This wrench can be used for several sizes of taps for light work.

F. A. Grohsmeyer.

Tightening a Lead Expansion Shield.

A wireman sometimes uses a larger brick drill than he should for drilling holes for screw expansion shields. Whenever I find that the expansion shields will not hold



Method of Tightening Expansion Shield in Brick Wall.

the screws tight, I wrap a layer of thin sheet lead around the screw shield; this fills the extra space and provides a good tight place to drive the screw into.

M. J. Moriarty.

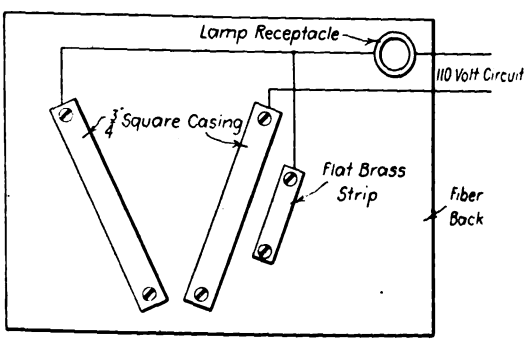
Bolting on Covers of Cutout Boxes.

In fastening a cover on a cutout box or pull box, where the holes in the box are not threaded or for some reasons the threaded hole has to be reamed out, stove bolts can be used. Place the nut right under the hole. Then take a little putty and place it over the nut and around its sides; this will hold it in place. Put cover on and screw in the bolts. Care should be taken not to fill the threads with the putty, however.

Benjamin Swanson.

Handy Device for Fuse Testing.

A very handy device for use in testing cartridge and plug fuses is made as shown in the accompanying sketch. On a fiber board are mounted two pieces of three-quarter-inch square casing, such as is used on fixtures with square



Fuse-Testing Device.

arms. These are so arranged as to form a V-shaped angle. Along one side of one of these pieces of casing is mounted a flat strip of brass. The wiring is as shown, a lamp receptacle being put in series with the circuit. By this arrangement it is possible to test Edison plug fuses between the two parallel strips at the right by merely touching them to the strips. Cartridge fuses, whether of the ferrule or knife-blade type, are tested between the V strips. Thus this arrangement takes any size of fuses up to 400 amperes.

E. M. Raetz.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

CREDIT EFFICIENCY A MEANS FOR THE PREVENTION OF BAD ACCOUNTS.

Pertinent Suggestions to the Merchandiser for Handling of Credits and Credit Accounts.

By W. B. Parker.

This is the fourth of a series of articles appearing in this publication on the subject of credit and collection efficiencies. At first thought it might appear as if this article should have preceded the articles on collections, because a defective credit system is a prerequisite of slow collections. However, the majority of business men, on account of already having bad accounts on their books, are more readily interested in the subject of collections than in preventing a similar condition in the future. For this reason the logical order of publication was reversed, and the writer trusts that his suggestions on handling collections have already borne sufficient fruit to induce a careful study of the matter of sane credits.

Too often credits are granted indiscriminately, merely to acquire a greater volume of business, in the belief that while some losses will occur the profits of the increased business obtained will more than offset the losses, and that, therefore, a careful plan of extending credits is unnecessary. The records of failures reported through the mercantile agencies daily prove the falsity of this theory. "There is a reason" should be the basis of every credit granted, and the conditions on which credit will be granted should be decided on in advance and not deviated from. Intuition and guess work are exceedingly unsafe guides.

Generally speaking, all credits should be based on knowledge of the character, habit of pay and financial responsibility of the applicant. The moral hazard is the greatest in the average mercantile transaction, and it, therefore, follows that character should be given the first consideration. A reputation for prompt settlement of obligations, combined with an otherwise reputable record, would form a safer basis for moderate credit than the ownership of property and a questionable reputation. In fact, it is a serious error to base the granting of credit on evidence of financial responsibility alone.

The next requirement of an efficient credit system is an adequate plan for securing accurate information regarding the applicant. This is usually done through either mercantile agencies, banks, merchants' associations or direct reference to other merchants with whom the applicant has done business. And that little word "either" explains where much of the trouble comes in. Merchants' associations are growing so fast that more and more merchants are coming daily to rely on them entirely for their credit information. This is a great mistake, even in the smaller communities. The mere fact that the applicant for credit has a favorable rating on some mercantile agency's or association's records should not mean that no other steps should be taken to obtain further information. It is, of course, a reasonably safe basis for the granting of a moderate credit in the first instance, where time for further investigation is lacking, but as soon as possible all other sources of information should be drawn on. The fact that the agencies and associations find it necessary to issue revised rating books four times a year or more shows the changes that are constantly going on in the financial circumstances of those rated. The wise credit man will endeavor to have information of credit deterioration on the part of any of his customers in advance of such general publication, instead of finding it out after he has already unwisely extended a long line of credit.

In other words, eternal vigilance is the price of credit safety. Even in handling a comparatively small volume of business the use of a card system for recording credit information is advisable. The key ratings used by agencies and associations should be copied on the cards and notes made of all other information received, so that a glance at the card will show the agreement, or lack of it, among the various sources of information. Where a card system is in use in the handling of collections the reverse of these cards may be conveniently used for these credit notations.

When deciding to grant credit to any applicant the maximum of credit that is deemed safe to extend should be decided on, and this amount should be entered on the credit card. The amount should depend to a large extent on the normal requirements of the customer for the goods dealt in, as well as his income. In the retail field, for example, a man with an income of $100 a month might be allowed a maximum of $50 a month for groceries and meats. It would be very poor judgment, however, to allow his wife to average such an amount for dress goods. When a merchant encourages or allows a customer to purchase goods on credit to an amount beyond his ability to pay without hardship he is almost surely placing an account on his books that will give him much trouble if not actual loss.

In this connection it should be noted that the matter of the granting of credits should be handled by one man only. In the case of a partnership or company one of the firm should take the entire responsibility of this end, if an experienced credit man is not employed. In no case should a matter so important as this be left to the judgment of a clerk or other employee.

The lack of proper methods in the granting of credits and handling credit accounts has caused so much loss that a business man who has been unfortunate in this regard is apt to overlook the real reasons for the loss, and decide against the further granting of credit to any one. It is true that cash methods of doing business are possible and perhaps advisable in some lines, in certain localities and under certain conditions, but for the majority it is not practicable. When a merchant has decided to do an absolutely cash business it almost invariably means that he is passing up a large amount of the most profitable trade in his community.

The fact that all the largest and highest dividend-producing department stores grant credit readily would indicate that this conclusion is correct. The one real reason for deciding to do a strictly cash business, where merchandise instead of service is involved, is lack of capital to carry the accounts. Except for that reason the credit system can be safely adopted if the proper safeguarding methods are also used.

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Dealer and Manufacturer Must Co-operate

Liberal Interpretation of Guarantees and Support of Dealers Will Solve Some of the Present Difficulties in Electrical Merchandising

By G. D. Crain, Jr.

A growing and important factor in the electrical field is the retail merchant. The distribution of electrical merchandise to the consumer has been growing so fast that contractors in many cases have waked up to find themselves in the dealer class as well. Manufacturers, in creating new outlets, have not always had time to smooth off the rough edges of their sales policies, and there has been opportunity for the creation of conditions which are not always satisfactory.

The situation, in general, is one which demands co-operation. On the one hand is the maker of the goods, anxious to secure sales, and at the same time desiring to hold the expense of replacements of defective goods down to the minimum. On the other side is the dealer, equally anxious to get business, and at the same time to give his customer the service which he feels is necessary, and to interpret the conditions of the guarantee in such a manner as will satisfy the user of the goods.

It is the spirit in which the situation is approached that makes all the difference in the world. If the manufacturer makes it clear to his dealer that he is anxious to do everything in reason, that is equitable and right, and if the dealer does not take an arbitrary position, insisting on concessions which are not in keeping with the requirements, the situation will take care of itself. On the other hand, lack of harmony, and an insistence on technicalities on either side, and especially by the manufacturer, can easily disrupt trade relations which ought to be pleasant and profitable for everybody concerned.

The need of a liberal attitude toward the dealer is being emphasized in many quarters. Holding him rigidly to account and reading agency contracts, guarantees and similar documents too literally, do not make for the sort of enthusiastic co-operation which is needed in spreading the good news of what up-to-date electrical merchandise can do to make living conditions more agreeable.

Interpretation of Guarantees.

The guarantee especially seems to be proving a stumbling-block to the development of correct relationships between manufacturers and their retail representatives. Most of the guarantees contain a provision that the manufacturer warrants the goods to be free from mechanical and electrical defects for one year, and that repairs or replacements will be made, provided freight charges both ways are paid.

The last clause is the fly in the ointment, for the reason that in most cases the merchant is called upon to absorb this expense. The factory man has announced that he will make good any defective part, but that he won't move a step away from his plant in order to do so. The consumer, on the other hand, may or may not know the manufacturer; but he does know the dealer, and the latter is the one who is held responsible, and who is asked to make good under any guarantee proposition. In the event that a breakage occurs, it is the dealer who is called upon to shoulder the expense of taking the machine down, sending the part to the factory, and re-installing it when the new part arrives or the repaired machine returns, as the case may be.

It is possible, theoretically, to make the customer pay this expense; and in some cases, notably the automobile business, the owner of the car (who is accustomed to getting the hot end of it all along the line) usually submits without a murmur, if something goes wrong with the electrical equipment. But the average consumer does not restrict the interpretation of the terms of the guarantee to cover merely replacement, without including freight or labor. He puts this squarely up to the dealer. Possibly the latter should be strong enough to refuse to take care of these factors; but the realization that a broader policy is necessary, in order to hold the good-will and the trade of the customer, results in the dealer going far enough to involve himself in a good bit of expense before he gets through.

That is why the margin of profit on a given item, even assuming that it is liberal—and it is not always so—shrinks considerably when the cost of delivering service during the term of the guarantee is considered. Under the circumstances, the dealer can hardly afford to take care of these expenses unaided. By the time that the labor of the men needed to take down and re-install a machine is added to the cost of transportation, the expense is almost prohibitive.

Sometimes, it must be admitted, the manufacturer does not meet the dealer at that half-way point where agreement is usually found, but rests on his rights as indicated in the guarantee. This means that the dealer is between two fires—the demands of his customers, which must be considered, and the limitations of the manufacturer, which can hardly be overstepped. Is it any wonder that a lot of distributors are beginning to consider where they are to "get off"?

Typical Cases of Differences.

A few typical cases will illustrate the situation and may serve to suggest a remedy.

A dealer who represents a well known concern manufacturing battery-charging equipment was recently called on by a customer to take care of a breakdown. It was found that there was a defect in the machine, which could best be repaired on the spot. To take down the charger—which involved putting the electric car of the customer out of commission for some time—ship it to the factory and await reshipment at its convenience, all of this at the expense of the dealer, seemed to involve more money and more trouble than the situation justified, in the judgment of the manufacturer's local representative.

With the desire to render service to the customer, the dealer went ahead with his own repair facilities and put the charging apparatus in good working order. The cost of the job was $7, and a bill for it was sent to the factory, the assumption being that in view of the fact that the dealer had probably saved everybody concerned some money, the item would be taken care of without delay. However, the reply which was received did not indicate that this would be the outcome, but included the following statement:

"We are in receipt of your charge for repairs on our charger for Mr. Blank. Please advise us what this covers and who authorized the charge. You no doubt know that our guarantee covering apparatus sold does not permit outsiders to make repairs on the apparatus and charge the same back to us."

Possibly in this case the dealer did not explain fully the

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conditions which had led to a technical violation of the guarantee provisions; possibly, also, if he had done so, the agreement to pay the item would have been forthcoming promptly. Nevertheless, the tone of the letter was hardly of a sort to make a dealer feel good, especially that portion of it classing him as an "outsider." As a matter of fact, the customer was the manufacturer's customer, as well as the dealer's; and the dealer is on the same side of the fence as the maker of the goods, and ought not to be put in the category of outsiders, who are beyond the pale and not entitled to any special consideration.

This is really the crux of the matter. The manufacturer should be close enough to his dealers to know and trust them. He may not always be willing to rely upon their judgment in such cases, and he may find it advisable to require specific authority to permit the dealer to make repairs, instead of having them attended to at the factory, but, at any rate, there should be a feeling of mutual confidence that will eliminate the suspicious and almost unfriendly tone which may creep into a letter such as the above.

"It seems to me," said the dealer referred to, "that a concern which goes out to appoint representatives ought to select nobody in whom it hasn't full confidence. If it has confidence in the dealers who are handling its line, it ought to be willing to give them some leeway in the matter of service. In this case it was simply up to me, from the standpoint of doing the right thing by the customer, to make those repairs and get the charger to work in the shortest possible time. To begin splitting hairs over whether the guarantee under which I made the charge for the work requires a return of defective equipment to the factory or not is adopting a narrow policy, which it seems to me cannot work out right."

Not long ago another electrical merchandise dealer, who is selling washing machines on a narrow margin of profit, received notice from a customer that the machine was broken.

In order to find out what the matter was it was necessary to send a man to the home of the customer, who lived in a suburb several miles out. He found that a broken gear had developed, probably from an overload. However, he could not, of course, prove this, and consequently agreed to replace the gear, under the guarantee which covered the machine. He returned to the store, where arrangements were made to send the gear back to the factory. Later on a new gear was received, taken out to the customer's house and put back in the washing machine.

That made everything all right, didn't it? Yes, for everybody except the dealer. The customer got service, and the manufacturer paid for the gear—but somehow the dealer was lost sight of in the shuffle. The time involved in the two trips to the home of the customer was sufficient to more than eat up the original net profit in the washing machine.

This suggests that either the margin of profit on such goods be sufficiently large to enable service to be paid for, or that the manufacturer should assist in rendering this service. Of course, there is the alternative of charging the customer for everything except the actual replacement, but it seems to be agreed that this is impracticable in most cases.

This instance calls forth the reminder that there is room for improvement in the wording of guarantees, and no doubt much trouble, time and expense could be spared both the dealer and manufacturer if the guarantees on some appliances were not so general, but more specific in their terms as to conditions under which replacements will be made.

One more case, which is of a typical nature, will help to show the situation. In this instance a contractor who handles a big motor business was involved. He sold a transformer, and ordered it from one of the biggest concerns in the country. When it arrived and was about to be installed, it was found that a bracket which was essential to the job had not been sent. It would have been possible to notify the manufacturer, have the bracket shipped, and calmly await its arrival before completing the job.

In the first place, however, the men of the contractor were already at work, and it would have cost something to stop them and transfer them to some other job. In the second place, the customer wanted hurry-up action, as is usually the case. The net result was that the contractor went into his own shop and had a bracket made at a cost of $3.

The manufacturer refused to pay the bill, pointing out that the dealer had no authority to make the bracket, and that the cost was much greater than it would have been had it been shipped from the factory. The dealer, by reason of his desire to avoid a greater loss, and in order to take care of his and the manufacturer's joint customer, thus appears to be "stung" to the extent of $3.

What's the answer?

What Is the Responsibility of the Dealer?

This is a big question, and not one that can be disposed of off-hand. Obviously, also, there are two sides to the subject. The manufacturer does not feel like giving every representative carte blanche to go as far as he likes in making repairs on his, the manufacturer's account, for the reason that not every dealer has the judgment as to such matters that would be needed to conserve the interests of the maker of the goods. On the other hand, the manufacturer cannot afford to be small in treating with the dealer, especially where it is evident that the object of the latter was to provide service to the customer.

An electrical man, who is a manufacturer, a jobber and dealer, all at the same time, making and distributing his own and other companies' products, said recently that he believed that the limitations placed in the guarantee and agency contracts are necessary to protect the manufacturers from unreasonable demands on the part of the consumer or the dealer, but that, on the other hand, the manufacturer should be willing to consider every claim on its merits, and assume the burden of the expense where the equity of the case suggests.

"The dealer naturally wants to stay on the good side of the customer," he said, "and if he can shift the burden to the manufacturer, he will do it. If the maker were too easy in the matter of making replacements, due to faulty operation, such as overloading, paying not only for new parts, but for the labor involved, he would soon be flooded with such claims, and would be unable to continue in business.

"But if there is a legitimate case, in which the dealer is put to expense in taking care of the reasonable requirements of the customer, the manufacturer, if properly approached, will, in most cases, do his share. The trouble is that the dealer often fails to state the case fully, and hence the manufacturer is left to suppose that the work was done without its being really necessary.

"To insure continuance of the relations which the manufacturer desires to maintain, inasmuch as the dealer is his customer, there should be a full statement of every such experience, so that a decision may be made with all the facts at hand."

The solution of the problem, from this angle, then, would seem to be mutual confidence, whereby the dealer is willing to lay all his cards on the table and trust to the fairness of the manufacturer, and the latter is ready and willing to assume his share of the expense when conditions justify. Such a situation involves real co-operation, and co-operation is the answer to most problems of distribution, including the difficult matter of service and guarantees.

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Timeliness in Prize-Winning Window Displays

A Year of the New York Edison Company's Prize-Winning Windows.

Arthur Williams, general commercial manager of the New York Edison Company, in March, 1915, inaugurated a plan of giving prizes as incentive for new ideas in appropriate window displays for holidays and days of special interest during the year. Mr. Williams offered first and second prizes of $10 and $5, winners being decided by a committee of seven. Drawing power, economy, adaptability to the many show rooms of the company and the extent in which electricity is featured are major considerations in making the awards.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 341.—Controller for Bascule Bridge.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

No. 342.—Trouble Finders.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

No. 343.—Theater Emergency Lights.—Rule 38*a* of the National Electrical Code provides that "where supply to a theater cannot be obtained from two separate sources, the feed for emergency lights must be taken from a point on the street side of main service fuses." Has this provision been found ample for the purpose? Would it not be desirable to insist on an entirely independent source, such as a storage battery?—J. H. R., Pittsburgh, Pa.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

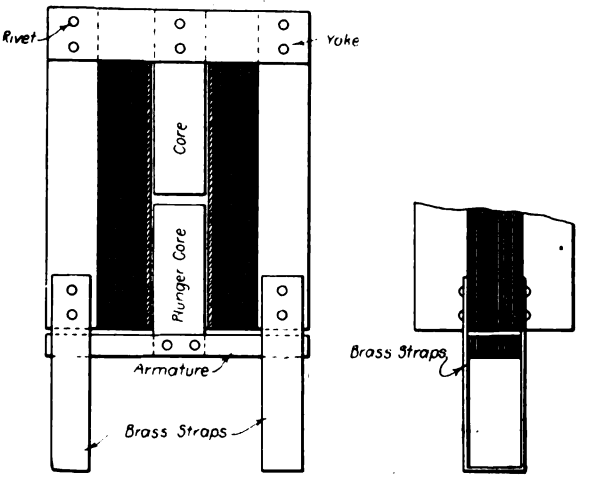
No. 345.—Demagnetizing Iron Castings.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

Answers.

No. 331.—Small Lifting Magnet.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

The accompanying sketch gives practical suggestions for building a small lifting magnet of the size required. The steel laminations are built up to half-inch depth. One-half the outside legs are cut 3 inches, and the remainder 2.5 inches long; they are then assembled alternately so that they will dovetail into the yoke, which is 2.5 inches long. One-half of the steel strips for the yoke are cut 2.5 inches long, while the remainder are cut one-half inch long.

The core is 1.75 inches long by one-half inch, with one-half of the strips cut 1.25 inches long. The one-half-inch pieces of the yoke are used to fill in between the core and the outside legs. The plunger core is 1.5 inches long and built up of pieces of steel cut seven-sixteenths inch wide, one-half of them 1.5 inches long and the remainder 1.25. The armature is 2.5 inches long by 0.25 inch deep and a half inch wide, with half of the strips cut one and one-thirty-second inches long. To the ends of the outside legs are riveted brass straps which act as guides and as a one-inch drop limit for the armature. The core is to be fitted with a square brass tube 2.5 inches long and this should be slotted with a hack saw, insulated with empire cloth, and wound with four layers of No. 14 B. & S. cot-



No. 331.—Small Lifting Magnet.—Fig. 1.

ton-covered magnet wire to a coil 2 inches long when required for direct current 20 volts. If alternating current, however, is to be used No. 12 B. & S. wire will give better results. This design makes a powerful lifting magnet, and the materials used will not cost more than $1.00. With a little care it can be nicely assembled in a short time.—G. W. E., Pittsfield, Mass.

It will hardly be possible to find a little electromaget of a lifting power of one foot-pound ready-made in stock in a supply shop; most of the lifting magnets in the market, being for operation of brakes and motors, cranes, etc., have a much greater lifting power—12 to 15 foot-pounds and more. Besides, the shape of a lifting magnet is generally dependent on the purpose it has to fulfill, so it will be better to have it specially made after a general drawing.

In the following the general design will be given of a simple plunger-type electromagnet, as shown in the sketch; it is assumed that the available pressure of 20 volts is of direct current, so that core and plunger can be made of solid iron. Should, however, only alternating current of 20 volts be available, the iron part must be laminated.

The magnetic pull between two magnetic poles is (from Maxwell's equation)

$$P=B^2A/11{,}200{,}000$$

where B=maxwells per square centimeter,
A=surface in square centimeters,
P=pull in pounds.

Now, as the plunger has also a certain weight which the magnetic pull has to lift besides the useful weight, this must be taken into account. This weight may be taken, at the first guess, to be one pound; it must be verified later and the winding altered correspondingly after the whole electromagnet has been laid out. The weight depends to a great extent on the purpose, but the illustration of the example will show how to proceed.

On account of the smallness of the apparatus and the comparatively long stroke we choose the magnetic density to be about 3,000 maxwells. With a total weight to pull of two pounds we arrive at the surface of the pole of

$$A=11{,}200{,}000\times 2/9{,}000{,}000=2.49 \text{ square centimeters.}$$

The plunger to be of soft round iron will therefore have a diameter of 17.75 millimeters. To account for some leakage and a little margin, take 0.75 inch diameter (=19.05 millimeters), which gives a section of 2.87 square centimeters.

The shape of the electromagnet may be seen from the sketch, Fig. 2. A is a cast-iron (or malleable-iron) frame; B a soft-iron plug; C the plunger; D the coil; E a lining with

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a brass tube and F a little brass or copper stud to prevent sticking of the plunger to the iron frame.

We can now proceed to determine the winding. The magnetomotive force to drive the flux through the iron is entirely negligible against the length of the air gap. In the beginning the air gap, that is, distance between plunger and plug, is one inch or 2.54 centimeters.

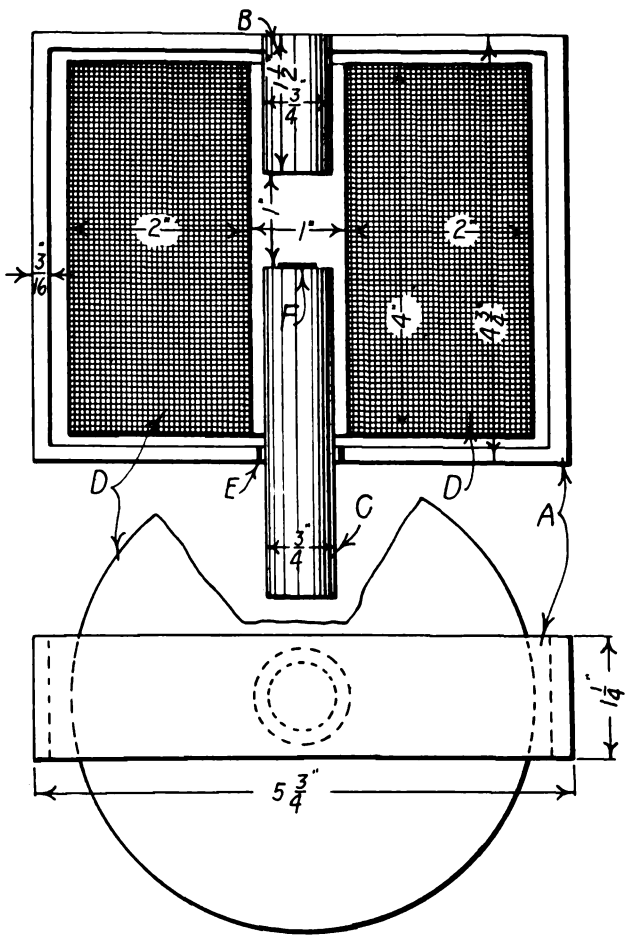
The necessary ampere-turns we get from the equation

$$AT=0.8\times B\times L$$
$$=0.8\times 3{,}000\times 2.54=6{,}100.$$

Assume a thickness of the coil of 2 inches; the mean length of turn will be $3\pi=9.5$ inches. The section of the wire can be determined from

$$s=0.000829\times AT/1{,}000\times LM/E$$
$$=0.000829\times 6.1\times 9.5/20=0.0024 \text{ square inch, which corresponds to a diameter of 0.055 inch.}$$

From wire lists we find No. 15 B. & S. = 0.057 inch in diameter = 0.00255 square inch area. For intermittent service (time



No. 331.—Small Lifting Magnet.—Fig. 2.

of rest at least double of time of operation) the current density may be taken as approximately 1,600 amperes per square inch, which gives for our wire 4.1 amperes. The number of turns becomes 6,100/4.1=1,500. The insulated diameter of the double-cotton-covered wire is approximately 0.069 inch. As the coil is to have a depth of 2 inches, the number of layers is 2/.069=29 and the number of turns per layer 1,500/29=52, which gives a length of the coil of 52×0.69×1.05=3.8. We take four inches; five per cent is taken as allowance for inequalities in the insulation.

The dimensions of the iron part can now be determined, the same magnetic densities approximately to prevail in all parts. This gives then the dimensions as shown in the sketch; the calculation is so simple that it need not be given.

The length of the wire will be 1,500×9.5/12=119 feet total, and the weight 1.25 pounds approximately. The resistance cold is 0.38 ohm which permits a current to flow at 20 volts of 5.25 amperes. The magnetomotive force is therefore 7,900 ampere-turns maximum, i. e., a margin of 29.5 per cent. The energy consumed is 105 watts. A suitable resistance in series with the coil can reduce the current to the right value when testing the magnet out.

Should the source be alternating current of 20 volts, the calculation is practically the same, but to avoid heating of the iron the magnetic circuit must be made of laminated iron. For convenience, the plunger will then not be round, but of square or rectangular section. In this case, the dimensions could be 5/8 by 5/8 inch, while the section of the frame might be the same as before. If any other form of the electromagnet is more suited for the case in question, the determination of the coil will be similar as shown in the foregoing example.—H. A., Pittsburgh, Pa.

No. 338.—Grounding of Motors.—What is the best way to ground a group of motors? Can motors of different voltages be connected to the same ground plates, say in the case of 110, 220 or 440-volt alternating-current machines?—R. B., Jackson, Mich.

When all the wiring to the motors is in steel conduit, the best way to ground the frames is to connect them to the conduit by means of suitable lugs and ground clamps. Where the motors are close together and are not wired for in conduit, an iron pipe can be run from the base of one motor to another and well grounded at some convenient point, thus grounding all the motors. The pipe is mechanically superior to several ground wires.

Yes, motors of different voltages may be connected to the same ground plate, as the object of the ground is to keep the motor frames at "earth" potential.—J. S., Victoria, B. C., Canada.

No. 340.—Three-Phase Versus Single-Phase Transformers.—If the three-phase transformer actually possesses all the advantages that are claimed for it, why is the three-phase distributing transformer not used instead of the single-phase on a larger scale? How do the two compare as regards reliability and cost?—N. T., Chicago, Ill.

It is customary in America to use three single-phase transformers for changing from one pressure to another on a three-phase circuit. In Europe three-phase transformers are used, in which there are three primary coils and three secondary coils wound on a three-legged iron core The general practice here is to use three standard single-phase transformers connected up either star or delta, as may be required.

This may be attributed to several reasons. For instance, if one coil or phase of a three-phase transformer burns out, it will undoubtedly damage the other two and may result in a total burnout, or if not, it is not altogether safe to repair or cut out the damaged coil with the current on and this means interrupted service. In the case of the three single-phase transformers one can be taken out and the remaining two can maintain the service until repairs are made or a new transformer substituted. Again, in the case of a total burnout, it is cheaper to replace one single-phase transformer than a three-phase transformer.

Three-phase transformers can be made as rugged as single-phase transformers and therefore are as reliable. They are also cheaper than banks of three single-phase transformers, as there is not nearly as much material needed for core and frame as in the case of three single-phase. They are mostly used where space will not permit the installation of a bank of three single-phase units, such as in a manhole, etc. Whenever space can be obtained and first cost is not as essential as uninterrupted service, it is best to use the three single-phase transformers. They have greater radiating surface, therefore keep cooler under the same load conditions, and they can be more easily handled as one can be separated for inspection and repairs without interrupting the service.—W. T. E., Ansonia, Conn.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hotpoint Electric Ranges.

After 14 years of very extensive investigation and research to discover the most efficient method for the application of electric current for general cooking, the Hotpoint Electric Heating Company, of Ontario, Cal., advises that its engineers have concluded that the open-coil reflector type heating element is the most desirable from every standpoint of efficiency. The next problem which confronted the engineers of the company was to design a supporting frame sufficiently durable and that would absorb a minimum of the heat units developed by the heating element. In order to obtain a maximum of durability with a maximum of efficiency the Hotpoint engineers have built their new heating element of steel and porcelain imbedded in steel, in a truss form of construction that makes for rigidity and absorbs a minimum of heat. The company has adopted this glowing-coil reflector type of heating element of porcelain and steel and it is known as the "Hotpoint Reflex Burner."

The importance of the heating element, or "burner," in an electric range makes the following statements exceptionally pertinent to those interested in electric range cooking. The Hotpoint reflex burner is claimed to excel in:

Hotpoint Electric Range, Model D.

Speed.—Working temperature is reached within 15 seconds after current is applied and an element wound for 1,500 watts with a diameter of not more than 8.5 inches approximates the speed of a modern-sized gas burner, something which has never before been accomplished with an electric range.

Economy.—Highest economy is obtained because the principle upon which this element transmits heat to the cooking utensils is very similar to the gas burner and any type of cooking utensil can be used to good advantage. It is well known that dark surfaces absorb heat and bright surfaces reflect it. Careful investigation has shown that the majority of utensils used in the home have a more or less dark or dull bottom. This fact influenced the construction of the reflector type of burner as it shows great economy and efficiency when using the ordinary utensils found in the home. It operates directly on the principle that dark, dull surfaces absorb heat rays more rapidly than light colored, bright surfaces. The Hotpoint reflex burner is said to be extremely efficient in the use of graniteware utensils so common in the average kitchen.

Cleanliness.—The arrangement of Hotpoint reflex burners in the surface of Hotpoint ranges is such that these burners or elements are quickly and easily accessible. The reflector plates, by a novel arrangement, rest on the crumb tray which pulls out the same as a crumb tray on the ordinary gas range, when the reflector plates can be lifted off. The fact that there is a space of approximately one inch between the coils and the reflector plate makes it impossible for food to accumulate around the coils, thus minimizing the danger of disagreeable odors and the risk of coils being subjected to excessive temperatures and consequent breakdown through lack of air circulation. If repairs at any time should prove necessary, the element is easily removed by taking out three screws which make the electric connections.

Psychological Effect.—The psychological effect of the open-coil type of element is a feature not to be overlooked. We are accustomed to "seeing" fire in connection with cooking and the glowing coils give confidence and besides, show whether the current is on or off.

The company states that a Hotpoint reflex burner under test with competitive heating elements under exactly parallel conditions showed it to be from 20 to 42 per cent more efficient than the other elements, depending on the utensil used. Each Hotpoint reflext burner is controlled by a three-heat indicating snap switch.

One point particularly essential to win the housewife's favor is that the Hotpoint reflex burner does not require special cooking utensils; any ordinary kitchenware gives satisfactory results.

The Hotpoint range is made in five models to suit the needs of either large or small families. Model D is illustrated herewith. Four of the models are of the standard gas-range design; another is modeled after what is known as the gasoline stove type. All models are finished in black enamel. The ovens of four of them are lined with aluminized steel and high-grade mineral wool is packed between the walls. The prices of the ranges are from $40 to $90.

Improved Dover Electric Flatirons.

The manufacture of electric flatirons has been developed to a large scale and a considerable number of reliable irons are now on the market. Development in this industry has been continued by many manufacturers and notably by the Dover Manufacturing Company, Canal Dover, O. This company has been in the business of making irons some 21 years, during which it has established an enviable reputation for its "Asbestos" sadiron, which is a stove-heated iron with a number of separate heating units.

Several years ago the company began developments along the lines of electric flatirons and during 1913 brought out an innovation in this field in its Abesto automatically regulated electric iron, which was described in our issue of August 16, 1913. This iron includes an automatic

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thermostatic cutout which can be adjusted to any point between 300 to 600 degrees Fahrenheit; this cutout automatically opens the circuit as soon as the iron has reached the temperature desired. When the iron has cooled off a few degrees below this point, the circuit is again automatically closed. Thus this cutout acts as an automatic regulator of the temperature of the iron and enables the operator to maintain just the right amount of heat for the particular goods being ironed. It also eliminates the danger of overheating of the iron and possibility of starting fire from neglect to open the circuit when the iron is left. Since the time this iron was described it has been perfected in a number of details and has met with very large sale.

The company also makes the Dover electric iron without the automatic regulator feature. This iron, a partly sectional view of which is shown in the accompanying illustration, has recently been made the particular subject of a strong publicity campaign which the company is conducting through national advertising mediums. The heating unit in this iron, as well as in the Abesto iron, is what is known as the "Vea No-burn-out element," on the perfection of which the company has spent some seven years of research and experiment. The resistance wire is Nichrone. This is embedded in a refractory insulating composition made of fused alumina. This material has been selected because of its exceptional properties. It is an excellent electrical insulator and at the same time a fairly good conductor of heat; it expands and contracts to the same extent as the ironing base. It is set around the resistance wire with a hydraulic pressure of 65 tons and is then baked solid at a temperature of 1,400 degrees. The heating element is therefore hermetically sealed against any access of air, since its co-efficient of expansion is the same as that of iron, which eliminates the liability to crack. The adjacent portions of the coil are separated by one-sixteenth inch of this composition which is said to be seven times more than necessary to prevent short-circuiting.

Dover No-burn-out Electric Iron.

The company is so confident of the absolute durability of this element that it gives the iron an unlimited or, as it is termed, an everlasting guarantee. During the Panama-Pacific International Exposition, where both of these irons were on display, one of these heating elements was kept continually energized from the time the Exposition opened in February until it closed in December, which is said to be the equivalent of over 100 years of average family use. This particular element has shown no trace of deterioration and is believed to be as good as new. This iron and the company's Abesto automatic iron were awarded the only gold medals for electric irons at the Exposition.

Above the heating elements of each of these irons is a heat-storage reservoir in the shape of an iron block and between this and the hood is an air space which decreases the radiation upwards. The Dover non-automatic iron has a six-foot cord with detachable plug. The plug end that is connected to the iron is protected by a rigid steel clamp and spring coil. The plug has extra long spring contacts. The Abesto automatic iron has its cord permanently attached. Each iron is supplied with a three-ply electrically welded steel stand. In the upper surface of this there is a groove that can be used for receiving an ordinary curling iron. A waxer and cleaner is also supplied with each iron. A small truss attachment can be added to the stand by means of which the iron can be inverted and used as an electric stove.

Special 2.5-Pound Telephone for Forest Rangers.

A portable telephone, made of aluminum and weighing only 2.5 pounds, the invention of a United States forest officer, R. B. Adams, of Missoula, Mont., will be part of the regular equipment of patrolmen in the National Forests during the coming field season. This instrument is regarded as a great improvement over the set formerly used, which weighed 10 pounds.

It is said that a field man equipped with this telephone, a few yards of light emergency wire, and a short piece of heavy wire to make the ground connection can cut in anywhere along the more than 20,000 miles of Forest Service telephone lines and get in touch with the headquarters of a supervisor or district ranger. To talk, one end of the emergency wire is thrown over the telephone line, the two ends are connected to the portable instrument, and the instrument is connected to the ground wire, the end of which must be thrust into the damp earth or in water. Contact with the line wire is made possible by removal of the insulation from a few inches of the emergency wire.

The Adams instrument does not ring the bell of the receiving telephone, but instead causes a screeching sound from a small megaphone-shaped apparatus, descriptively known as a "howler." This instrument is installed at the ranger station telephone and is said to give effective notice that some one is on the wire. If the field man needs to talk with some one elsewhere on the line, the ranger station instrument can be used to ring up the person wanted, when the conversation can be carried on.

Forest officers say that these portable telephones are especially valuable in reporting fires and other emergencies with the least possible delay, and also in sending instructions to field men and keeping the district rangers informed as to the progress of work going on in the field, thus supplementing the regular telephone sets installed at lookout points, ranger stations, and at convenient intervals along Forest Service roads and trails.

Automatic Motor-Operated Switching Apparatus for Connecting Emergency Power Source.

For many purposes electric power supply must be made positively reliable and continuous. This is particularly true for signal purposes. If direct current is supplied, an emergency or auxiliary source of great reliability can be provided in the form of a storage battery. However, where alternating current is supplied, a storage battery can act as an auxiliary only through a rather complicated set of control equipment including either a reversible rotary converter or motor-generator. If two independent alternating sources are available, one used as the normal supply and the other as the emergency only, the likelihood of failure of both sources at the same time is rather remote. What is desired in this case is a dependable means of automatically changing from the normal source of supply, in case of failure thereof, to the auxiliary or emergency source.

Such a means has been provided through the invention by C. W. PenDell, of the Public Service Company of

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Northern Illinois, of an automatic switching system, which was designed primarily for use in connection with railway signal circuits that are supplied from alternating-current power transmission lines. An installation of this apparatus has been made in an automatic substation along the Grand Trunk Railway, at Elsdon, Ill. Fig. 1 shows a view in the corner of this substation. Figs. 2 and 3 are front and back views of the control and motor mechanism for opening and closing the oil switch.

The mechanism consists of a single-phase repulsion-type induction motor connected through a set of mechanical parts that transmit the power of the motor to the oil-switch-closing mechanism; there is also provision for adjusting the time interval between energization of the motor and closing of the switch; a low-voltage release to trip out the switch and a means to prevent the switch from closing, if energy is restored to the line from another source before the mechanism has completed its operation, are also included in the set.

The motor receives its power through the contacts of a low-voltage relay, which is de-energized when power on the signaling system or supply bus fails. The power of the motor is transmitted through a worm gear and pinion to the pawls which move the ratchet. In Fig. 2 this is shown as the mechanism is just beginning to operate and in Fig. 3 the view from the opposite side shows the position of the mechanism just after the switch has been closed. One of the pawls works on an eccentric from the pinion shaft and the other is fastened concentric to the shaft. For each revolution of the pinion the eccentric pawl moves the ratchet the space of one tooth and the other pawl holds the ratchet in this position, while the former is reaching forward to another tooth. Each movement from tooth to tooth consumes two seconds. The ratchet may be set to start the motion on any tooth so that the time interval between energizing the motor and closing the oil switch may be adjusted by two-second increments from two to thirty seconds.

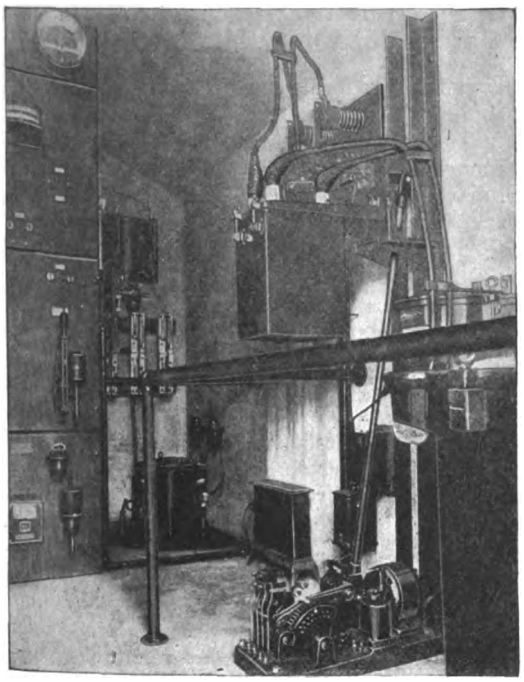

Fig. 1.—Automatic Motor-Operated Switching Mechanism in Substation.

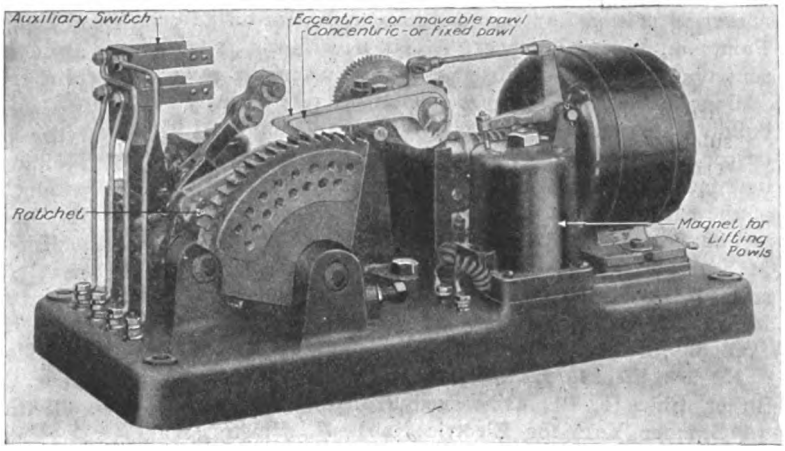

Fig. 2.—Automatic Motor Mechanism Beginning to Operate.

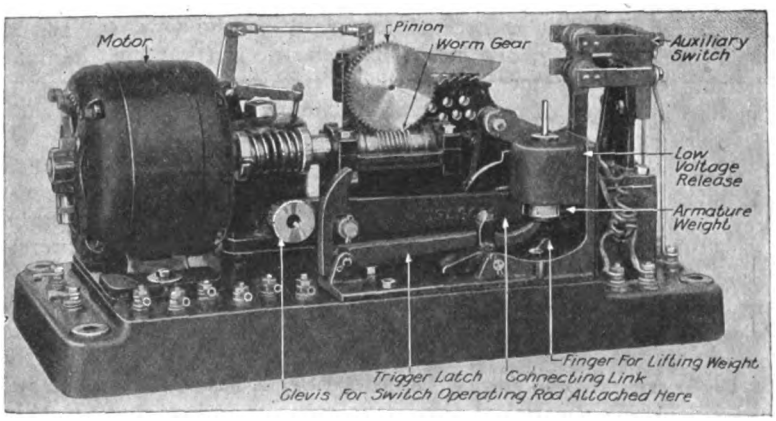

Fig. 3.—Opposite View of Mechanism Just After Operation.

The first movement of the ratchet closes the fingers of the auxiliary switch which relieves the relay contacts from heavy current; the final movement simultaneously raises the weight of the low-voltage release and closes the oil switch.

When the latter closes, energy is restored to the potential relay and to the magnet that lifts the pawls. This allows the ratchet to return to normal position and the auxiliary switch to open, but the oil switch does not open because the connected link attached to its operating rod is held by the trigger latch. The oil switch is tripped out only when the low-voltage release is de-energized. The restoration of service through one equipment energizes the potential relay and the pawl-lifting magnet of the mechanism that controls the other source of supply. This immediately stops further operation of the mechanism, all parts being restored to normal and the switch not closed.

The time-element adjustments on the mechanisms controlling two power sources supplying, for instance, a signal bus or other load, are set to give one source the preference. Thus, if the mechanism controlling the normal source is set for, say four seconds' delay, and that the emergency source for 30 seconds, the normal source will be reconnected to the service before the emergency source, in case of a momentary interruption. Should the interruption continue beyond the time set for the emergency source, the latter will be connected to the service and the normal source blocked out until it is again fully available, when it will trip out the switch on the emergency supply by means of the low-voltage relay which is energized from the normal source and short-circuits the release coil of mechanism on the emergency supply.

This system is adaptable to a great many classes of load where continuity is very important. Although the equipment described is all of the single-phase type, it can be adapted to polyphase circuits. This equipment is manufactured by the General Electric Company.

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INDUSTRY ACTIVITIES

Hazard Manufacturing Company, Wilkes-Barre, Pa., has issued a 16-page booklet on Keystone railroad signal wire, processes of construction and the characteristics of Keystone insulation being given.

Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill., manufacturer of "Violetta" high-frequency generators for medical use, is distributing mailing folders describing and illustrating the device.

Ward Leonard Electric Company, manufacturer of electric controlling devices, has removed its offices in Pittsburgh, Pa., to 901 Park Building. John B. Sebring remains as the company's Pittsburgh representative.

Globe Stove & Range Company, Kokomo, Ind., has issued a revised edition of its series of four folders on "Talking Points on Globe Electrics." This new literature will be sent upon request to those interested in electric ranges.

General Electric Company is soon to erect a new factory building at Providence, R. I., for the manufacture of incandescent lamp bases. About 500 will be employed in the new factory, which will be completed during the latter part of the summer.

The Protean Electric Sign Company has been organized at Kansas City, Mo., with E. J. Kampf as vice-president and general manager to install and operate in Kansas and Missouri the "talking signs" of the Peerless Electric Sign Company, of Dayton, Ohio.

Hughes Electric Heating Company, 211 West Schiller Street, Chicago, Ill., has issued a mailing folder entitled "A Bumper Year for Electric Ranges." Illustrations of latest types of Hughes ranges are given, together with a reprint of an article on building up a range load.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has contracted to furnish to the Owen-Schoeneck Company, of Chicago, Ill., electric starting and lighting equipments for its six-cylinder trucks. The equipments will consist of type 750 starting motors and type 202 lighting generators.

Kandem Electric Company, formerly the Koerting & Mathiesen Company, has recently moved to larger quarters at 29 East Twenty-first Street, New York City. The new offices are much more spacious, and large storage space forms part of the new facilities. An increased demand for "Excello" arc lamps and for fans and other devices which the company handles made this change necessary.

Underwriters' Laboratories, Chicago, Ill., has issued a 32-page booklet on electrical data. The contents include descriptions of its New York City testing station, a ten-cent electric toaster, motion-picture equipment and labeling of slow-buning films, dental panelboards, electrically heated pads, foot-warmers and blankets, steel or brass-coated iron in electrical fittings, and fires and accidents due to electrical causes.

The Mohrlite Company, Urbana, O., manufacturer of electric-lighting fixtures, has prepared a very attractive catalog of its line of indirect and semi-indirect fixtures, which are of a self-contained type. The light is projected by a diffuse reflector upon a cone-shaped diffusing surface, which forms the upper part of the fixture placed on the ceiling. The patented curves and reflecting surface are designed to distribute an even illumination over a wide area and the interior reflectors being the only constant there is a wide range for originality in design.

Sangamo Electric Company, Springfield, Ill., manufacturer of meters, is planning the erection of a $100,000 addition to its main factory at Eleventh Street and Converse Avenue. The building will be three stories high, with four-story wings at each end.

Brassart Fixture Company, 13 Laight Street, New York City, has prepared 70 half-tone sheets, showing a complete line of electric-lighting fixtures, and a 46-page catalog of gas-lighting fixtures. Copies of either or both catalogs will be mailed upon request to electrical or fixture dealers.

Westinghouse Church Kerr & Company, engineers and constructors, 37 Wall Street, New York, N. Y., has issued a folder which describes in pictures the construction of the new plant of the Taylor-Wharton Company at Easton, Pa., a plant arranged to permit of many operation and production economies.

General Insulate Company, 1008 Atlantic Avenue, Brooklyn, N. Y., manufacturer of "Insulate" and "Hi-Heet" molding compound, has established such a demand for its products that it has just broken ground for an addition to its present building in Brooklyn and has contracted for additional equipment which will increase its plant and will enable it to more than double its present capacity. Some departments have been working nights and holidays for some time past, though none of the output, the company's officials state, is "war business," but to supply domestic trade.

Edison Storage Battery Company branch-office managers and salesmen gathered at the company's factory and main office in Orange, N. J., March 13-17 for the annual sales meeting. H. G. Thompson, vice-president and general sales manager, presided. The reports of the various salesmen showed a healthy condition throughout the industry and marked important developments made by the Edison storage battery. The success of the Hartford Electric Light & Power Company, using the Edison storage battery service system, and the fact that the company was able to charge lower rates than charged by any other company was pointed to as information which should be more clearly brought to the attention of other central stations interested in securing off-peak load.

The Chicago Fuse Manufacturing Company, of Chicago and New York, is sending out a new catalog describing the "Union" line of electrical supplies. This company previously published separate catalogs for fuse material and for switch and outlet boxes, but the present No. 28 Edition combines both in an attractive book of 132 pages, divided into four sections. All descriptions have been revised and many new features introduced to make a handy reference guide for the buyer's desk. National Electrical Code fuses, cutouts and fittings are shown in Section 1; "old Code" fuses in Section 2; auto fuse material, telephone and open fuses in Section 3; and stamped-steel outlet boxes and covers and switch boxes in Section 4. The principal outlet boxes are illustrated with half-tones, while small line cuts illustrate every cover opposite its description. A reference list of other manufacturers' corresponding numbers is given for outlets, fuses and cutouts. All of the extensive "Union" line of switch boxes are illustrated, together with four styles of mounting ears, and as many forms of clamps. Descriptive and numerical indexes complete the book, which is attractively printed and neatly bound in flexible covers.

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PERSONAL AND BIOGRAPHICAL

MR. J. S. RICKARD, formerly connected with the Metropolitan Engineering Company, of New York City, has joined the sales organization of the Philadelphia Electrical & Manufacturing Company, and will devote his time to the sale of Pemco products.

MR. L. G. BRIDGER, who has been the Iowa representative of the Northwestern Electric Equipment Company, of St. Paul, Minn., for the past seven years, has resigned and joined forces with the Midland Electric Company, of Mason City, Iowa, whose business outlook for the ensuing year is sufficiently encouraging to warrant an increase in its selling organization.

MR. R. S. WALLACE, vice-president and general manager of the Central Illinois Light Company, Peoria, Ill., and president of the Illinois State Electric Association, underwent an operation for appendicitis last week at a hospital in Peoria. At the time of going to press it was reported that Mr. Wallace was progressing very nicely, and his friends will be glad to look forward with him to an early recovery.

MR. D. W. ROPER, who recently was elected vice-president of the Electric Club-Jovian League, Chicago, Ill., is superintendent of the street department of the Commonwealth Edison Company, Chicago. Mr. Roper was graduated from Cornell University in 1893, after which he accepted a position with the National Electric Company, of Eau Claire, Wis., later resigning to take the students' course of the General Electric Company at Schenectady. Later he was in station-operating work at Niagara Falls, N. Y.,

D. W. Roper.

and in 1897 joined the staff of the Missouri Edison Electric Company at St. Louis. After supervising the installation of the underground conduit system and the removal of the overhead wires, Mr. Roper was appointed superintendent of electrical equipment in 1899, his duties being gradually extended to include the supervision of all electrical construction and operating work. In 1903 Mr. Roper became connected with the old Chicago Edison Company, now the Commonwealth Edison Company. In 1904 he was appointed assistant to the chief operating engineer, his work involving special attention to the design, construction and operation of the underground distribution system, and in 1915 Mr. Roper was given the title of superintendent of the street department.

MR. ADDIS M. WHITNEY, treasurer and director of the Massachusetts Lighting Companies, has resigned as treasurer, to take effect April 22, and as trustee, effective June 1. Mr. Whitney has been connected with the organization since its beginning in 1903, being treasurer and director since that time. Before that he was treasurer and director of several gas and electric companies, and has since held similar positions in 32 separate organizations. Mr. Whitney will take up other lines of work in territory not covered by the Massachusetts Lighting Companies, it is announced.

MR. J. M. WAKEMAN, general manager of the Society for Electrical Development, has been appointed by Jupiter Thomas A. Wynne, a Statesman-at-Large of the Jovian Order. Mr. Wakeman is one of the old-time Jovians, his Potential being 524. He was Supreme Apollo in the Fifth Constellation, and in appointing Mr. Wakeman as Statesman-at-Large, Jupiter Wynne writes that "the appointment is made with the feeling that the Society for Electrical Development and the Jovian Order will be in close touch and will co-operate with one another to the fullest extent." The work of both these organizations being strictly co-operative in its character, although along different lines, it is eminently fitting that the general manager of the one should be recognized by this important appointment in the other.

MR. A. D. FISHEL, former manager of the distributing transformer section of the supply department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been appointed commercial manager of the Adams Bagnall Electric Company, Cleveland, O. Mr. Fishel is a graduate of the public and high schools of Cleveland, and also of Case School of Applied Science of that city. He entered the engineering apprenticeship course of the Westinghouse company in 1909, two years after his graduation, and was engaged in general engineering and detail sales work until 1912, when he became head of the transformer division, which position he held until his recent transfer to Cleveland. Mr. Fishel is an associate member of the American Institute of Electrical Engineers, Jovian Order and other electrical societies, and is well known in the electrical industry.

MR. L. H. KELLER, who for the last three years has been manager of the Chicago district office of the Moloney Electric Company, is moving to St. Louis, Mo., where he is being advanced to an executive position in the general offices of this company. Mr. Keller has been with the Moloney Electric Company ever since he was graduated from the University of Missouri in 1912. He has a wide acquaintance in the Middle West and for the past three years has been very active in electrical and allied organizations. While his loss will be keenly

L. H. Keller.

felt by his many Chicago friends it is realized that Mr. Keller's promotion is a well deserved one and they unite in extending best wishes for his continued success. MR. RALPH B. COLEMAN, who has been traveling out of the Chicago office, will succeed Mr. Keller as manager.

OBITUARY.

DR. ERIC GERARD, for many years one of the foremost professors of electrical engineering, and who had the distinction of being the first person to teach electrical engineering as a separate subject, died in Paris, France, March 27. Dr. Gerard was born in Liege, Belgium, September 22, 1856.

DR. HARRY C. JONES, professor of physical chemistry at Johns Hopkins University and a recognized authority on that subject in the United States, died at Baltimore, April 9, 1916, from apoplexy. He was editor of and contributor to numerous scientific journals and was the Longstreth medalist of Franklin Institute in 1913. His principal works were "Freezing Point, Boiling Point and Conductivity Methods" and "The Modern Theory of Solutions," and he was the author of "Outlines of Electro-Chemistry," published in the ELECTRICAL REVIEW in 1901. In this field Dr. Jones was one of the earliest authorities and a pioneer in respect to many ideas suggested in that classical work. His book entitled "Electrical Nature of Matter," published in 1906 and revised in 1910, was widely read and adopted as a textbook in a number of educational institutions. He possessed a magnetic personality and his students and fellows were warmly attached to him. Dr. Jones was a graduate of Johns Hopkins and had studied at Leipsic, Amsterdam and Stockholm.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

RUMFORD, ME. — The Maine Coated Paper Company, which operates its machines entirely by electric power, is about to make an addition to its plant costing about $200,000. The Oxford Paper Company, another large user of electric power, is now completing a large addition.

CAMBRIDGE, MASS.—The City Council has passed an order providing for the appointment of a special committee to investigate the problem of municipal lighting and to consider the advisability of the purchase of the plant of the Cambridge Electric Light Company or the establishment of a municipal plant.

PEABODY, MASS.—The finance committee has recommended that the town raise $40,000 for the purpose of enlarging the equipment at the electric-lighting plant, the maturing bonds and interest to be paid from the receipts of the department.

ROCHESTER, N. Y.—Work will soon begin on the new power station of the Rochester Railway & Light Company in Leighton Avenue. The building will be two stories, 60 by 40 feet.

WATERTOWN, N. Y.—The New York Air Brake Company has prepared plans for the erection of two power plants, one to be located at the West Main Street factory and the other at the East factory. It was announced that the capacity of the former plant will be 1,200 horsepower, and it will be completed about July 1. Work on the latter plant wil start August 1, this plant to be of somewhat larger capacity. Contracts have been let to the Samuel Green Engineering Company, of Springfield, Mass., for the construction work.

ATLANTIC CITY, N. J.—General Manager Montgomery, of the Atlantic City Electric Company, has announced that the company has commenced the construction of a transmission line between this city and Ocean City. The new line, which will cost about $75,000, will connect the plants in the two cities, and it is planned to have the Ocean City plant for emergency use only. There will be a submarine crossing at Great Egg Harbor Bay.

BAYONNE, N. J.—The Vacuum Oil Company will build a new reinforced-concrete power plant at its oil refining works.

TOMS RIVER, N. J.—The Ocean County Electric Company has been granted permission by the Board of Public Utility Commissioners to issue stock for $370,000, the proceeds to be used for the construction of a hydroelectric power plant on the Toms River.

TRENTON, N. J.—Following a conference of engineers, announcement is made that the Trenton Water Power Company will immediately renew construction work on the proposed power plant at the junction of the Sanhican and Assunpink Creeks, an industrial section adjacent to the Delaware River. The project was temporarily abandoned during the period of depression more than a year ago.

TRENTON, N. J.—By the adoption of House Bill No. 315 by the State Legislature, and its formal approval by the Governor, the city of Trenton is arranging for the installation of an extensive street-lighting system. The new system will be placed along State, Broad and Warren Streets, with extensions along adjacent streets. The city will purchase the necessary poles, lamps and auxiliary equipment. Electric energy will be supplied by the Public Service Electric Company, which will also keep the system in repair.

CATASAUQUA, PA.—Borough Engineers Rascom & Sieger have been authorized by the Council to secure data relative to the construction and operation of a municipal electric light plant for Catasauqua.

DARLINGTON, PA.—The Harmony (Pa.) Electric Company is erecting a transmission line from Koppel to this city, and later will extend the line to Lisbon, O.

LEBANON, PA.—Thomas L. Becker, of Millbach, Oscar Witter, of Newmanstown, and Frank P. Hammer, of this city, are members of the directorate of the new Lancaster & Berks Street Railway Company, which proposes to effect through trolley service from Reading to Lebanon by the construction of a line between Womelsdorf in Berks County and Lititz in Lancaster County.

MARCUS HOOK, PA.—A municipal electric-lighting plant is being planned for this city.

MT. AETNA, PA. — Applications have been made for charters by the Marion Electric Company, to supply light and heat to residents of Marion Township, and by the Mt. Aetna Electric Company, to supply lighting and heat in Tulpehocken Township. Each company will be capitalized at $5,000.

READING, PA.—Application has been made to the Public Service Commission for approval of a contract between the Metropolitan Electric Company and the city for supplying power for the operation of the city's disposal plant at Canal and Sixth Streets.

BALTIMORE, MD.—In his annual report, Lighting Superintendent Mohr announced the work for 1916 will include the installation of 300 arc lamps, 300 incandescent lamps, 25 250-watt nitrogen filled lamps, and the changing of 500 lamps from the overhead to the underground service.

VIRGILINA, VA.—Plans are well under way for the establishment of a municipal electric-light system.

WHEELING, W. VA.—The City Council is planning to make improvements and extensions to the city lighting system.

ST. GEORGE, S. C.—Plans are being prepared for the establishment of a municipal electric-lighting plant, $5,000 in bonds having been voted for the purpose.

NORTH CENTRAL STATES.

ALLIANCE, O.—A corporation is being organized to construct an interurban electric railway between Salem and Youngstown, extending through the village of Canfield. John Goeppinger, of Alliance, is interested in the plan.

ASHTABULA, O.—About 20 property owners of Windemere and Lynnhurst have signed petitions asking the Cleveland, Painesville & Ashtabula Electric Railway Company to supply lighting service.

BAREERTON, O.—Extensive additions to the city lighting plant are recommended by Superintendent R. E. Long to enable it to meet the demand for energy, a new building and power equipment estimated to cost $43,769 being suggested. The two power units at present constituting the plant are operated regularly, without reserve equipment, and it is anticipated that when a heavier demand begins next fall the plant will not be able to supply the current needed.

BATAVIA, O.—Extensions and improvements to the municipal distribution system are being considered.

DESHLER, O.—The question of issuing bonds for the establishment of a municipal electric-lighting plant will be submitted to the voters May 10.

HICKSVILLE, O.—The purchase of the plant of the Hicksville Lighting & Power Company has been completed by the Northwestern Ohio Light & Power Company, of Van Wert, O., for about $100,000. The company plans extensions of the service to cover a number of towns not now reached by electric lines.

KENT, O.—The city has been considering plans for the construction of a municipal electric plant, but will suspend definite action pending consideration of a proposal from the Kent Water & Light Company, now serving the city, for the installation of additional street lights and other concessions. About 400 bracket lamps for the residence section and a modern system for the business district will be placed by the company, if its offer is accepted.

RAVENNA, O. — Power and pumping equipment will be required in connection with the new city waterworks, to be constructed in the vicinity of Muzzy Lake. R. W. Pratt, of Cleveland, has been recommended by Service Director Linton to have charge of the engineering work on the plant. Plans have not yet been decided upon.

INDIANAPOLIS, IND. — The Merchants Heat & Light Company soon will begin alterations and additions to its plants that will cost about $280,000 has been announced by A. W. Higgins, general manager. The changes include a new brick stack, 300 feet high, at the West Washington Street plant, new boilers, engines and stokers, and new brickwork for the new equipment. There also will be changes and improvements at the Pearl Street, the Alabama Street, the Court Street and the Talbott Avenue stations. Contracts have been awarded for a Westinghouse 6,250-kilowatt turbogenerator and other equipment.

BEMENT, ILL.—The Bement Electric Light & Power Company, W. J. Day, manager, is planning to erect a transmission line to Ivesdale and furnish electric service there.

GALVA, ILL.—At a meeting of the board of directors of the Commercial Club it was decided to place cluster lights along the streets where paving is to be done.

GENESEO, ILL.—Plans are being made by Mayor H. R. Ott and other city officials for erecting a municipal lighting plant.

JACKSONVILLE, ILL.—On May 12 citizens here will vote on a $100,000 bond issue, part of which will be used to improve the city electric-lighting plant.

LITCHFIELD, ILL.—The plant of the United Gas & Electric Company has been purchased by the Southern Illinois Light & Power Company, of Hillsboro, Ill., the sale having been approved by the Public Service Commission. It is rumored that the plant here will be enlarged and that electrical energy for light and power will be supplied to a number of neighboring towns.

LORAINE, ILL.—The Loraine Electric Light & Power Plant of Loraine has been incorporated with a capital of $2,500 to furnish light and power to this city. B. Van Blair, A. Van Blair and W. R. Hastings are the incorporators.

MANCHESTER, ILL.—Plans are being discussed here by city officials for securing electric lighting.

PAXTON, ILL.—The Central Illinois Utilities Company, of Paxton, N. J. Boisen, manager, is planning improvements to its plant at Fairbury.

SPRINGFIELD, ILL.—Plans insuring the completion of the Springfield & Jacksonville electric railway during 1917 have been completed, according to officials here. J. H. McFarlane, of Springfield, general manager of the company, which was organized in 1910 to build the line, has announced that the work is to be commenced soon.

GREENVILLE, MICH.—Bonds in the sum of $5,000 have been voted for a boulevard lighting system here.

HANCOCK, MICH.—The lighting committee of the City Council is planning to improve the street-lighting system. It is proposed to replace 44 arc lamps with tungsten lamps.

HOUGHTON, MICH. — The Houghton County Electric Light Company is planning a number of plant extensions and improvements to be made during the coming summer. A turbogenerator, boilers and auxiliary equipment will be added. Plans for the proposed improvements have been prepared and bids will be asked for shortly. The plant is under the management of Stone & Webster, 147 Milk Street, Boston, Mass.

HOWARD CITY, MICH.—Franchises for the purpose of supplying electrical energy in the various communities in Montcalm County are being secured by F. E. Hatch, of Detroit, and W. C. C. Clark, of Pontiac. The former has secured 30-year franchises in Morley, Sand Lake and Pierson and is

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seeking similar franchises in Aetna, Deerfield, Winfield, Pierson and Maple Valley townships. Mr. Clark has secured a franchise to operate in Edmore and is seeking franchises in Stanton, Sheridan, Six Lakes and Crystal.

MONROE, MICH.—At a city election held last week, the voters approved the issuance of $90,000 in bonds for the installation of an electric-lighting plant.

ST. JOSEPH, MICH.—A new electric railway line from this city to Michigan City is being planned by M. W. Stock and others.

CHIPPEWA FALLS, WIS.—Work on the construction of the Wissota dam of the Wisconsin-Minnesota Power Company on Paint Creek is well under way. Several million feet of lumber have been used for the cofferdams and molds for the concrete work.

LACROSSE, WIS.—Plans are being made for an extension of the white way system on North Third Street.

BEMIDJI, MINN.—The City Council is planning to install a white way system in the business district.

VIRGINIA, MINN. — Chairman A. G. Flournoy of the public welfare committee of the Commercial Club has appointed a committee to make plans for a white way on Chestnut Street.

WADENA, MINN.—Bonds in the sum of $11,000 have been voted for extensions to the electric-lighting and water plant. A new 100-kilowatt generating unit will be purchased.

ADAIR, IOWA.—The City Council has completed negotiations for the sale of the municipal electric-lighting plant to John A. Reed for $12,500. The proposition will be submitted to the voters April 24.

DIAGONAL, IOWA.—The Council is planning ways and means to secure a municipal electric-lighting system.

DOW CITY, IOWA.—The city is contemplating the purchase of an emergency generating unit, to be driven by a 25-horsepower oil engine, for the municipal plant, of which H. G. McQueen is superintendent.

HOPKINTON, IOWA.—W. A. Milroy, owner of the local electric-lighting plant, plans to install additional generating equipment.

VINTON, IOWA.—Plans for improvements to the municipal electric-lighting and waterworks systems call for an expenditure of about $15,000.

KANSAS CITY, MO.—The Kansas City Light & Power Company has purchased land at Twenty-first and Walnut Streets, for $125,000. It is understood the tract will be used for the heating plant which the company has heretofore maintained downtown. The company may ultimately install its own plant for generating electricity.

PIERCE CITY, MO.—A proposal to sell its municipal electric-lighting plant and buy energy from the Ozark Power & Water Company, of Joplin, has been approved by voters here. The company has offered to pay $6,000 for the plant and seeks a 20-year franchise.

PLATTSBURG, MO.—E. B. Murray Engineering Company, Kansas City, Mo., has been instructed by the City Council to prepare plans for a waterworks system and a sewer system for Plattsburg, the entire improvement to cost about $58,000. Bids on the waterworks system probably will be asked in 30 days.

SPRINGFIELD, MO. — The Lawrence County Light, Power & Cold Storage Company, which buys current from the Ozark Power & Water Company, has made a contract for the electrification of the properties of the Union Mining Company, at Aurora. This is the first electrification in the Aurora district. The contract will make necessary additional generators for the power company, the estimated expenditures being about $275,000. The mining company will, it is said, spend about $5,000 a year for power.

KANSAS CITY, KANS.—Commissioner L. H. Chapman has recommended the transfer of $20,000 of the earnings of the municipal electric-lighting plant to the extension fund. The money will be used for extensions to the distribution system.

LEWIS, KANS.—A. L. Moe, proprietor of the Kinsley (Kans.) Electric Light & Power Company, has submitted to the Council a proposition to build a transmission line from his plant to Lewis, install 50 street lights and build such lines as are necessary to the city. In return Mr. Moe asks that the city hold an election and vote bonds to the amount of $10,000.

PRATT, KANS.—At a city election held last week a bond issue of $23,000 to purchase the old electric-lighting plant was carried. The plant will be consolidated with the municipal plant.

DATES AHEAD.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SYLVIA, KANS.—Bonds in the amount of $5,000 have been voted to secure electric service here. A transmission line probably will be erected to Stafford for the purpose.

COLERIDGE, NEB.—The new municipal electric-lighting plant will soon be in operation. The machinery has been installed and most of the line work completed.

FLORENCE, NEB.—On April 18 the proposition to issue $10,000 in bonds for the establishment of an electric-lighting plant will be submitted to vote.

MERNA, NEB.—Improvements will be made to the electric-lighting and waterworks system, $9,000 in bonds having been voted for the purpose.

STELLA, NEB.—An accident to the engine in the municipal electric-lighting plant has placed the plant out of commission. The town will be without electric light unless some private company takes over the plant.

WINNEBAGO, NEB.—John Ashford, M. S. Mansfield and O. E. Buckley have been appointed by the Council to secure an electric-lighting system for this city.

ELK POINT, S. D.—Improvements and extensions are being planned for the municipal electric-lighting plant.

FAULKTON, S. D.—The Faulkton Light & Power Company, Oscar Edwards, manager, contemplates the installation of two additional generating units and proposes to establish a 24-hour service.

HOWARD, S. D.—Plans are under consideration for the purchase of the local electric-lighting plant by the city.

LEMMON, S. D.—E. F. Sheets has purchased the local electric-lighting and power plant from the Security Investment Company and is planning to supply 24-hour service.

REDFIELD, S. D.—Redfield will construct a modern municipal lighting, heating and power plant to cost about $75,000. It is expected to have the new plant fully completed and in operation before the first of the year. E. J. Bain is city clerk.

BURLINGTON, N. D.—A proposition to erect a transmission line to Foxholm for the purpose of supplying electric service to that city and intervening communities is being considered by the Northern States Power Company.

CLEVELAND, N. D.—An electric-lighting plant is now assured for Cleveland, the required money for construction having been subscribed.

SOUTH CENTRAL STATES.

CYNTHIANA, KY.—Mayor Swinford and Commissioners Conway, Wohlwender, Hatterick and Sprake, with City Manager Durbin, are making investigations of municipal lighting plants in connection with a proposal that the city enter the lighting field. The municipal plants at Falmouth and Winchester, Ky., have been inspected and further inquiries are to be made.

ELKTON, KY.—The South Kentucky Power Company holds an option until April 22 on the plant and franchise of the local electric light company owned and managed by Charles C. Damon, of Elkton.

GRAYSON, KY.—The Grayson Light & Power Company has been incorporated with a capital of $6,000 by J. A. Bagby, R. M. Bagby and others, and will furnish electric service here.

HAZARD, KY.—The Kentucky River Power Company has closed contracts, according to R. L. Cornell, manager, for equipment and erection of the power plant which it was announced last winter the company would build here. A five-acre site has been purchased in the eastern end of the city and construction will begin at once, the plant to be completed by October 1.

RUSSELLVILLE, KY.—The city, after consideration, has declined to sell its lighting and waterworks plants to the South Kentucky Power Company, which had asked for a proposal.

NASHVILLE, TENN.—The City Commission has passed an ordinance providing for the preparation of plans for a lighting system for the Woodland Street bridge.

ANNISTON, ALA.—The work on the foundation for the second electric furnace at the plant in Anniston is well under way, and it is understood that there is a prospect of the installation of four more furnaces of the same type, with probabilities of a further increase to ten. The Heroult furnace recently started up is doing excellent work and is meeting the expectations of the company's engineers.

ASHLAND, ALA.—A contract has been entered into between the City of Ashland and the Alabama Power Company, of Birmingham, by which the latter comes into possession of the lighting plant, now owned by the city, and energy will be furnished this place by the company after June. A transmission line from Talledega to Ashland will be erected.

BALDWYN, MISS.—A bond issue has been voted for the installation of an electric-lighting plant and improvements of the water system.

HIGHLAND PARK, TEX.—This community, which is a suburb of Dallas, has voted $10,000 in bonds for the purpose of securing electric lighting.

WACO, TEX.—City Electrician Ernest F. Copley estimates that the cost of the proposed white way system will be about $6,000.

WESTERN STATES.

ANACONDA, MONT.—Plans for the construction of a concrete dam at the city limits to form a small reservoir to control flood waters and serve as power for a contemplated municipal lighting plant have been completed by the city engineering department. The project will cost $25,000, according to estimates of the department, divided as follows: Dam and reservoir, $3,000; concrete lines, open ditch, $2,000; pipe, $11,731; excavation, 5,000 cu. yds., $5,000.

RED LODGE, MONT.—A project to build an electric railway system connecting Red Lodge, Bear Creek, Columbus and other points in Carbon County has taken definite shape. The proposed line would be about 40 miles in length and would cost about $500,000. F. W. Lyle is interested in the project.

WINSLOW, MONT.—The Winslow Gas & Electric Company has been incorporated to construct and operate a $50,000 plant.

SPRING CITY, UTAH.—Application has been filed with State Engineer Beers for rights to six cubic feet of water per second from Oak Creek for the purpose of constructing a municipal electric-lighting plant.

ROBERTS, IDAHO.—In a recent decision, the Public Utilities Commission at Boise decided against the Ashton & St. Anthony Power Company, Ltd., in the case of the village of Roberts vs. Ashton & St. Anthony Power Company. The certificate of convenience and necessity granted the Power Company to serve the village of Roberts was withdrawn. The Utah Power & Light Company, which is petitioning for the right to serve Roberts, is preparing to enter the field within 60 days after the Public Service Commission grants it the right. The Ashton & St. Anthony Company, however, still holds the right to serve territory in the vicinity of Roberts, and has already begun the construction of its dam and power house about two miles west of Ashton, where a 5,000-horsepower plant is under construction.

WALLACE, IDAHO.—A franchise has been granted the Washington Water Power Company, of Spokane, Wash., by the City Council, giving the company permission to construct, operate and maintain electric transmission lines over certain streets in Wallace, through to the city limits, where the company will furnish current to several mining camps on Placer Creek. The

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installation will be made as soon as materials can be purchased and delivered.

EVERETT, WASH.—Rucker Brothers, of this city, owning the majority of the stock of the Western Water Power Company, in a recent proposition to Superintendent J. D. Ross of the Seattle municipal lighting plant, offered to develop the Deer Creek-Lake Cavanaugh Power project in Snohomish County, and sell same to the city. In their offer, it is asserted the development of the project would involve the diversion of the waters of Deer Creek into Lake Cavanaugh by means of a flume and tunnel, the flume to be 19,200 feet long, and the tunnel 3,600 feet long. Five dams would be constructed to impound the water. From the south end of the lake the water would be carried by two tunnels, 8,020 feet long and 2,390 feet long. The second tunnel from the south end would carry the water to the penstock to a proposed power house in the Stillaguamish Valley, near Cicero. The proposed plant is approximately 70 miles north of Seattle.

NORTH YAKIMA, WASH.—The local land office has received information that the United States Land Office has withdrawn a power site consisting of 1,137 acres on the headwaters of the Klickitat River, near the slopes of Mount Thomas. The withdrawal was made on the recommendation of the Geological Survey. This withdrawal, it is stated, will interfere considerably with the projected power development of the Klickitat Power & Irrigation Company, which plans the development of Horse Heaven land. The Power Company plans utilizing the water from the Big Muddy and Klickitat Rivers in watering these lands.

OAKVILLE, WASH.—The plan of the Council to purchase from Frank Leisner the local electric light plant has been abandoned, according to reports.

OREGON CITY, ORE.—A special meeting of the City Council will be held shortly for the discussion of the practicability of a municipal electric-lighting and power plant.

PORTLAND, ORE.—The Home Telephone Company has agreed to pay a fine of $500, assessed by Judge McGinn in 1911, for failure to follow the provisions of the city ordinance regulating the installation and maintenance of overhead wires, and has also agreed to immediately begin the installation of its wires underground. The company plans to have 80 per cent of its lines underground in four years, and where hazardous conditions exist will place the wires underground within one year. J. B. Middleton is manager of the company.

RIDDLE, ORE.—A. E. Brais has been granted a franchise to construct and operate an electric distribution system here.

BAKERSFIELD, CAL.—After investigating the new electrolier street lighting system in Fresno, City Manager Morgan estimates that a similar system, consisting of 156 lights, could be installed here for $19,000.

LOS ANGELES, CAL.—Property owners along West Adams Street, between Hoover and Figueroa Streets, have been granted a permit by the Board of Public Works to erect an ornamental lighting system.

SACRAMENTO, CAL.—The State Water Commission has granted an application of the Pacific Power Corporation for a water appropriation from Leevining Creek in the Mono Lake basin. The water is sought for power purposes and involves an investment estimated at $717,144. The grant stipulates that construction shall begin by July 1.

SACRAMENTO, CAL. — Because wet weather has delayed the work of the Pacific Gas & Electric Company in Oak Park, the company will not complete its improvements in the annexed district until July, according to an announcement by C. W. McKillip, local manager for the corporation. The company is spending $30,000 on this extension of its system.

SAN FRANCISCO, CAL.—Ninety-nine per cent of the property owners on Market Street between East and Front Streets have entered into written agreements with the committee at work on the campaign for the installation of the Ryan system of illumination on Market Street, according to C. R. Hammersmith, of the Downtown Association, which has the campaign in charge.

WILMINGTON, CAL.—A petition from the Wilmington Chamber of Commerce, asking for electric lights in the residence district of Wilmington, has been referred to the Board of Public Works.

MANILA, P. I.—On the ground that the insular government's telegraphic service is unnecessarily expensive and cumbersome, Director R. M. Shearer, of the bureau of posts, has submitted to Commissioner De Veyra, acting secretary of commerce and police, a system for the general improvement of the telegraph, cable and wireless service, by means of which he proposes to place the telegraphic service on a satisfactory basis.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D.C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20537. ELECTRICAL GOODS. — A firm in India informs an American consular officer that it desires to be placed in touch with American manufacturers and exporters of electrical goods. Correspondence may be in English.

NO. 20565. ELECTRICAL SUPPLIES.—An American consular officer in England reports that a firm in his district desires to receive catalogs and price lists from American manufacturers of shade carriers, with cord grip and bayonet lamp holder; electric bells and fittings, flexible wires, bell wire, electric vacuum cleaners, and other household electrical supplies.

NO. 20680. MACHINERY AND TOOLS, —An American consular officer in Norway reports that a firm in his district is in the market for large quantities of machine tools, steel tubing for electric conduits, electrical cables, copper tubing, etc. A complete list of the requirements of this firm, together with specifications and full information, may be examined at the bureau or its district offices.

NO. 20686. ELEVATORS.—An American consular officer in China writes that a department store in his district desires to receive catalog and full information for six-passenger elevators of the latest pattern, two to carry from 8 to 12 passengers, two from 10 to 12, and two from 5 to 6, all for buildings 4 and 5 stories high, together with crude oil motors and dynamos, one of 60 and two of 80 horsepower each. The firm wishes to deal directly with exporters and desires to secure an agency for the machinery it buys.

NO. 20711. TRAMWAY AND ELECTRICAL MATERIAL.—A commercial agent of the Bureau reports that a representative of a European tramway system is now in the United States for the purpose of establishing commercial relations with American manufacturers of all kinds of tramway and electrical material.

New Incorporations

MARION, IND.—Delta Electric Company has increased its capital stock from $25,000 to $65,000.

CHICAGO, ILL.—L. B. Lincoln Electric Works has increased its capital stock from $25,000 to $50,000.

WEST HOBOKEN, N. J.—Davis Tungsten Lamp Company, manufacture electric lamps. Incorporators: J. Davis, M. Davis and W. Perlis.

BIRMINGHAM, ALA.—Electric and Auto Supply Company. Capital, $50,000. Incorporators: T. H. Benners, C. D. Cotten and W. H. Manly.

STEUBENVILLE, O.—Multicell Electric Company. Capital, $10,000. Manufacture electrical devices. Incorporators: A. T. Howser, G. F. Hamilton and others.

NEWARK, N. J.—Electric Company, capital, $50,000; electrical contracting. Incorporators: A. H. and E. H. Koellhoffer, East Orange, N. J., and E. C. Worth, Newark.

TOLEDO, O.—United Electrical Manufacturing Company. Capital, $50,000. Manufacture electrical horns and apparatus. Incorporators: B. E. Hayes and E. J. Wagner; Detroit; Karl Wagner and Walter Haley, Adrian, Mich.

Financial Notes

Brush Electric Company, of Galveston, a subsidiary of Cities Service Company, has sold to Klem & Keen, of Philadelphia, $1,000,000 of its five-per-cent first-mortgage bonds.

Cleveland Telephone Company has sold to the First National Bank, of Cleveland, $3,000,000 five-per-cent two-year notes, subject to the approval of the Ohio Public Utilities Commission.

Gross receipts of Brooklyn Rapid Transit in March made a handsome gain of nearly $157,000 which compares with $115,000 in the 28 days of February and $154,000 in January. This was an increase slightly less than $5,100 per day during March.

It is officially announced that the Equitable Trust Company, as trustee of the first-mortgage bonds of West Penn Traction Company, has purchased and retired 51 per cent of the bonds and certifies that the outstanding funded debt of the company is now $5,536,000. The $6,000,000 three-year six-per-cent notes of West Penn Traction Company, due in 1917, will be called for payment at 100.5 and interest on September 1, 1916.

The Kings County Electric Light & Power Company has filed notice of an increase in its capital stock from $14,000,000 to $16,000,000. The increase is for the purpose of taking up $2,500,000 convertible bonds which were authorized to be issued by the Public Service Commission in December, 1912, the proceeds of which were used for certain corporate purposes. The bonds are dated March 1, 1913, and convertible after three years and within 12 years.

Santa Barbara Gas & Electric Company, a subsidiary of Southern California Edison Company, has called for payment July 1, at 105, its outstanding $842,500 first-mortgage 6-per-cent bonds. The company has authorized a new mortgage of $3,500,000, and $1,000,000 of bonds to be issued under this have been purchased by bankers subject to the approval of the California Railroad Commission. Earnings of the company for the year ended February 29, 1916, were $336,798 gross and $163,194 net.

Showing the net income of the Pacific Telephone & Telegraph Company, operating in the state of Washington, for the year ending December 31, 1915, to be $615,934, the report of that company was recently filed with the Public Service Commission. The report shows the exchange revenues of the company for the year were $2,800,748, while the toll revenues totaled $879,938. Miscellaneous revenues brought the total revenues up to $3,607,795, while expenses approximated $2,707,795.

Consolidation of the St. Lawrence Transportation Company and the Northern Power Company, under the name of the St. Lawrence Transmission Company, has been authorized by the Public Service Commission of New York. The transmission company operates lines through Norfolk, Raymondsville and other towns to the Canadian line. The power company operates in Ogdensburg and surrounding towns. The joint capital stock of the companies is $326,000. The consolidated company is authorized to issue this amount of stock, which will be exchanged, share for share, at par for stock of the present companies.

A deal has been consummated for the merger of the Southern California Edison Company and the Pacific Light & Power Corporation. The former company operates in Los Angeles and vicinity and has very valuable markets but lacks hydro-electric developments sufficient for its requirements. The Pacific Light & Power Corporation has at Big Creek one of the largest developments in this country. The

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Apr. 10.	Apr. 3.
American Tel. & Tel. (New York)	128	127
Commonwealth Edison (Chicago)	144	146
Edison Electric Illuminating (Boston)	239	243½
Electric Storage Battery, common (Philadelphia)	61¾	61½
Electric Storage Battery, preferred (Philadelphia)	61¾	61½
General Electric (New York)	165½	166
Kings County Electric (New York)	129	129
Massachusetts Electric, common (Boston)	6¾	7
Massachusetts Electric, preferred (Boston)	35	35½
National Carbon, common (Chicago)	—	180
National Carbon, preferred (Chicago)	—	122
New England Telephone (Boston)	136	136
Philadelphia Electric (Philadelphia)	27¾	—
Postal Telegraph and Cables, common (New York)	79¼	78¼
Postal Telegraph and Cables, preferred (New York)	68	68
Western Union (New York)	90	91
Westinghouse, common (New York)	69¾	65
Westinghouse, preferred (New York)	74	74

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financial details of the merger have not been announced, but it is generally understood that the Southern California Edison Company will acquire the stock of the Pacific corporation, which is controlled by Henry E. Huntington. The Southern California Edison has outstanding $4,000,000 five-per-cent cumulative preferred stock and has authorized $26,000,000 common, of which $10,400,000 is outstanding. The Pacific Light & Power has outstanding $5,000,000 first preferred six-per-cent cumulative stock and $9,975,000 second preferred five-per-cent cumulative. Dividends are being paid on both classes of stock. Of the $25,000,000 common stock authorized, $10,559,500 is outstanding.

Dividends.

	Term.	Rate.	Payable.
Am. Lt. & Trac	Q	2.5 %	May 1
Am. Lt. & Trac., ,pf	Q	1.5 %	May 1
Bell Tel. of Penn	Q	1.5 %	Apr. 15
Brooklyn City R. R.	Q	2 %	Apr. 15
Commonwealth Edison	Q	2 %	May 1
Com. Gas & Elec	Q	1.375%	Apr. 15
Crocker-Wheeler	Q	1.5 %	Apr. 15
Elec. Util., pf	Q	1.25%	Apr. 15
Ky. Secur., pf	Q	1.5 %	Apr. 15
Milw. Elec. Ry. & Lt., pf.	Q	1.5 %	May 1
Monongahela Val. Tran.	Q	1 %	Apr. 15
Phila. Co., com	Q	1.75%	May 1
Pub. Serv. Invest., pf	Q	1.5 %	May 1
Va. Ry. & Pw	S	1.5 %	Apr. 20

Reports of Earnings.

REPUBLIC RAILWAY & LIGHT.

Republic Railway & Light Company reports for the fiscal year ended December 31, 1915:

	1915	1914
Gross earnings	$3,121,297	$3,001,285
Net earnings	1,247,214	1,144,818
Other income	1,753	176
Total income	1,248,967	1,144,994
Interest charges	688,953	679,987
Preferred dividends	311,484	311,484
Surplus	248,531	153,523

HUDSON & MANHATTAN.

Hudson & Manhattan reports for year ended December 31, 1915, compares as follows:

	1915	1914
Gross	$3,725,989	$3,750,950
Net after taxes	1,997,156	2,052,406
Other income	1,025,739	1,025,898
Total income	3,022,895	3,078,304
Bond interest, etc	2,381,763	2,357,797
*Net income	641,132	720,507

*Available for interest on adjustment income bonds.

New Publications

MAGNETIC TESTING.—A third edition of Circular No. 17, dealing with Magnetic Testing, has been issued by the Bureau of Standards. It deals with magnetic quantities, the formulas connecting them, data of magnetic materials, and methods of measurement employed at the bureau.

RESISTANCE ALLOYS.—"The Electrical Resistances and Temperature Coefficients of Nickel-Copper-Chromium Alloys," by Frederick M. Sebast, has been published by Rensselaer Polytechnic Institute. Variation of the results with different percentages of the metals is investigated, and many curves given. An alloy of high resistivity, low temperature coefficient, and commercial promise was found.

SCIENTIFIC PAPERS.—The Bureau of Standards, Washington, D. C., has issued the following papers, copies of which may be obtained upon application: "Effect of Imperfect Dielectrics in the Field of a Radiotelegraphic Antenna," by J. M. Miller; "Luminosity of a Black Body and Temperature," by P. D. Foote and C. O. Fairchild; "Inclusions in the Silver Voltameter Deposits," by G. W. Vinal and W. M. Bovard.

Proposals

FURNITURE LIGHTING.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., May 2, 1916, for furniture lighting in the United States post office at Denver, Colo., in accordance with drawings and specifications, copies of which may be had at that office or at the office of the custodian, Denver, Colo., in the discretion of the Supervising Architect. J. A. Wetmore, Acting Supervising Architect.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., April 17, for furnishing and delivering to the Department of Gas and Electricity, electric light and gas fixtures, glassware, castings, etc., and labor for installing and connecting same in an operative condition at the municipal pier, located at the foot of East Grand Avenue, strictly in accordance with plans and specifications on file in the office of said commissioner. William G. Keith, Commissioner of Gas and Electricity.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9480, Boston, Mass., oil-break switches, etc. Schedule 9490, Newport, R. I., electrical supplies. Schedule 9502, Brooklyn, N. Y., telephone cable and twin-conductor wire. Schedule 9503, Brooklyn, N. Y., 5,500 feet four-conductor cable, miscellaneous interior communication cable and twin-conductor cable. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

Electrical Patents Issued April 4, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,177,617. Sound-Muffling Attachment for Telephonic Apparatus. L. B. Gray, Boston, Mass. Deadens effect on transmitter of sounds except those entering directly through mouthpiece.

1,177,638. Coupling. L. S. Larson and C. E. Jones, Toledo, O. For driving magneto.

1,177,658. Signaling Device for Automobiles and the Like. E. H. Smith, Jr., Chicago, Ill. Stationary lamp lights license plate and second lamp on swinging arm adjustable about first.

1,177,680. Electric Furnace. John W. Brown, assignor to National Carbon Company, Cleveland, O. For treating granular material; current passed through charge and gas heated by passing through hot treated material is burned in untreated material to preheat.

1,177,685 and 1,177,686. Electric Regulation. J. L. Creveling, assignor to Safety Car Lighting & Heating Company, Jersey City, N. J. First patent: Has special electromagnetically operated compressor resistance. Second patent: Has special coordination of carbon-pile resistances responsive to voltage and current.

1,177,694. Telegraphic Type-Printing Receiver. A. Franke and Erwin Ehrhardt, assignors to Siemens & Halske Aktiengesellschaft, Germany. Mechanism of impulse-operated device.

1,177,701. Inductor. A. B. Herrick, assignor to M. C. Messler, Pawtucket, R. I. Induction coil combined with spark plug has electric and magnetic circuits controlled by engine compression.

1,177,702. Variable Resister. J. H. Hodde, assignor to Sangamo Electric Co., Springfield, Ill. Adjustable vane in mercury chamber between electrodes is controlled by magnet.

1,177,707. Portable Stop for Electric Cranes. J. A. Jones, Chicago, Ill. Chock block for detachable connection to rail.

1,177,708. Wireless Safety Ship Signal. P. Juhasz, South Bend, Ind. Special receiving apparatus for indicating from what direction waves are received.

1,177,718. Electric Igniter. A. C. Merten, Westcliff, Colo. Make-and-break type; attachment for engine cylinders operated by cylinder compression and electromagnetically controlled.

1,177,726. Electric Lapwelding Machine. F. L. Sessions, assignor to the Standard Welding Company, Cleveland, O. Resistance type; arrangement of roller electrodes for welding pipe seams, etc.

1,177,753. Railway-Signal. J. R. Wilson, assignor to The Union Switch & Signal Company, Swissvale, Pa. Contact arrangement for signal-holding device comprising rotor and stator.

1,177,754. Printing-Telegraph Apparatus. W. Zabel, assignor to The Union Switch & Signal Company. Details of mechanism of translator.

1,177,761. Electrically Operated Valve. J. H. Clemmer, Blue Creek, Va. Valve attracted into open and closed positions by electromagnets on body.

1,177,765. Clutch-Controlling Mechanism for Motor Vehicles. R. E. Drachenberg, Detroit, Mich. Clutch manually controlled and electrically controlled upon operation of transmission.

1,177,768. Relay. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. Magnet controls contact springs, some of which are quick and others slow restoring on de-energization of magnet.

1,177,773. Railway Traffic Controlling Apparatus. C. O. Harrington, assignor to Union Switch & Signal Company. Electromagnetic devices for indicating condition of two switches at crossover.

1,177,776. Telephone System. C. F. Jones, Oakland, Cal., assignor of six-tenths to P. Smith, Boston, Mass. Has amplifying receiver and high-tension source in secondary of repeater coil and a sensitive return circuit including a transmitter and receiver.

1,177,778. Telegraph Sending Machine. J. M. Kennedy, St. Louis, Mo., assignor of one-half to E. Springmeier, Jr., St. Louis, Mo. Vibrator key.

1,177,782. Printing-Telegraph Apparatus. L. V. Lewis, assignor to Union Switch & Signal Company. Comprises a typewriter and continuously operated motor.

1,177,788. Dynamoelectric Machine. S. H. Martin, Chicago, Ill. Rotor has two squirrel-cage windings, one of which is segmental.

1,177,789. Trunking Arrangement for Automatic Telephone Arrangement. T. G. Martin, assignor to First Trust & Savings Bank, Chicago, Ill. Arrangement for crossed line conductors.

1,177,800. Vibrator. E. I. Pearson, assignor to the Temco Electric Motor Company, Leipsic, O. Comprises magnetically operated reed.

1,177,803. Coated Metal Button or Similar Article and Method of Making Same. J. F. Quinn, Providence, R. I. Metal more electropositive than silver is dipped into silver plating solution and silver plated article coated with powdered pearl and lacquer.

1,178,818. Photograph-Printing Apparatus. E. J. Schroder, Chicago, Ill. Switch mechanism.

1,177,819. Distributing Head. E. O. Schweitzer, Chicago, Ill. For a transformer pole.

1,177,841. Protecting Unit for High-Tension Electric Systems. H. W. Young, assignor to Delta Star Electric Co., Chicago, Ill. Arrangement of choke coil and horn-gap ground connection. (See cut, next page.)

1,177,842. Electric-Signaling System. S. M. Young, New York, N. Y. Block system for electric railways having direct propulsion and alternating signaling current.

1,177,848. Apparatus for and Method of Recording Fluctuating Currents. L. De Forrest, assignor to Radio Telephone & Telegraph Co., Delaware. Currents are amplified by audion and recorded by magnetic device.

1,177,857. Regulating Valve Device for Gas Supply to Ovens. H. E. Gilbert, Conshohocken, Pa. Has alarm circuit controlled according to valve position.

1,177,866. Adjustable Headlight. F. F. John, Milwaukee, Wis. Pivoted headlights actuated by remotely controlled solenoids.

1,177,872. Electric Cloth-Cutting Machine. N. Komow, Brooklyn, N. Y. Mounting of motor, gearing, etc.

1,177,881. Dynamic Control. W. S. Mayer, assignor to Niles-Bement-Pond Co., Philadelphia, Pa. Resistance control of series motor for running and dynamic braking in both directions.

1,177,894. Type Ejector for Typesetting Machines. W. J. Poole, assignor to American Lineograph Co., Los Angeles, Cal. Electromagnet gives type initial impulse down transfer chute.

1,177,896. Process of Hydrogenating Oils or Fats. W. D. Richardson, assignor to Swift & Co., Chicago, Ill. Comprises submerging arc between metallic electrodes in the oil or fat.

1,177,920. Electric Connection. W. C. Brinton, assignor to Philips-Brinton Co., Kennet Square, Pa. Connection of conductor to binding post.

1,177,923. Cap for Electric-Circuit Interrupters. W. H. Brown, assignor to Philips-Brinton Co. Readily removable cap for ignition interrupters.

1,177,924. Spark-Plug. W. H. Buckley, Bridgeport, Conn. Special structure of central electrode.

1,177,942. Automatic Train-Stop. J. Fournia, Albany, N. Y. Track and vehicle electromagnetic devices co-operate to control brakes.

1,177,948. Circuit-Breaker. B. Haskins, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Oil switch has two arms, one tripped on overload and cannot be restored until other has been opened.

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1,177,976. Dimmer for Automobile Headlights. C. J. Wallace, Springfield, O., assignor of forty-nine-one-hundredths to M. B. Tennant, Springfield, O. Structural details of adjustable resistance.

1,177,981. Magnetic Separator. P. Wright, Vancouver, British Columbia, Canada. Arrangement of chutes and water streams in rotary magnetic separating device.

1,177,988. Electric Relay. C. R. H. Euhl, Cleveland, O. Combination of permanent magnet and core with double wound coil for reversing its polarity.

1,177,992. Pressure Gauge or Indicator. C. A. Clouser, New Smyrna, Fla. Lamp-illuminating indicator is lighted only when pressure is on.

1,177,993. Divided Conductor for Electrical Distributing Systems. W. H. Cole, Waltham, Mass. Insulation less at predetermined points to cause breakdown at those points on development of unsafe voltage.

1,177,996. Insulator. W. J. Curry and W. A. Andrews, East Liverpool, O. Reversible cleat.

1,177,998. Spark-Plug. F. Davis, Jr., Duquoin, Ill., assignor of one-half to W. H. Meng, Duquoin, Ill. Ground electrode has rotatable hub with radiating blades in line with power electrode.

1,178,020. Means for Shaping Leaf Springs. Z. B. Leonard, Cleveland, O. Electromagnet energizes leaf support and draws it into position.

1,178,020. Telephone. R. H. Manson, assignor to the Garford Mfg. Co., Elyria, O. Switch-hook lever can be thrust inwardly so as to be protected by casing.

1,178,023. Telephone Key. G. E. Meuller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Party-line ringing key.

1,178,029. Electric Curling-Iron. E. Schwartz, Racine, Wis., assignor of one-third to J. L. Burgard, Chicago, Ill. Flexible heater element threaded into tortuous apertures in jaws.

1,178,034. Warning-Signal Device. W. J. St. Onge, assignor to the Garford Mfg. Co., Elyria, O. Resonator and contained reflector have same focal point at which lamp is located.

1,178,036. Grinding Machine. C. M. Stretcher, Springfield, O., assignor to C. H. Stephan, Springfield, O. Adjustably mounted motor has longitudinally adjustable rod at its axis carrying grinder wheel.

1,178,046. Signaling Apparatus. H. B. Anderson and P. Justus, Cleveland, O., assignors of one-third to E. C. Ranney, Lakewood, O. Arrangement of primary and secondary alarm circuits.

1,178,057. Electric Heater. S. G. Crane, Toledo, O. For heating flowing liquid, electric heat elements forming conveyors; means for thermally controlling flow of liquid. (See cut.)

1,178,058. Telephone Bracket. S. D. Cruse, Louisville, Ky. Details of extensible arm.

1,178,062. Moving-Picture Apparatus. T. A. Edison, assignor to New Jersey Patent Co., West Orange, N. J. Light through film of desired color at desired portions of film through film control of color devices.

1,178,066. Storage Battery. W. Gardiner, assignor to Gardiner Storage Battery Co., Chicago, Ill. Arrangement of terminals, bus bars, etc., for number of cells constituting battery.

1,178,067. Electrical Ignition System. E. Gassman, assignor to Eisemann Magneto Co., New York, N. Y. For engines; combines alternating high-tension circuit with battery.

1,178,079. Attachment for Electric Lamps. G. M. Laird, Hillsboro, Ill. For attaching lamp to dry cell.

1,178,085. Railroad Switch. G. A. Lorenz, Cincinnati, O., assignor of one-half to E. Jacob. Electrically operated turntable for electric railway.

1,178,089. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Normally operates on inductor principle but armature may be oscillated for supplying initial spark.

1,178,115. Electric-Elevator Brake. C. W. Wheller, assignor to Otis Elevator Co., Jersey City, N. J. Brake shoes applied by main spring and each having independent auxiliary spring automatically operated to give extra pressure, are released by single electromagnet.

1,178,121. Circuit-Controller. J. M. Anderson, assignor to A. and J. M. Anderson Mfg. Co., Boston, Mass. Arrangement of metal resistance strips.

1,178,128. Direction Signal. O. L. Britton, Denver, Colo. For automobiles; illuminated pointer operated by special arrangement of contacts controlling specially wound motor.

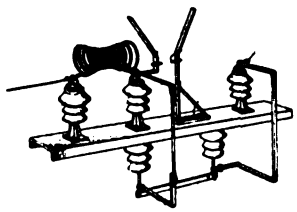
1,178,150. Flexible-Conduit Fastener. M. Guett, assignor to the Hart & Hegeman Mfg. Co., Hartford, Conn. For securing to wall of outlet box.

1,178,152. Variable-Rate Meter. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Pressure circuit varied by magnet in work circuit.

1,178,158. Game Apparatus. F. W. Hitchings, Cleveland, O. Projectile electrically released from moving suspended car by pressing button in effort to hit target beneath.

1,178,192. System of Automatic Block Signaling for Electric Railways. F. Townsend, assignor to General Railway Signal Co., New York, N. Y. Utilizes number of connected parallel tracks for return propulsion current.

1,178,195. Electrical System of Automatic Generation and Distribution. W. F. Wanrer, Davenport, Iowa. System for automobiles, including dynamo, battery ignition, etc.



No. 1,177,841.—Protecting Unit for High-Tension Electric Systems.

1,178,199. Electrical Fuse. J. E. Wood, assignor to Metropolitan Electric Mfg. Co., Jersey City, N. J. Details of enclosed fuse.

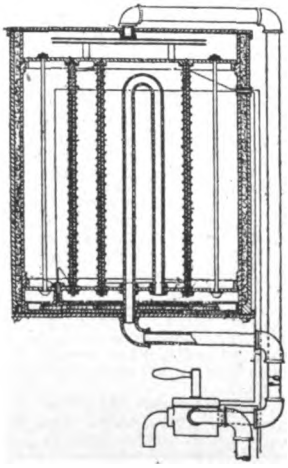
1,178,201. Semi-Indirect Lighting Fixture. H. C. Adam, St. Louis, Mo. Arrangement of top and bottom diffusing shields and reflector.

1,178,207. Terminal Bank. C. F. Baldwin, assignor to Western Electric Co., New York, N. Y. Superimposed and compressed insulating sheets and metal terminal strips for telephone lines, etc.

1,178,215. Printing-Telegraph Receiver. G. S. Conger, assignor to Dow, Jones & Co., New York, N. Y. Rotary-type wheel and electromagnetically operated mechanism therefor.

1,178,247. Contact for Subsurface Electrical Railroad Systems. O. E. Longsdorf, Chicago, Ill. Details of contact structure.

1,178,249. Trolley Wheel. H. K. McClure, Elk Lick, Pa. Hub structure.



No. 1,178,057.—Electric Heater.

1,178,267. Connecting Device for Electrical Conductors. G. L. Scheel, Chicago, Ill. Swiveled structure with ball bearings.

1,178,271. Electric Alternating Machine. C. G. Silvander, Vesteras, Sweden. End-conductor support.

1,178,291. Telegraph Key. R. L. Boulter, Los Angeles, Cal. Combination of keys of "Morse" and vibrator types.

1,178,305. Automatic Train-Stopping Device. G. H. Ennis, Derby, Conn. Train-control devices on vehicle controlled by magnets along track.

1,178,374. Push-Button Mechanism for Passenger Cars. C. H. Anderson, Cincinnati, O. Structural details.

1,178,383. Insulator. W. H. Caslow, Claridge, Pa. Special structure of bracket and insulator for securing to hollow support.

1,178,418. Manufacture of Metallic Filaments for Incandescent Electric Lamps. J. A. Scoular, assignor to Dick, Kerr & Co., London, England. Relates to making tungsten filaments.

1,178,424. Spark-Plug. J. A. Soden, Toledo, O. Gaskets and glands provided for making tight joints about insulator and central electrode.

1,178,430. Process of Electrical Separation. H. A. Wentworth, assignor to Huff Electrostatic Separator Co., Boston, Mass. Comminuted materials of different conductivity passed through electrostatic field.

1,178,431. Intermittent-Current Conveyor. J. H. Wheelock, assignor to American Model & Instrument Co., Worcester, Mass. Special structure of contact making and breaking device.

1,178,432. Intermittent-Current Conveyor for Closed Circuits. J. H. Wheelock, Worcester, Mass. Contacting device with shunt branches closed when contacts are open.

1,178,444. Theatrical Illusion Device. S. Goldini, New York, N. Y. Appliance for electrical dancing.

1,178,447. Speed Regulation of Electrically Driven Ring Spinning Frames. C. C. Hoenig, assignor to General Electric Co., Schenectady, N. Y. Speed of frame controlled according to reciprocation of ring rail and layers on bobbin.

1,178,454. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Structure of magneto.

1,178,455. Dynamoelectric Machine. A. H. Neuland, San Francisco, Cal. Alternating-current, commutating type.

1,178,467. Whistle-Operating Mechanism. E. H. Bullard, Springfield, Mass. Electrically and mechanically operated shutters co-operate to form sound producing opening.

1,178,471. Automatic Telephone Exchange Apparatus. G. E. Kimball, assignor to First Trust & Savings Bank, Chicago, Ill. Interrupter comprising number of reciprocally controlled relays and step-by-step switching mechanism.

1,178,472. Telephone Transmission System. A. B. Smith, assignor to J. B. Russell, New York, N. Y. Differential transmitters arranged in form of Wheatstone bridge.

1,178,479. Electric-Lamp Socket. W. M. Elliot, Austin, Tex. Details of spring switch.

PATENTS EXPIRED.

The following United States electrical patents expired on April 11, 1916:

622,657. Circuit-Breaker. H. E. Andersson, Stockholm, Sweden.

622,669. Battery Cut-Out for Electric Selector Systems. T. C. Drake, Malta, O.

622,689. Process of Making Battery Electrodes. J. C. Howell, London, England.

622,690. Machine for Making Metallic Ribbon for Battery Electrodes. J. C. Howell, London, England.

622,736. Electric Overhead Railway. J. B. Verroken, Antwerp, Belgium.

622,747. Splicer for Trolley and Other Wires. M. M. Wood, Chicago, Ill.

622,748. Rheostat. W. H. Woodman, San Francisco, Cal.

622,759. Electric-Arc-Forming Device. J. Czihowski, Vienna, Austria-Hungary.

622,785. Electric-Light Radiator. H. Stenz, Faribault, Minn.

622,865. Apparatus for Line Distribution by Inductional Transformers for Secondary Generators for Electric Railways. E. E. Ries, Baltimore, Md.

622,866. System of Electrical Distribution. C. F. Scott, Pittsburgh, Pa.

622,885. Circuit-Breaker. H. P. Davis, Pittsburgh, Pa.

622,893. Electric Igniter for Gas Engines. E. W. Graefm, Baltimore, Md.

622,910. Electrically Illuminated Advertising Sign. W. T. Bell, Nottingham, England.

622,917. Electric Temperature Indicator. J. H. Dorion, Springfield, Mass.

622,977. Electrical Steering Mechanism. A. L. Riker, New York, N. Y.

622,991. Trolley. R. E. Carroll, Lima, O.

623,006. Flexible Electrical Conductor. J. W. Gottschalk, Philadelphia, Pa.

623,009. Fire Alarm. H. E. Greene and J. W. Haley, Hot Springs, Ark.

623,022. Electric Catheter. R. P. Johnson, Chicago, Ill.

623,033. Lighting Conductor. G. Raunacher, Vienna, Austria-Hungary.

623,036. Carbon-Sorting Machine. C. T. Richmond and M. M. Zellers, Cleveland, O.

623,063. Apparatus for Measuring and Recording Electric Currents. H. Aron, Berlin, Germany.

623,104. Electrode for Electric Accumulators. H. Pieper, Fils, Liege, Belgium.

623,117. Listening Key or Circuit-Changer for Operators' Keyboards. J. Baxter, Fort Wayne, Ind.

623,118. Switching Apparatus. J. Cloos, Milwaukee, Wis.

623,119. Switching Apparatus. J. Cloos.

623,120. Switching Apparatus and Method of Counteracting Arcs. J. Cloos.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, APRIL 22, 1916. No. 17.

EDITORIALS

ELECTRIC COOKING.

The Society for Electrical Development has announced the appointment of a special committee which is to take up the subject of electric cooking and plan an electric-range campaign which shall be of national scope. The central-station industry is waking up to the fact that electric cooking has great potentialities as a profitable load builder, and the present is regarded as a good time to inaugurate a national campaign. As quoted in an interview on another page, Mr. George A. Hughes even goes so far as to say that this load will eventually exceed the industrial power load of the central stations. While this statement may be credited to the exuberance of an enthusiast and may be regarded by many as an exaggeration, it is nevertheless true that there is an enormous field here for the application of electrical energy which merely awaits the aggressive promotion of those who direct the policies of the central stations of the country.

At the time of the National Electric Light Association's convention in 1912, we published an editorial, an excerpt from which is given below, pointing out that while lighting and industrial power loads are still growing and require the close attention of new-business departments, the next great development of the industry would be in the direction of electric cooking, which has only awaited the intensive sales efforts of the supply companies to yield a large and profitable load. The necessary attention seems about to be given. The Western States have already made a remarkable showing, and the report of the Electric Range Committee of the Northwest Section last year made such an impression that this committee has been appropriated bodily by the National Association, and will make a report at the national convention to be held in Chicago next month. Mr. S. M. Kennedy, of this committee, predicts that 10,000 electric ranges will be sold in 1916 in the Pacific and Intermountain States alone.

As made clear in the paper by Mr. P. L. Miles, in this issue, there are but two conditions necessary to the successful prosecution of a campaign of this kind: the customer must be satisfied, and the business must be profitable to the central station. We have never held any doubt as to the possibilities on either of these points, as a rate can be made which will meet both requirements. To quote from our editorial in the issue of June 22, 1912:

"There is one application of electricity, however, which can be made so general that it should in the future form a large element of the output of every central station in the land, and the next step in central-station development should be the acquisition of this potential load. Electric cooking represents a great possibility for the central station and one which has been entirely too much neglected up to the present time. It is an application that concerns every central station and every customer who is now within reach of the facilities of central-station service. Suitable equipment for this purpose has finally been developed to the point where general satisfaction can be expected from its use. The principal obstacle to its introduction seems to be generally regarded as one of cost, but it is a debatable question whether this is the real obstacle in the way of progress. Electric lighting was firmly established while its cost was still greater than that of other illuminants, and is now being largely used in places where that relation still holds true. It has spread, not on account of its cheapness, but in spite of its cost, and owing entirely to its other advantages. Electric power is sometimes installed with the object of lowering the immediate expense for power. In many other cases the reason has been, rather, its great utility and convenience coupled with considerations which affect matters of cost rather indirectly. Similarly, electric cooking should find its general introduction and firm establishment on other grounds than its cost, and when its advantages are fully appreciated, it will be introduced whether it is cheaper than other methods of preparing food or not. It is not necessary to enumerate its many advantages here, as these have been frequently referred to in these columns. Suffice it to say, that while central stations should make this development as attractive as possible from the standpoint of expense, they should, nevertheless, inaugurate a vigorous campaign to demonstrate to the public those advantages which will outweigh in its eyes even a disadvantage which will exist in many places from the standpoint of cost."

With the experience already obtained, no doubts should remain as to the possibilities of successfully introducing electric cooking. The question is rather one of methods. Central stations are finding that they can safely offer a sufficiently attractive rate, and many companies in the Central States and in the East are making a lower rate than other companies in the West which have already connected considerable loads of this character. There are about 3,000 companies in this country which now offer a cooking rate of not more than five cents per kilowatt-hour. Of these, 835 offer a rate of three cents or less. The latter figure appears to be low enough to get the business even in competition with

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cheap fuel. The high diversity-factor of this business—higher than would be anticipated—permits service to be supplied at low cost. The possibility of low rates is not confined to hydroelectric territory, but extends to steam plants outside of the coal fields, such as the Edison Electric Illuminating Company of Boston, which has a three-cent rate.

Two problems confront the industry. One has reference to securing the interest of the consumer; the other is concerned with the method of handling the equipment—of getting it to him. Few cooks or housewives are acquainted with the advantages of electric cooking—they must be educated. This calls for publicity work, demonstrations and personal attention by salesmen. Often trial installations will be necessary, as the uninformed regard the subject as still in the experimental stage. The use of high-class equipment should be encouraged as much as possible, and this will be facilitated by arrangement for deferred payments, or purchase on the instalment plan.

The merchandizing problem shows the industry to be in just as chaotic a condition with respect to this subject as to any other. It is a fact that in many parts of the country development awaits the initiative of the central station, and the latter must do the campaign work if any is to be done. It is then looked to by the consumer, and quite naturally, to supply the equipment and install it. Of course, the latter work can be turned over to contractors where suitable working agreements have been made, but the latter must be familiar with the requirements of this class of work. Whether the manufacturer should deal directly with central station or consumer, or confine his direct transactions to the jobber, is a knotty problem, with no uniform practice established. Some manufacturers make one schedule of prices to all, with quantity discounts. This leaves an opportunity open to the jobber where he can supply a large territory, and purchase in larger quantities than any single operating company, especially if the discounts are figured on annual sales rather than upon individual orders. Other manufacturers make a lower price to jobbers than to central stations, regardless of quantity. A few central stations refuse to do any merchandizing, but see to it that the channels are open for the easy flow of equipment through the jobber and local dealer.

Some central-station managers seem to think it necessary to sell at wholesale prices, or to do the requisite wiring free of charge in order to secure this business. Such ideas are usually based upon misconceptions. Application of salesmanship to the consummation of sales based upon the advantages to be secured, rather than upon cost considerations, will usually make such concessions unnecessary. Sales ability counts for more than price, and when a proposition has intrinsic merit it is a mistake to enlarge upon the latter. Few sales will be lost upon a cost basis if the advantages of electric cooking are sufficiently emphasized, especially if time payments are permitted.

SCIENCE AND ORGANIZATION IN BRITISH INDUSTRIES.

Progress is reported in connection with two large movements that have been set going in England owing to the war. We refer, first, to the scheme for giving national support to scientific and industrial research; and secondly, to the efforts that are being made to bring about a more efficient and unified organization of British engineering industries. The appointment by the British Government of an Advisory Council of Research was referred to in these pages some months ago when we stated the objects for which it was established. The outstanding weakness was the smallness of the fund placed at the council's disposal—$150,000. We are now able to report what has already been accomplished by the initial efforts. The scientific and professional societies were invited to submit applications for aid to continue researches for which the necessary staff and equipment were available and among the purposes for which grants have been or are to be made, are the following: Heating of buried cables and the properties of insulating oils (to the Institution of Electrical Engineers); hardness tests and the properties and composition of alloys (to the Institution of Mechanical Engineers); laboratory glass and optical glass (to the Institute of Chemistry); methods of extracting tin and tungsten (to the Institution of Mining and Metallurgy); corrosion of non-ferrous metals (to the Institute of Metals); tool-steel experiments (to the Manchester Association of Engineers); optical glass (to the National Physical Laboratory). Other proposed grants for similar purposes are under consideration, and one that has been recommended is in aid of an important new research into the manufacture of hard porcelain which is leading up to the establishment of such manufacturing in England. These are all initial steps of the government measures for giving national patronage to the application of science in industrial departments, and in order that the interests of particular branches of industry may be properly dealt with, standing committees of experts in those industries are to be appointed. It is stated that particulars have been collected of the research work of scientific and professional societies, universities, and higher technical schools, with a view to establishing a register of research, and it is not unlikely that the research work of particular firms will be similarly obtained. Action has been taken—action of a more or less preliminary nature, it is true, as not much can be done in this direction during the war—for training an adequate supply of research workers, it being recognized that this will be an important branch of the Advisory Council's work.

The second movement to which we allude is taking the form of a series of meetings of the engineering leaders of a number of important centers in England.

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PROGRESS IN LIGHTING EFFICIENCY.

The close relationship between physics, chemistry and illuminating engineering was made apparent by an address last week by President Steinmetz, before the New England Section of the Illuminating Engineering Society. Dr. Steinmetz devoted considerable time in his remarks to the possibilities of further progress in raising the efficiency of lamp filaments and at almost every turn, the importance of co-operative effort between the physicist and the chemist could be seen.

In the last decade there has been a six-fold gain in efficiency, considering merely the incandescent lamp. The specific consumption has decreased from 3 to 0.5 watts per candle. The efficiency of light production is a function of filament temperature, and efforts toward further improvement are sure to be directed along the line of finding a material which will withstand higher degrees of heat than present practice permits. The ideal light, with an efficiency of about 70 candles per watt, seems a tremendous distance away, the present gas-filled lamp yielding but 2 candles per watt. The half-watt gas-filled lamp runs pretty close to the melting point of tungsten. Nevertheless, something may be done along the lines of trying to improve efficiency through reduction of the energy lost by heat conduction and convection, employing, if it can be found, a gas of decreased heat capacity and lower heat conductivity than nitrogen or argon; of trying out the use of higher gas pressures, although the risk of explosion must be considered; or of seeking a material with a higher melting point than tungsten.

What is greatly needed is a substance with a maximum radiation in that portion of the spectrum which is the visible range, say one which could be operated at a temperature of from 5,000 to 5,500 degrees centigrade. The art might then rejoice in a luminous efficiency of 10 to 15 per cent, against the bare 3 per cent available in the gas-filled tungsten unit. Should it be found possible to use some special form of carbon, perhaps carbon deposited from a hydrocarbon vapor, in this work, it might be feasible to obtain an efficiency approximating 10 per cent. Here is a task for organic chemistry which may be expressed somewhat in this fashion: WANTED, a carbon molecule of low dissociation which can be operated at temperatures near the melting point of the element.

It is to the study of selective radiation that physicists must look, in seeking higher efficiencies. It is possible in theory to obtain a substance in which most of the energy is radiated in the visible spectrum. Titanium, calcium and mercury are of considerable interest in this connection. Something may be expected, perhaps, from researches in which superheated vapor is experimented upon with enormously high energy concentrations secured through the use of heavy condenser discharges through the material. Striking changes in the distribution of spectroscopic lines occur under such conditions, and may lead to practical results, perhaps to doubling lamp efficiency in the next ten years if success crowns the efforts of the researchers.

Meanwhile the illuminating engineer should take heart, for the great opportunities of the immediate future are directly concerned with the more efficient application of the lighting agencies available, and while the man in the laboratory works with spectroscope, crucible and bulb, the man who deals with the installation owner can be doing proportionally useful work in making the best possible use of the materials at hand.

MAGNETIC HYSTERESIS IN STRONG FIELDS.

The designer of electrical machinery has for years made use of the empirical relation discovered in 1892 by Dr. C. P. Steinmetz, that the loss of energy in magnetic materials due to the reversal of their magnetization is approximately proportional to a power of the flux-density represented by the number 1.6. In actual machinery the distribution of the magnetic flux is far from uniform and computations based upon average values could not be expected to agree very closely with fact. Even in test specimens, however, experiments seemed to show a wide departure from adherence to the Steinmetz law, especially at high values of the flux-density. The energy loss appeared to go up much more rapidly with increasing flux-density than was indicated by the law. This was especially true of silicon-steel, which has an unusually thick scale upon its surface.

The reason for these apparent deviations from the law are pointed out in an interesting article by Mr. John D. Ball in the current issue of the *Journal of the Franklin Institute*. Sheets of steel covered with a layer of scale constitute a heterogeneous material whose behavior is quite different from what one would find if a pure substance were involved. The scale has different properties from the iron, and both its permeability and hysteresis have different values. The proportion of flux in the two materials consequently varies as the total flux increases. Mr. Ball has shown that this is sufficient to account for the observed results, even if the individual materials conformed closely to the Steinmetz law. It is already known that the law is not exact, but it is much more nearly so than some of the experiments, which were vitiated by the condition pointed out, indicated. The reason the discrepancies are most prominent in strong magnetic fields is that the distribution of flux changes more markedly when the higher flux-densities are reached.

The work of Mr. Ball brings to light one more difficulty with which those making magnetic experiments have to contend. Heterogeneity of material causes difficulty in many places. In the dielectric in a condenser, for instance, it also increases the energy loss. To obtain results which shall be free from question it seems necessary that the experimenter should deal with pure materials.

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Happenings in the Industry

Society Plans Electric-Range Campaign—Railway Operation Discussed at New York—Electric-Range Conditions in the West—H. L. Doherty Speaks on Utility Regulation—Electric Vehicle Meeting at Boston—Preparedness Committee Organized—Indiana New Business Men Meet at Kokomo—Miscellaneous News

HOLD IMPORTANT ELECTRIC-RANGE MEETING IN NEW YORK.

Society for Electrical Development to Promote Greater Co-operation and Conduct Comprehensive Campaign.

A special meeting was held April 14, 1916, at the executive offices of the Society for Electrical Development in New York, to consider the undertaking of a special electric range campaign with the industry as well as directing public attention to the advantages of electric cooking. Those attending were representatives of leading electric range manufacturers. The meeting was preliminary to the appointment of a national electric range committee composed of representatives of all electric interests.

It is recognized that the attention of leading interests is being focused upon the desirability of the electric range as a means of building up the domestic load. Several manufacturers are contemplating big campaigns to promote electric range sales and it was reasoned that the Society for Electrical Development would be the best organization to act as a clearing house for the campaign as it did in the "Wire Your Home" movement which has just come to a successful close. It would be the function of the Society to lend support to central stations by giving them specific data on the desirability of range business and to aid them in conducting range campaigns. Sales arguments for range salesmen to use could be standardized as much as possible and then published in book form to be used by the individual salesmen. It was proposed that the Society issue a booklet on how to put on a range campaign.

Considerable stress was laid upon the suggestion that central stations include cost of installation in their range prices. In other words quoting prices with the range installed, thus avoiding selling the range and having then to argue out the cost of installation.

The Society would aid in developing the public demand for ranges by disseminating advertising and publicity matter through its various channels.

It was decided to appoint a special committee to take up in detail the plans for a national electric range campaign. This committee will meet in Chicago May 22, the first day of the convention of the National Electric Light Association.

Lectures on Electrical Subjects to Minnesota Students.

Charles L. Pillsbury, consulting engineer, Minneapolis, Minn., who has recently completed extensive valuation work in Detroit, Washington and other cities, is delivering a course of 18 lectures on "The Valuation of Electrical Properties" for the fifth-year engineering students at the University of Minnesota. R. A. Lundquist, consulting electrical engineer, Minneapolis, Minn., is giving a course of lectures to the fifth-year electrical engineering students on "Transmission Line Construction." Fred Dustin, of the Standard Electric Company of Minneapolis, is giving a course of lectures to the sophomore and junior electrical engineering students on the "Practical Applications of the National Electrical Code."

RAILWAY OPERATION WITH HIGH DIRECT VOLTAGES.

Monthly Meeting of the American Institute of Electrical Engineers at New York City.

At the 320th meeting of the American Institute of Electrical Engineers, held in New York City on the evening of April 14, a paper entitled "High-Voltage Direct-Current Railway Practice," by Clarence Renshaw, was the subject of discussion. In the absence of the author the paper was presented by N. W. Storer.

This paper pointed out the recent increase of operating voltages on direct-current railways, after many years of operation at about 600 volts, which seemed at one time to represent a standardized maximum. The differences in apparatus necessary for the high voltages was first considered, and the probability of still higher voltages pointed out. The author then described the 5,000-volt equipment which has been tried on the Grass Lake line of the Michigan United Traction Company. The car on this line has run over 30,000 miles since October 1, 1915, in all kinds of weather and most of the trouble was not occasioned by the high voltage used. The author considers that it would be desirable to standardize 5,000 volts for direct-current equipment.

The discussion was opened by Frank J. Sprague. He reviewed his past utterances upon the subject and pointed out that railway operation had developed very closely in line with his prophecies. William J. Davis, Jr., of the Southern Pacific Railroad, said that the proper voltage depends upon the tonnage to be hauled and the limitations as to speed. The problem narrows down to the question of the number of locomotives required on a given division and their cost. In the case of the Milwaukee electrification, a change from 3,000 volts to 5,000 volts would materially increase the cost of locomotives, say by 30 to 40 per cent. This would more than offset any saving.

William B. Potter said that in the Milwaukee case the total cost for 3,000 volts or 5,000 volts would be about the same, but it would be differently divided between copper and rolling stock. Since depreciation of the latter is rapid, the higher voltage would be a disadvantage.

Calvert Townley objected to any standardization of voltage at the present time. He attributed a recent tendency for higher voltages on direct-current systems to the competition of the single-phase system. S. I. Oesterreicher spoke of the application of storage batteries on direct-current railway systems. Benjamin F. Wood considered dependability of operation of greater importance than any features of cost. E. V. Pannell discussed operation of motors at different voltages. He considered 3,000 volts the maximum desirable at the present time.

A. H. Armstrong referred to the gradual progress in increasing direct voltages and stated that an experimental test had already been made in Schenectady with apparatus using 6,000 volts. But the higher the voltage the greater the cost and he considered 3,000 volts the most suitable at the present time for railroad electrification. The experimental line using 5,000 volts shows the possibility of higher voltage, but the paper throws no light on the economic advantage of using it.

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ELECTRIC-RANGE CONDITIONS IN THE WEST.

Predicted That Western Companies Will Sell 10,000 Ranges During 1916.

By W. R. Putnam.

In the report of the Electric Range Committee of the National Electric Light Association, which will be presented at the convention in Chicago in May, it is predicted by S. M. Kennedy, of the Southern California Edison Company, and a member of the committee, that the companies in the Pacific Coast and Mountain states will sell 10,000 electric ranges during 1916. Many of the companies in this territory have already purchased several carloads of ranges and practically all of the larger companies have energetic campaigns either now in effect or ready to start.

The very marked activity in prospective power business has diverted the attention somewhat from the range business. Also the tendency to stiffen prices on the part of the manufacturers and their announcement of better prices to jobbers than central stations has dampened somewhat the enthusiasm of many of the central-station men.

The high cost of extensions is also preventing taking on some business that would ordinarily come in under standard extension rates. The prosperity of customers, however, will make easier the sale of high-priced ranges. Western central stations report average monthly consumption of residences varying from 15 to 20 kilowatt-hours and they appreciate the importance of actively pushing uses of electric current which will increase the average monthly consumption of these customers to more than 100 kilowatt-hours. If met at least half way by the range manufacturers these companies will secure a large amount of this business in the next few years. No unusual developments have been produced by manufacturers.

There has been considerable discussion by central stations as to the respective merits of inclosed and open-coil units. There is a marked difference in efficiency of each obtained by use of proper kind of utensils. The general feeling is that electrically cooked food results in considerable saving in shrinkage and that this is one of the important selling points.

The Southern California Edison Company in six months' campaign has placed 400 ranges and claims it has just started. Other California companies are showing marked activity, likewise in Oregon, Washington and Utah. The Washington Water Power Company is trying the interesting experiment of training college students for summer range salesmen.

March Activities of Philadelphia Electric Company Section, N. E. L. A.

Henry L. Doherty was the principal speaker at the March meeting of the Philadelphia Electric Company Section of the National Electric Light Association, and discussed the subject of "Utility Regulation." After commenting on the unfortunate results of too much legislative tampering with railroad rates, he said: "We have the same serious problem to meet in the electrical business today. There is everywhere a tendency to regulate the profits of the electric companies and to cut them so short that so far as the immediate future is concerned there is no encouragement to go ahead in the active development of our work. But most of us in the electrical business are optimistic and we are sure the good sense of the people will prevail. We must teach the public that the electrical industry is entitled to the same degree of profit that would be realized in other lines of business which accept the same risk." Mr. Doherty, on reverting to the subject of the education of the public to the policies of electric lighting companies, took occasion to speak of the good work which the men affiliated with company sections could do, if organized to properly train public opinion along these lines. There were over 500 present at the meeting.

The meeting of the meter department branch was addressed by P. H. Bartlett, superintendent of the meter and installation departments of the Philadelphia Electric Company, who sketched the growth of these departments and indicated the possibilities for future expansion.

The meeting of the engineering department branch was addressed by E. A. Turner, who gave a talk on the work of the aerial line department. He had a large collection of slides showing appliances and tools, and pointed out the standard practice of the company in overhead construction work.

Five ten-minute papers were presented at the meeting of the commercial branch, covering the following subjects: "Contract Routine With Reference to Placing of Meters," by P. C. Glassey; "Contract Routine With Reference to Installing Service," by B. A. Looby; "Arguments Used in Explaining the Reason for a Minimum," by I. H. Mulford; "The Best Answer to the Question 'Why Should I Make a Deposit?'" by J. Mervish; "Methods of Handling Service Complaints from a Commercial Viewpoint," by F. P. Smith.

The April meeting of the Section will be addressed by Edward F. Trefz, field secretary of the United States Chamber of Commerce, on "Judgment, Enthusiasm, Obedience and Loyalty."

Comparative Costs of Electric and Gasoline Vehicles Given at Boston Meeting.

The final meeting of the New England Section, Electric Vehicle Association of America, which has recently been merged with the National Electric Light Association, was held at the Hotel Thorndike, Boston, April 11. E. S. Mansfield, of the Boston Edison Company, presided and announced plans for the May convention in Chicago, where it is expected electric vehicles will be an important subject for discussion.

George H. Hudson, district manager for the General Vehicle Company, spoke on the comparative costs of gasoline and electric vehicles. He pointed out that the electric is the logical transportation agency in congested city streets. Important advantages are the greater readiness with which drivers learn to operate the electric truck, its longer life and, hence, lower depreciation cost, and the greater mileage obtainable from tires.

Present gasoline prices are another powerful inducement to adopt the electric rather than the gas car. Current for charging costs about the same as for gasoline at 12 cents per gallon. One gallon of gasoline, operating a given truck three miles, gives a fuel cost of 8.3 cents, with gasoline at the present price of 25 cents. Under the co-operative charging rate furnished by the Boston Edison Company, the cost would be five cents a mile. Garaging charges are much less for the electric than for gas cars, and drivers' wages are $15 to $16 per week, while chauffeurs of gasoline trucks receive at least $18, and up to $25.

Mr. Hudson gave the total yearly operating cost for 5-ton trucks running 30 miles per day, as follows: fixed charges, electric, $691; gasoline, $1,264 (7.6 and 14 cents per mile, respectively); operating cost, electric, $2,772; gasoline, $2,824, a difference in totals of $625 in favor of the electric. Daily costs would be $11.54 and $13.62, respectively, and costs per mile 38.4 and 45 cents, respectively. This is on the basis of electricity at the comparatively high rate of five cents per kilowatt-hour, and gasoline at 25 cents per gallon.

D. C. Jackson, professor in the Massachusetts Institute of Technology, described the tests made by a department of the Institute which clearly proved that the electric is supreme in the field of short-haul freight handling. He pointed out the

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relative merits of various types of road surface, saying that hard asphalt, kept in good condition, is the most favorable for the operation of motor vehicles, with wood block, water-bound macadam, vitrified brick, cement-bound granite block, tar macadam, gravel or cinder, and cobblestone next in order. Granite block filled with sand, while excellent for horse-drawn vehicles because of the purchase given to shoes, is at great disadvantage for motors, offering 2.5 times the resistance of good asphalt or wood-block road. The almost universal use of motor vehicles in London, Paris and Berlin is in large part due to the smooth road surfaces in those cities.

New York State Industrial Preparedness Committee Organizes.

The Industrial Preparedness Committee, Naval Consulting Board of the United States, New York State Section, appointed by Secretary of the Navy Daniels, met at a luncheon given April 14 in New York City by J. G. White, president of J. G. White & Company, and organized for active operation.

The Industrial Preparedness Committee of the Naval Consulting Board, of which H. E. Coffin is chairman, has undertaken an exhaustive census of the industries in the United States, the object of which is to determine what way and to what extent the various manufacturing plants in the United States are equipped to be of service to the government in time of war. This census is to have the co-operation of each of the national engineering societies, and each Society has a representative on the various state boards.

At the organization meeting J. G. White, who is the representative from the American Society of Civil Engineers, was elected chairman of the New York state board. The remaining members of the board are as follows: William McClellan, American Institute of Electrical Engineers; Charles F. Rand, American Institute of Mining Engineers; W. H. Marshall, American Society of Mechanical Engineers, and Dr. T. B. Wagner, American Chemical Society.

Right of Electric Company to Build Transmission Line Upheld.

The State Supreme Court of Pennsylvania has rendered an important decision denying the right of property owners at Ellwood City to restrain the Harmony Electric Company from building a transmission line through the municipality, and sustaining a ruling of a lower court.

In this action, the property owners filed bills in equity to prohibit the company from building its proposed line along an alley fronting on their property on Chestnut Way, holding that since the company had agreed with the city not to furnish electric energy within its limits, it therefore had no right to erect the transmission line merely to carry power through the municipality. The company maintained that in its agreement with the city for permission to construct the line, the consent was qualified by the following clause in the contract:

"This consent is intended only for the purpose of permitting the company to carry its electric current through the borough to a substation of the Pittsburgh, Harmony, Butler & New Castle Railway at Koppel, Beaver County, and for no other purpose; therefore, the said company shall not make any connection with the said high-tension wire or wires within the said borough, or permit others to do so."

The lower court in its decision held that under the right given to the company in its charter to supply electric energy, the right to manufacture or generate it was included, and that in the case of a consolidated company, such as the present one, it was not necessary that the electric energy should be generated or manufactured in the district where it was to be used, and that by necessary implication the right existed (with municipal consent) to carry it to the district where it was to be used. The court also pointed out that the question whether the company was fulfilling its duties under its charter to the public in the district of Ellwood City, could not properly be raised in this case.

In affirming this decision, the Supreme Court says:

It does not appear that the company has refused to furnish electric light or power to any one in the Ellwood City district, and there is no evidence to show that the company has refused to perform any of the obligations imposed upon it under its charter. The company has shown its charter authorizing it to maintain electric transmission lines; it has shown permission from the borough to construct a line along a certain street, and the approval of the proposed construction by the Public Service Commission. It has not been shown that it has refused to furnish electricity to any applicant in Ellwood City. The bills will be dismissed and the ruling of the lower court sustained though it appears that the company has agreed with the borough, in a contract of questionable validity, not to furnish electric current within its corporate limits.

Hydroelectric Plant for the Production of Nitrates from the Air.

According to recent reports received from Spokane, Wash., the 200,000-horsepower project in "Z" Canyon, near Metaline Falls, upon which Wilbur S. Yearsley and associates have been working for three or four years, may become the site of a plant for the production of nitrates from the air, to be used in the manufacture of war munitions for the United States government. The plant is to cost approximately $20,000,000 and the project is considered one of the greatest water power projects in the United States, being held by the International Power Company. The project is located on the Pend Oreille River, 90 miles north of Spokane.

Credence is given to this report by the fact that Pierre S. du Pont, president of the E. I. du Pont De Nemours Powder Company, in a communication to the Secretary of War, stated his company would construct a plant of this nature for the government if the present water-power laws are amended to provide for the granting of 50-year water site leases. Mr. du Pont stated that in consideration for the government's aid, his company was willing to spend $20,000,000 on a hydroelectric and electrochemical nitric acid plant for the government and turn over to the government all or any part of the product of the plant at a price to be fixed by the Secretary of War. Hugh L. Cooper, one of the foremost construction engineers in the country, who has taken charge of the development work for Yearsley and associates, at "Z" Canyon, is also acting as consulting engineer for the du Pont De Nemours Powder Company.

Society for Electrical Development to Hold Annual Meeting in May.

The fourth annual meeting of the Society for Electrical Development, Inc., will be held May 9 at its executive offices in the United Engineering Societies Building, New York City. The board of directors for the ensuing year will be elected. An amendment to its by-laws will also be voted upon. General Manager Wakeman will read his annual report of the Society's activities and also outline the extensive plans for "America's Electrical Week" campaign this fall.

It is highly encouraging to the supporters of the Society to find that the "Electrical Prosperity Week" campaign, the "Wire-Your-Home Month" campaign, and its regular activities have yielded a large number of new members. The Society has some very big plans under way for similar sales movements which have not been announced.

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INDIANA NEW-BUSINESS MANAGERS DISCUSS ELECTRIC COOKING.

Enthusiastic Meeting of Indiana Association at Kokomo.

That electric cooking as means of increasing central-station income with a comparatively low additional investment is one of the vital questions confronting the central-station industry today was brought out by the discussion at a meeting of the New-Business Committee of the Indiana Electric Light Association at Kokomo, Ind., on April 19.

A paper presented by Pierre L. Miles, of the Globe Stove & Range Company, which is abstracted on other pages of this issue, pointed out the salient features of the business and a spirited discussion followed. This was lead by Norman A. Perry, of Indianapolis; M. V. Stagg, of Ft. Wayne, and H. E. Gant, of Marion. It was brought out that one of the features to be considered in striving for cooking business is that it will, perhaps, make necessary the rebuilding of secondary lines. It was also pointed out that one objection to electric cooking is that it is slower than gas. The co-operation of range manufacturers looking to the placing of electric ranges on trial was advocated.

R. A. McGregor, of Indianapolis, pointed out that the greatest field was among the middle classes, because families employing servants gave less consideration to efficiency in the kitchen than where cooking was done by the housewives. In the early stages of the development of this business it is frequently desirable to install individual transformers for range customers, but as the load increases customers can be grouped.

E. J. Condon, of Angola, called attention to the fact that conditions of the Middle West are not comparable to those in other territories, particularly on the Pacific Coast and in the East. Profits at present are so low that material reductions are prohibitive.

The meeting was the first of its kind held by the New-Business Committee of this Association and there was an attendance of 80 at the meeting. E. J. Condon, president of the Association, welcomed the delegates in an address in which he called attention to present-day central-station problems. O. M. Booher, chairman of the committee, presided.

Following the discussion on electric cooking, luncheon was held at the Courtland Hotel, immediately following which Elwood Haynes delivered an address on "Tungsten and Its Application to the Electrical Industry."

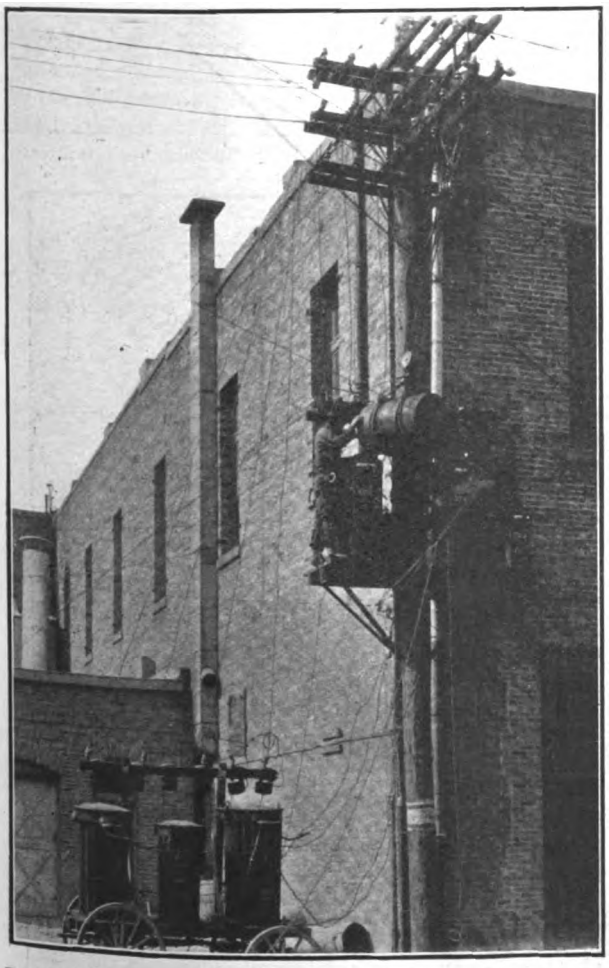
At the afternoon session a paper was presented entitled "Features and Figures on Rural Extensions," by P. H. Palmer, of the Indiana Railways & Light Company, Kokomo. This paper was discussed by E. I. Meyers, of Fort Wayne, G. K. Wilson, of Muncie, and John Kester, of Noblesville. There was also a paper by A. C. Riggs, of the Merchants Heat & Light Company, Indianapolis, entitled "Forecast and Co-operation." This paper was discussed by G. O. Nicolai, of Terre Haute, and Theodore Donahoe, of Lafayette.

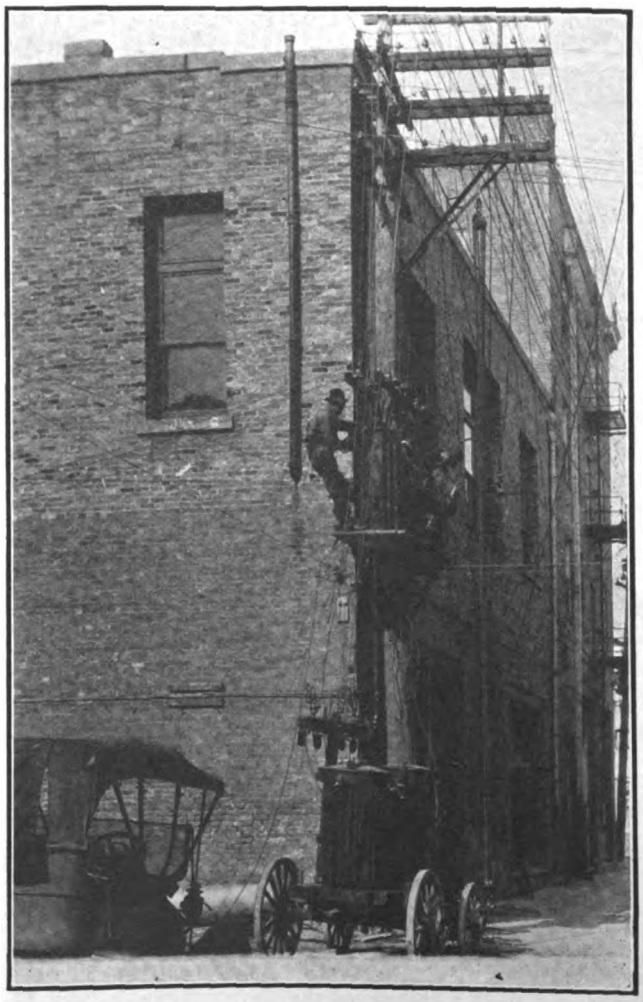
Keeping Service On by Use of Portable Transformers.

The accompanying illustrations show the method used in Waco, Texas, a city of some 40,000 population, of changing circuits from 2,300 to 4,000 volts, and from two phase to three phase, without interfering with the service in this town.

In making the complete change-over, there was but one slight interruption and this was of no consequence.

The bank of transformers shown on the wagon was moved from place to place and used while the permanent bank was being erected.





Two Views Showing Method Used by Texas Power & Light Company in Changing Service Without Interrupting Supply. Portable Transformers Are Mounted on Truck.

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Electrical Men on Industrial Preparedness Committee.

The appointees of the American Institute of Electrical Engineers of State Directors of the organization for industrial preparedness, who become associate members of the Naval Consulting Board have been announced for the several states as follows:

Alabama, Theodore Swann, Alabama Power Company, Birmingham.
Arizona, David W. Jones, Arizona Copper Company, Clifton.
Arkansas, W. N. Gladson, University of Arkansas, Fayetteville.
California, A. H. Babcock, Southern Pacific Company, San Francisco.
Colorado, W. S. Aldrich, Colorado Agricultural College, Fort Collins.
Connecticut, Samuel Ferguson, Hartford Electric Light Company, Hartford.
Delaware, W. S. Spruance, Jr., E. I. Dupont de Nemours & Company, Wilmington.
District of Columbia, John H. Finney, Aluminum Company of America, Washington.
Florida, C. S. Hammatt, Consolidated Engineering Company, Jacksonville.
Georgia, A. M. Schoen, Underwriters' Association, Atlanta.
Idaho, O. G. F. Markhus, Electric Investment Company, Boise.
Illinois, P. Junkersfeld, Commonwealth Edison Company, Chicago.
Indiana, F. S. Hunting, Fort Wayne Works of General Electric Company, Fort Wayne.
Iowa, Norman T. Wilcox, Mississippi River Power Company, Keokuk.
Kansas, George C. Shaad, University of Kansas, Lawrence.
Kentucky, Carl P. Nachod, Nachod Signal Company, Louisville.
Louisiana, M. S. Sloan, New Orleans Railway & Light Company, New Orleans.
Maine, W. S. Wyman, Central Maine Power Company, Augusta.
Maryland, J. B. Whitehead, Johns Hopkins University, Baltimore.
Massachusetts, C. L. Edgar, Edison Electric Illuminating Company, Boston.
Michigan, H. H. Crowell, Michigan Railway Company, Grand Rapids.
Minnesota, W. N. Ryerson, Great Northern Power Company, Duluth.
Mississippi, J. T. Robertson, Mississippi Inspection and Advisory Rating Company, Vicksburg.
Missouri, C. S. Ruffner, Mississippi River Power Distributing Company, St. Louis.
Montana, M. H. Gerry, Jr., Engineering Corporation, Helena.
Nebraska, H. A. Holdrege, Omaha Electric Light & Power Company, Omaha.
Nevada, W. K. Freudenberger, Public Service Commission, Carson City.
New Hampshire, J. B. Smith, Manchester Traction, Light & Power Company, Manchester.
New Jersey, Farley Osgood, Public Service Electric Company, Newark.
New Mexico, J. L. Brenneman, University of New Mexico, Albuquerque.
New York, William McClellan, New York City.
North Carolina, C. I. Burkholder, Southern Power Company, Charlotte.
North Dakota, John F. Stevens, University of North Dakota, University.
Ohio, Samuel G. McMeen, Columbus Railway, Light & Power Company, Columbus.
Oklahoma, H. V. Bozell, University of Oklahoma, Norman.
Oregon, O. B. Coldwell, Portland Railway, Light & Power Company, Portland.
Pennsylvania, Paul Spencer, United Gas Improvement Company, Philadelphia.
Rhode Island, L. W. Downes, D. & W. Fuse Company, Providence.
South Carolina, W. M. Riggs, Clemson Agricultural College, Clemson.
South Dakota, B. B. Brackett, South Dakota State College, Brookings.
Texas, Fred A. Jones, Dallas.
Utah, Markham Cheever, Utah Power & Light Company, Salt Lake City.
Vermont, B. T. Burt, Rutland Railway, Light & Power Company, Rutland.
Virginia, Walter S. Rodman, University of Virginia, University.
Washington, John Harrisberger, Puget Sound Traction, Light & Power Company, Seattle.
West Virginia, H. S. Sands, H. S. Sands Electric & Manufacturing Company, Wheeling.
Wisconsin, A. W. Berresford, Cutler-Hammer Manufacturing Company, Milwaukee.
Wyoming, P. N. Nunn, Wyoming Electric Company, Casper.

Visits to Local Industries During Convention Week.

One of the sub-committees of the general convention committee which is making elaborate preparations for the annual convention of the National Electric Light Association to be held at the Auditorium and Congress Hotels on May 22-26 is the Local Industries Committee.

This committee is arranging trips for convention visitors to many points of electrical and technical interest in Chicago at the time of the convention. The chairman of the committee is W. L. Abbott, of the Commonwealth Edison Company, and the other members are H. L. Grant, Western Electric Company; W. T. Dean, General Electric Company; T. J. McGill, Westinghouse Electric & Manufacturing Company; S. M. Bushnell, Illinois Maintenance Company; J. G. Learned, Public Service Company of Northern Illinois, and Frederick Von Schlegel, Allis-Chalmers Manufacturing Company.

This committee has held several meetings and is preparing an attractive list of excursions that visitors to the convention may have an opportunity of inspecting the many interesting technical concerns in and near the city.

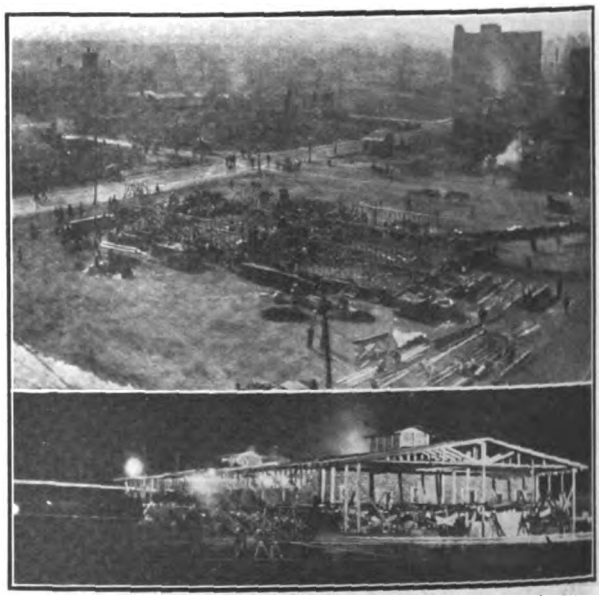
Executive Committee of Industrial Electric-Heating Bureau, N. E. L. A., Meets.

The first meeting of the executive committee of the new Industrial Electric-Heating Bureau of the Commercial Section of the National Electric Light Association was held in Detroit, Mich., April 11. Plans for the work of the bureau were formulated, an outline plan of the work for the coming year being made. All the various appliances used in heating by electricity were divided into classes, with the object of having sub-committees delegated to take up the work under the different classifications, which are: furnaces for steel and ferro alloys; furnaces for other alloys; enameling and paint-drying ovens; heat-treatment and tempering furnaces; welding apparatus, and small industrial applications such as glue pots, soldering irons, embossing presses, tailors' irons, etc.

The executive committee is composed of C. I. Hirshfeld, Detroit, Mich., chairman; G. H. Jones, Chicago, Ill., secretary; A. K. Young, Toledo, O.; H. O. Loebell, New York City, and M. E. Turner, Cleveland, O.

Flood Lighting in Reconstruction of Burned City.

As soon as the contractors started building operations in the City of Paris, Texas, recently destroyed almost in its entirety by a disastrous fire, the Texas Power & Light Company got on the job and with flood lights installed at



Reconstructing a City by Aid of Flood Lighting.

convenient points enabled the contractors to work at night and thus hasten the reconstruction work.

The two illustrations show a temporary building that was hastily erected on the city square. One of the views shows a night picture of this same building as illuminated with flood lights.

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Miscellaneous NEWS NOTES

What an Electric Sign Is.—"An Electric Starter on Your Business" is what the Rutland (Vt.) Railway, Light & Power Company aptly calls an electric sign. The company is pushing this line of business rather strongly at the present time.

Texas Electrical Contractors to Meet.—The annual meeting of the Electric Contractors' Association of Texas will be held in Galveston, May 17 and 18, which will be coincident with the meeting of the Southwestern Electrical and Gas Association. Charles W. Graham, of Dallas, is secretary-treasurer of the contractors' association.

Utility Companies Must Number Poles.—The Board of Commissioners of Knoxville, Tenn., has passed an ordinance requiring all the public utility companies to number all line poles and to furnish the city with maps showing their location. It is claimed that this will aid in the work of eliminating unnecessary poles.

Flood Lighting for Arkansas State Capitol.—The Arkansas State Capitol is now illuminated by flood lighting, the installation being made by the Little Rock Railway & Light Company. It is said to be the first state capitol in the country to be lighted in this manner. The entire exterior of the building is covered with light from 30 500-kilowatt units.

Duluth Revising Its Electrical Ordinances.—The building code of the city of Duluth, Minn., is being revised and an ordinance pertaining to the installation and maintenance of electrical work will be included. A committee, of which A. W. Lindgren, manager of the Northern Electrical Company, is chairman, is engaged in the work of drafting the new ordinance.

Electric Flags at Gas Meeting.—Electric "Old Glorys" were a striking feature of the banquet of the Pennsylvania Gas Association, held on April 12, during their annual convention at Easton, Pa. The manager of the local company, W. D. Ray, arranged three electric flags in the room, and as the diners rose to sing "America" the current was switched on. The spirit of the occasion was one of interest and enthusiasm following this outburst. If the flags had been burning at the beginning they probably would have received little attention.

Louisville Rotarians Hold Magnetic Meeting.—The Rotary Club of Louisville, Ky., called their session of April 13 a magnetic meeting, the program being turned over to the electrical members of the organization. The meeting was in charge of Robert Montgomery, of the Louisville Gas & Electric Company. Speakers on the program included H. B. Anderson, Frank H. Miller, Louis K. Webb, Fred Burdorf, W. C. Daviet, James Clark, Jr., F. A. Clegg, H. V. Bomar, A. R. Fugina and J. F. Snarenberger. As each man entered the dining room his card was rung up on a fare register and he received a slight electric shock from a device in the floor. The room was decorated with safety-first signs and many floor and table lamps, and a large spotlight brought the speakers into prominence.

Project for Tidal Generating Plant Launched at Boston.—The Universal Tide Power Company, with $10,000,000 capital, has been organized under Massachusetts laws to operate and develop the Knowlton tide motor, under United States patent No. 830,543. Offices have been opened at 7 Water Street, Boston, where a model of the motor is exhibited. A feature claimed is its ability to perform its work continuously, with uninterrupted operation of a power transmission shaft in one direction. By means of three float compartments, which are supplied from a reservoir, the floats alternately provide continuous power. It is said that the company is considering installing an electric generating plant near Rockland, Me., to supply energy to a railway line. Those behind the undertaking are John A. Knobs, president, and John A. Knowlton, treasurer.

Dr. Steinmetz Addresses Boston Section A. S. I. E.—Dr. Charles P. Steinmetz, president of the American Society of Illuminating Engineers, addressed the Boston Section at the Engineers' Club April 13. He outlined the progress in electric lighting, and then described in minute technical detail present developments and future possibilities in the field of both street lighting and interior illumination.

Jovian Initiation at Sandusky.—Fourteen men identified with the electrical industry in Sandusky, O., were initiated into the Jovian Order, April 11, by the degree team from Cleveland, composed of B. Peris, E. H. Martindale, M. H. Moffett, M. S. Cotavish, J. M. Bateman, J. A. Wahlgren and W. C. Kunzman. E. A. Bechstein was appointed First Tribune at Sandusky and will have charge of the organization of the chapter that probably will be formed there. The installation was attended by a number of Jovians from Akron, Toledo and New York, as well as from Cleveland.

Colored Photography Discussed Before Los Angeles Jovian League.—A pleasing and instructive diversion was provided at the meeting on April 12, by S. J. Keese, chairman of the day, in a lecture on "Colored Photography," which was explained and illustrated on the screen by photographic slides taken in their natural colors. Herbert J. Goudge, the principal speaker of the day, discussed the theory of the spectrum and explained with the aid of lantern slides, the process of decomposing light with the spectroscope. He was followed by T. C. Low, also an authority on spectroscopy, who explained the intricate details of color photography, and illustrated his talk with photographic slides of scenery and flowers. Dain L. Tasker and S. J. Keese, also exhibited color photographs made by themselves.

New Electrically Operated Clock in Boston.—Boston's new Customhouse Tower clock, one of the largest all-electrical installations in the country, was put in operation April 8. The dials are 21 feet in diameter, the hands being 13 feet 6 inches and 10 feet 6 inches long. Control is from a master clock in the custodian's room 374 feet below the clock dials. The master clock is fitted with a contact to close the circuit every minute. It also has a pilot clock to coincide with the four pairs of hands on the tower, and a device for resetting the hands if required. In this room is also a switch for controlling the lamps which light the dial and hands. Back of the dials, on the twenty-third floor, are motor-driven secondary clock works, fitted with magnets which are operated exactly on the minute by the master clock. The armature, drawn forward, throws in the motor circuit, and the motor runs 10 seconds, moving the hand across the space to indicate one minute's time.

New York Contractor's License Suspended.—The license of Joseph Boritz, an electrical contractor, of 121 Columbia Street, Manhattan, N. Y., was suspended for 30 days by Commissioner Williams, of the Department of Water Supply, Gas and Electricity, New York City, for repeated failure to solder and tape splices and for other serious electrical defects appearing on work recently performed by him. This is the first suspension under the Electrical Code, enacted in July, 1915, by the Board of Aldermen. The code not only contains detailed provisions in reference to the installation of wires and appliances for electric light, heat and power calculated to reduce the number of accidents to property and persons through fire and to persons through electric burns or shocks, but it also wisely provides the commissioner with a means of control through requiring electrical contractors to obtain licenses from the department and giving the commissioner power to suspend or revoke such licenses when sufficient cause has been given.

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The Future of Electric Cooking Assured

George A. Hughes Sees Time When Range Load Will Exceed Motor Business and Double Revenue of Central-Station Companies

"The time is not far removed when the electric range load will exceed that of motors and double the present income of central stations, with a comparatively small additional investment." This optimistic prediction of George A. Hughes, president of the Hughes Electric Heating Company, Chicago, and a pioneer in electric range manufacture, was made to a representative of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN upon the return of Mr. Hughes from a meeting called by the Society for Electrical Development in New York recently to discuss ways and means to bring the merits of electric cooking before the ultimate consumer.

As might be expected, Mr. Hughes is firmly convinced that the electric range has been tried and proven and is here to stay. "Progress of electric cooking is to a very marked degree similar to that of the development of power business, the same trials and tribulations being encountered as a few years ago when a few manufacturers of electric motors endeavored to interest central stations in securing business from factories and other industrial establishments. It was thought that considerable difficulty would be encountered in justifying to customers using electricity for lighting purposes, a lower rate for energy to operate electric motors, especially in those instances where power was used during lighting hours."

Mr. Hughes stated that the same conditions, to a somewhat less degree, were first found to exist when trying to interest central stations in the possibilities of electric cooking. This was especially true in those states having commission regulation, it being thought by many central-station managers that it would be difficult to justify a low cooking rate where comparatively high lighting and power rates were in existence. "As is true of motor business, the high load-factor and diversity-factor of electric cooking has made it entirely feasible for central stations to offer a low rate for this class of business and practically all public service commissions have recognized and approved of special cooking rates. The western states, particularly those served by large hydroelectric projects, have been the first to recognize the importance of this field and make a rate sufficiently low to attract the business, but it has been demonstrated by an analysis of conditions in practically every state, that in many communities served by steam generating plants a lower rate is in effect than in some of the western communities served by cheap hydroelectric energy. It is just as possible for an efficient modern steam plant to make a low rate for cooking as in the districts served by water powers.

"As to diversity-factor, it has been found in a number of instances that this runs as high as 20 in an entire community and in one building, the Tudor Arms Apartments, of Portland, Ore., where 45 ranges are installed, the diversity-factor is never less than 10. It is my contention that in extensive installations such as in Billings, Mont., where there is over 3,500 kilowatts of electric-range load connected, the diversity-factor approximates 30.

"It is interesting to note that only six years ago the central station at Billings, Mont., was the only company of record offering a rate as low as three cents exclusively for electric cooking. Today there are upwards of 3,000 communities in which a special low cooking rate is in existence and many others have signified their intention of offering a special rate for the summer campaign."

Mr. Hughes believes that there is nothing that can stop the march of progress of electric cooking. Very frequently there has been a tendency on the part of competing gas companies and in some few instances combination gas and electric companies to hinder the progress locally, in the case of the latter to at least refrain from taking any active part in promoting the business. This hindrance or inactivity has no terrors for the electric cooking enthusiasts. "Electric cooking is here; it is a better method than any at present known for the preparation of food," says Mr. Hughes. "That one fact is in itself of sufficient importance to absolutely insure the future of the business. The opposition which we sometimes meet can be compared to the opposition of the Indians in the northwest to prevent the passage of trains over the Northern Pacific Railroad when it was first built. Several redskins stood on either side of the track and held a buckskin lariat between them with the intention of stopping the first train as it came on its way."

Referring to the arguments sometimes advanced that electric cooking cannot possibly be promoted in communities where a plentiful supply of gas is available, Mr. Hughes says, "Electric ranges are actually being sold in communities where natural gas at 25 cents per 1,000 cubic feet is available. This should not be taken to mean that electricity for cooking is cheaper than 25-cent gas, but the superior results obtained, the great convenience and other merits of the electric method are so well appreciated that even at a higher cost electric cooking is demanded. As a matter of fact, it has been proven in innumerable installations that electricity at three cents per kilowatt-hour is about equal to gas at $1.00. However, it should be emphasized that electricity is not being sold on a price basis, but on a quality basis.

"The public has been educated to use electric light not because it is the cheapest, but because it is the best. The same applies to electric cooking and with equally intelligent and comprehensive activity on the part of manufacturers and central stations to educate the public, the same situation in regard to the use of electricity for cooking will come to pass.

"One often hears of the high cost of the electric range and that this feature will retard its universal adoption. The cost of electric ranges is higher than that of gas and undoubtedly always will be because of their much better construction, their higher efficiency and the great attention to details which is given by every reputable manufacturer. However, it should be known that the efficiency of the electric range is 85 per cent as compared to an efficiency of 15 per cent for the gas range. Of course, with greater production, the cost of electric ranges will be decreased."

In regard to the methods adopted by various central stations to interest the prospect in electric ranges, perhaps the most satisfactory is that of placing them on trial. "The manufacturer is willing and ready to stand back of his product and the central station should have no hesitancy in agreeing to permit the customer to determine by experience whether or not the electric range meets his expectations. Of course, it is only proper that the utility company be reimbursed, at least to some extent, for the expense incurred for wiring and installing the range, but this feature rests entirely with the company. A very satisfactory policy is that adopted by the Illinois Northern Utilities Company which permits a customer to use a Hughes range on 15 days' trial. The customer reserves the right to have the range removed at the expiration of this period, the only expense being for the amount of energy consumed, plus a charge of $4.00 for the cost of wiring and connecting the range. This charge of $4.00 does not cover the entire cost of wiring, but leaves the impression with the customer that should he desire the range removed he has paid the necessary expenses and is therefore under no obligation." Mr. Hughes also stated that a practice which has been very successful is that of permitting the customer

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to use the range the first month without any cost for energy, it being found that the first month's bill is always abnormally high due to the inexperience of the user and to frequent demonstrations which are made to visitors. Often a customer is so impressed by the first bill that he desires the range removed immediately and this practice overcomes this important objection. However, it is advisable to inform the customer that the amount of energy used was excessive, if this is so, and he should be instructed how to use the range so as to reduce the consumption.

"In a few isolated cases there has been some complaint regarding the discount allowed by manufacturers to jobbers, central stations, etc.," said Mr. Hughes. "This matter of discounts is entirely a quantity proposition and does not take into consideration whether the purchaser is a central-station company, jobber or dealer. Neither the central station nor jobber is entitled to any preference in this regard."

Mr. Hughes referred to the expensive wiring necessary for an electric range installation and stated that the practice in many communities, where considerable progress had been made in developing this business, was to either sell the range at list price and do the necessary wiring without cost to the customer, or sell the ranges at cost and require the customer to pay for his own wiring installation. "With the proper co-operation on the part of the various interests vitally concerned in the development of this business, there is no question but that electric cooking will very rapidly come into its own and prove the solution to the ever present question of how to increase the revenue from residence customers."

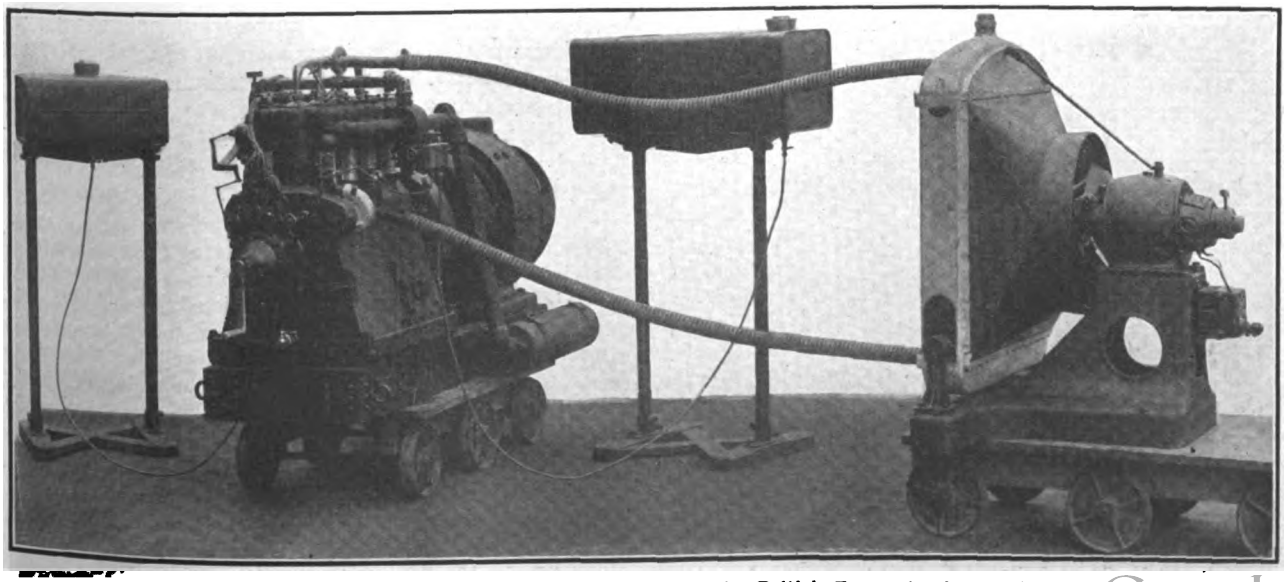
A British Military Field Workshop Electricity Generating Plant.

The European war has been responsible for the introduction for military purposes of many new examples of electrical engineering skill, many of which are not likely to have the light of publicity turned upon them until the great struggle of nations is over. On both sides of the fighting line, not a great distance from the trenches, extensive establishments have sprung up for engineering repair work of all kinds where tools are not only lighted by electricity, but in which the machine tools are electrically driven. Herewith is shown an illustration of a special generating set which has been designed and constructed for the British military authorities by the Austion Motor Company, Ltd., for supplying energy for lighting and power purposes in field work-shops.

The plant comprises one of the company's standard type of automobile engines, with four separate cylinders, coupled direct to an 18-kilowatt generator. The engine, which is provided with a governor, in order to secure a constant speed, is fitted with magneto ignition and is adapted to work with either gasoline or kerosene; the former is used on starting up and kerosene when the engine becomes warm, the heat of the exhaust manifold being utilized, by means of a "muff" in conjunction with the gas admission pipe, to assist in the vaporization of the heavy oil. An interesting feature of the plant is the method of cooling the cylinders; instead of the large tank of water usually employed for this purpose in stationary engines, an ordinary automobile-type radiator is employed, this being mounted on a separate bed-plate and provided with an inclosed fan, driven by a small electric motor, in order to maintain a strong current of cool air through the radiator; flexible armored hose is used to conduct the water to and from the engine, the circulation being maintained by a small pump. As will be seen, the set practically comprises four units—the engine and generator, the radiator and fan, and the kerosene and gasoline tanks, the latter being mounted on stands in order to give the necessary head for gravity flow of the liquid fuel to the carburetor, an arrangement which enables the plant to be quickly erected in any desired position and equally rapidly dismantled.

Hearing on Valuation of Telephone Properties in State of Washington Finished.

The Washington State Public Service Commission on March 20, finished its hearing relative to the physical valuation of the properties in the state of Washington of the Pacific Telephone & Telegraph Company, which maintains head offices in San Francisco. The hearing was begun in Tacoma, January 17. Findings on the valuation are not anticipated for several months, due, to the mass of data involved. Chairman Reynolds announces the commission will begin its rate hearing on May 21, at Olympia, and at this time the commission will consider the question of segregation of properties, used for local and toll service in the large cities of the State. The commission will also consider the question of discrimination, and of switching rates on farmer lines. The Pacific Telephone & Telegraph Company contends for a valuation based on the cost of reproduction of approximately $19,000,000. The figures of the commission are estimated at a total of about $16,000,000. It is stated the commission's figures are deceptive, inasmuch as they do not include such items as development costs, taxes, interest during construction, and other items which the company includes in its unit costs.



A Portable Electric Generating Station Used by the British Forces in the Field.

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Developing the Electric Range Load

Some Suggestions for the Inauguration of a Comprehensive Campaign and Salient Features of the Possibilities of the Business

By P. L. Miles

In entering upon any discussion of the subject of electric cooking, there are two factors which merit our first consideration: Will this load be profitable to the central station? Will the electric range be satisfactory to our customers? Upon the answer to these questions, hinges the policy which the lighting company will pursue. For it stands to reason, that if the load offers no attractions from the profit side of the ledger, the interest of the lighting company will be short lived. Looking at the question from the other side of the fence, from that of the consumer, no matter how profitable to the central station the load may be, very little will be accomplished in the way of making progress towards universal electric cooking, unless the customers can be pleased with this method.

It is almost impossible to give even an approximate answer to the first question of profit. Naturally, the rate is the solution. But to give a formula for the creation of cooking rates, is no easy task. Rates for cooking depend upon the hours use of the demand or load-factor, the diversity-factor and the peak load, the cost of generating and distributing the current. These factors vary in different localities, with the consequent impossibility of making any set rule for the establishment of any rate.

There is this one happy medium in the creation of a cooking rate, namely, one high enough to produce a profit and one low enough to produce the business. A 3 or 3.5-cent rate is certainly low enough to produce the business, and the question of whether it will be profitable must be settled by local conditions of the lighting company.

To the sales manager of the electric lighting company, this question of profit is very important. It is not sufficient that ranges be put onto your lines, but it must be seen that the revenue which they produce contains some portion of profit to the lighting company.

RATES FOR COOKING.

Rate, Cents	Number of Towns
5	640
—5	211
4	692
—4	506
3	540
—3	261
2	27
—2	7
Total	2,884

The following rates have been placed in effect in Indiana according to all the data which we have been able to collect:

COOKING RATES IN INDIANA.

Rate, Cents	Number of Towns
5	12
—5	3
4	13
—4	23
3	22
2	4
Total	77

There are probably some central-station managers who will be willing to look to the practice of other central stations, in regard to the establishment of rates for electric cooking, and adopt similar rates in their own properties. This seems a fairly accurate index, as it is hardly possible that these companies have put rates into effect blindly, and with no thought as to the profitableness of the rate. In this respect the accompanying tabulation of rates for electric cooking which have been placed in effect in this country, will probably prove worthy of attention.

There are, according to the above list, 835 towns in this country, which have adopted a rate for cooking of three cents or less, and as stated, it is hardly possible that these managers, have all lost sight of the profit column in making their rate calculations.

As another example, take the Edison Electric Illuminating Company, of Boston, with a statistical department which is second to none, it has created a cooking rate of less than three cents. It cannot be, that this large company did not assure itself of some margin of profit in figuring this rate. There is no question, that it went into the matter in great detail, and arrived at its conclusions after a careful study of known facts.

Attitude of Customers.

The next point to consider is the attitude of customers towards electric cooking. Do they want electric ranges? Is the electric stove better than something they are now using? Will it do the work properly? Will the monthly bills be satisfactory? Will your customers be satisfied after purchasing a range? Will the range stay sold and be the means of selling other stoves?

In order to ascertain these points, the company represented by the author sent investigators to 20 cities and towns throughout the country. These men called on housewives of all stations in life. The following figures are very interesting: 26 per cent of the housewives called upon have considered buying electric stoves; 11 per cent would be willing to pay 100 per cent more than at present; 27 per cent would be willing to pay 50 per cent more than at present.

This alone would indicate an existing interest in electric cooking on the part of the housewives, as well as their absolute willingness to pay more for this class of service. Furthermore, these surprising figures exist in spite of the fact that the housewives interviewed knew little or nothing about many of the advantages of electric cooking; 37 per cent of them knew it was cleanly, while only about 1 per cent knew that it would save on the meat bills; 24 per cent knew that it was more convenient; only 6 per cent were aware that it was cooler, and a mere 3 per cent that it was safer than gas. Not one knew that it gave a constant temperature—a very important factor in all cooking operations.

Rates for Electric Cooking.

The first point to consider in promoting the use of electricity for cooking purposes is the rate to be charged for this class of service. As previously stated, the safe, but rather difficult rule to follow is the adoption of a rate, high enough to insure a profit and low enough to secure the business. No definite recommendations can be given. The question of rates will have to be settled locally by the central-station manager according to conditions.

Installation Charge.

The installation charge, namely the cost of running the wires from the meter to the range, at first seemed to be a hindrance to the selling of ranges. Many central stations

From a paper presented at the meeting of the New-Business Committee of the Indiana Electric Light Association, at Kokomo, Ind., on April 19. The author is sales manager, electrical department, of the Globe Stove & Range Company.

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made a charge of $5 or $10, or the actual cost of the work, based on time plus material, for the installation. This necessitated the salesman making two sales instead of one.

This question of installation charge is one of commercial expediency, rather than one of equity. That the customer should pay for this inside wiring—which after installation becomes his property—admits of no argument.

When one housewife was asked to pay this charge, logic would not appeal to her. It was carefully explained that this inside wiring was on her property and was only between the meter and the range. Her answer was: "I don't see why I should pay for the range and then pay to have it installed."

It appears that the best course to pursue is to include the cost of installation in that of the range. The total to constitute the list price. In this manner, only one sale is necessary, and the price quoted covers the cost of the stove, delivered and ready to snap on the energy.

However, the policy of the majority of central stations today is to deduct the cost of installation from their own margin of profit, namely, the discount allowed by the manufacturer. This policy they adopt as a means of aiding their customers in purchasing electric stoves, and, in the early stages of the cooking game, making their proposition as attractive as possible.

Time Payments.

On a subject which has proven its value in many phases of the electrical business, an endorsement is hardly in keeping. But to those central-station men who are opposed to the practice of giving time payments, let me point out that they have been the means of solving the problems of the distributors of many high-priced articles—such as the piano, furniture, kitchen cabinet, and the like. Even in the electrical business time payments have given great impetus to the wiring of homes, and the sale of vacuum cleaners, washing machines, and other appliances. In a sense, time payments offer one solution to the complaint about the high price of the article for sale.

Trial Installations.

A trial proposition on any article, especially those with which the public is unfamiliar, is a sign of confidence that the article will do all that is claimed for it. On the other hand, a refusal to make a trial, carries with it an implied statement that the merchant is not willing to give the purchaser an opportunity to verify what may seem like very exaggerated claims.

Put yourself in the place of one of your customers. If you were asked to make an investment of say, $100, in a new, and, in your opinion, an untried article, would you not feel entirely justified in insisting upon the privilege of returning the article in case it does not prove satisfactory? The clever salesman may give you a list of names who are perfectly satisfied, yet these people are not yourself, and it is your own $100 which you are going to spend, and it is yourself who must be satisfied.

The first thought of the central-station man is to lay too much stress on the fact that a trial installation requires an investment for wiring, which, in case the range is returned, will prove a dead loss. This fact is certainly true, and should the number of ranges which are returned be excessive, then the trial installation would be out of the question. It would not be the fault of the proposition, however, but rather the fault of the range itself.

First Cost of Electric Ranges.

On every hand is heard the statements of central-station commercial men, regarding the large number of ranges which they could sell, were the manufacturers only able to supply them with a range retailing for $40 or $50. In the same breath they tell what a wonderful gas range can be purchased for $40—and they are at a loss to understand the difference in price between the gas and electric. Many of these central-station men earnestly claim that the high price of the electric range is the real reason that is preventing their universal adoption.

Is this not an error in reasoning? Can you point to one single article, placed before a public which is admittedly hard to educate in new methods and things, which has been popularized on the price appeal alone? It is efficient salesmanship which will educate a public to the use of a new article, and not low price. Is the reducing of the price of the range from $80 to $50 going to tell the housewife about the cleanliness of electric cooking? Will it convince her of the convenience and safety of electric ranges? By no means. Is this price reduction in any way going to convince her that all of her cooking operation can be performed in a more satisfactory manner, than on any other form of stove? Is a slash in the price going to convince the housewife that electric cooking is past the novelty stage, and that it is practical in every sense of the word? No, indeed. But salesmanship will do these things and will do them efficiently.

The central-station man calls attention to the price of the gas stove, and states that the electrical manufacturer must put out a stove which will compete in price. Is this true? Do these same men forget the other articles which have been introduced successfully into the homes of the electrical consuming public? Take the toaster as an instance. To my recollection a gas toaster costs something like ten cents. But the cost of the electric toaster when it was first placed on the market was somewhere in the neighborhood of $4—forty times as much. How are the two statements reconciled? You can buy an old sadiron for somewhere around 35 cents. The electric iron used to sell for $5 and some of them sell for this price today. Think of it, fifteen times as much. Yet has this great difference in price retarded the sale of these articles? Take more expensive articles, the washing machine and vacuum cleaner for instance. Compare their price with the price of the old tub and washboard or the broom. Yet these same central-station men are today doing a good business in these articles. Today the electric range is somewhere about twice as expensive as a gas range.

Electric Range Campaign.

In the operation of campaigns to promote the sale of electric ranges, there seems to be a tendency to start the campaign with a great deal of enthusiasm, full-page advertisements, cooking demonstrations and the like. Then because there are not a great many immediate sales, the interest wanes, and the campaign is called a failure.

It is the continuity of an electric range campaign, which will eventually bring results. The full-page advertisements and cooking demonstrations are all right, only as starters. They arouse a certain amount of interest among your prospects, which interest must be maintained until the sale is closed. People are not educated in a couple of weeks. It takes months, if not years. It means keeping everlastingly at it, hammer and tongs. It means the consistent use of every advertising media at your command—continually telling the public about the advantages of electric cooking. Use small space in your newspapers—but use it often. Ten small advertisements are better than one large one.

Put a man on the work whose business is to develop your electric cooking load. If he does not sell a range in a month, or in two months, keep him right on the job. Eventually his work will show excellent results. Where he only sells one range the first month, he will sell twenty the same month a year later.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Boston Edison Advertises Apartments Equipped with Electric Ranges.

The accompanying illustration shows an advertisement appearing in the Boston papers, under the classification of "Real Estate." The practice of the company for some time

Advertisement Paid For by Boston Edison Company.

past has been to so advertise, without expense to owner or agent, buildings equipped with electric ranges. This service is greatly appreciated by customers and is said to be influencing the sale of ranges.

Cooking Campaign in Portland, Ind.

One of the most active municipal plants in the middle west as regards the pushing of electrical appliances is the Municipal Electric Light Plant at Portland, Ind.

It is generally the rule that since municipal plants may not sell appliances themselves, they extend little or no aid to the dealers who could handle such business at a profit.

However, such is not the case at Portland. Through the active efforts of George Nicholson, the superintendent of the Electric Light Department, an admirable working agreement is in effect with Charles Nahrwold, a local electrical contractor, whereby satisfaction is assured to lighting company, contractor and consumer alike.

At present, they are in the midst of a successful electric-range campaign and are going ahead vigorously in the face of a similar campaign waged by the local gas company which was, by the way, started several weeks ahead of the lighting company.

The Portland people are firm believers in the trial proposition as a method of selling articles of known value to their customers. They are applying this to their present range campaign.

Electric ranges are being offered on several weeks' trial and in addition, time payments are accepted. This makes it easy to overcome that objection to the electric range which is often raised—namely, the high cost of the stove.

As an additional inducement to their customers, free installation is made on all electric stoves put out. Many central stations do not do this but it has been found that this one feature alone has sold a great number of the stoves which are now in service.

Globe ranges manufactured by the Globe Stove & Range Company are being used exclusively in this campaign.

This campaign is being watched with special interest by other municipal managers who intend to go after an electric cooking load.

Premium to House-Wiring Customers of Cincinnati Company.

As an inducement to prospects to wire their homes during the month of April, the Union Gas & Electric Company has inaugurated the plan of giving each new customer a coupon, valued at $2.50 if applied on the purchase of any portable lamp on display at the company's display room. So far a large number of coupons have been redeemed. The accompanying advertisement shows the method used by the company in appealing to prospective customers.

Advertisement of Cincinnati Company.

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A Model "House Electric" in Baltimore

Consolidated Gas, Electric Light and Power Company Operates a Lighting Sales Store Equipped for the Display and Demonstration of Things Electrical as in a Private Home

By Walter R. Moulton

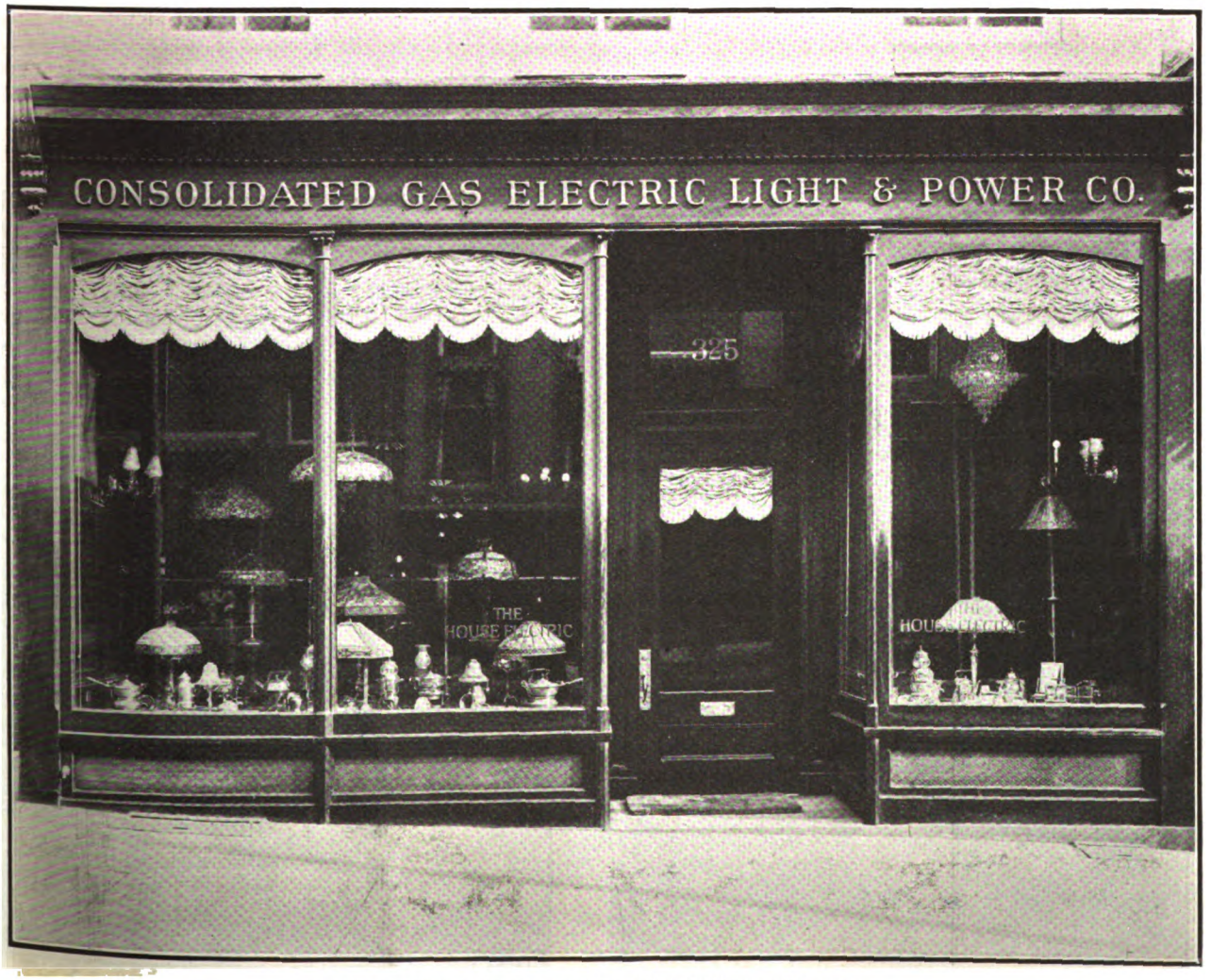
The sale of electrical equipment by the central station plays an important part toward increasing the connected load and toward the saturation of the territory covered by the public service company. Recognition of this fact is shown by the increasing number of public service companies who sell wiring, lighting fixtures and appliances and other electrical equipment to their customers. To properly educate the public in the application and use of various things electrical and to successfully market such equipment on a broad scale, requires show-rooms and demonstration rooms in which their application may be seen under conditions and surroundings that are fitting.

The Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., realized the necessity several years ago, of following the above policy. The territory which it served was very fertile, but undeveloped. The general public was not familiar with the many uses and applications of electricity, nor were many familiar with the development in other cities. Show-rooms were necessary for the demonstration and sale of fixtures and appliances and in order that this might bring the best results an independent store called "The House Electric" was established.

The House Electric is located on Charles Street in the heart of the best retail shopping district. It is a three-story building, having about 30-foot frontage and depth of 140 feet. Proper thought and care have been shown in the design of the exterior. As shown in one of the illustrations, the store front proper is of good design and attractive in appearance, but maintains the necessary dignity of a public service corporation. The show windows are very well finished and always attractively decorated. The actual display in the show windows is changed once a week, in order that the windows may not lose their drawing power. Lighting fixtures and portable lamps are always lighted when displayed in the show window and appliances are arranged as far as possible to suggest their actual use. Of course the show windows are brightly illuminated with the best window lighting equipment and burn until midnight every night.

Lighting Fixtures on First Floor

The entire first floor is devoted to the display and sale of lighting fixtures, portable lamps and appliances. Upon entering the door the customer at once finds himself in a very attractively furnished store. On one side are floor



Entrance of the House Electric of the Baltimore Company.

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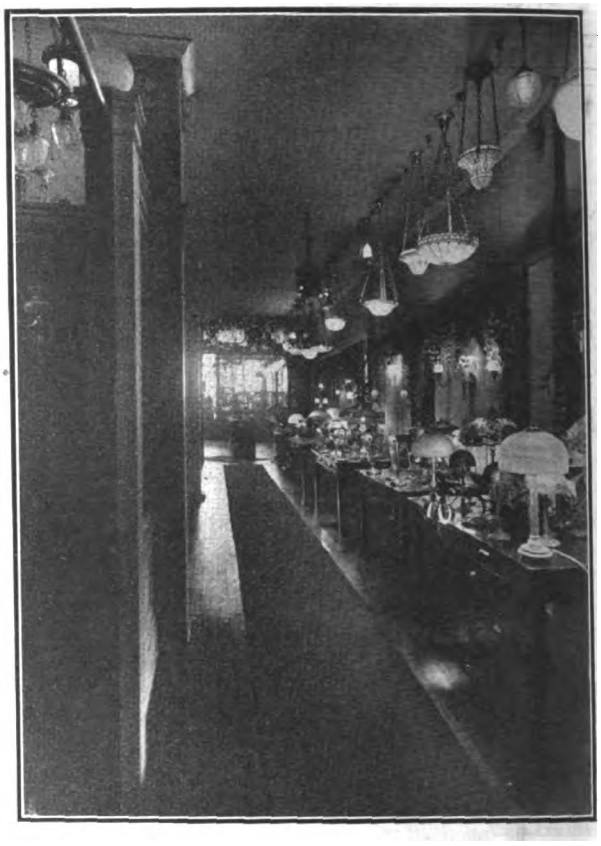
and wall display cases for the appliances, and a counter on which the various utensils may be examined more closely. In other parts of the store, either on tables or standing on the floor are numerous portable lamps, as shown in two of the accompanying illustrations. The lighting fixtures illuminating the store are very high grade and thoroughly appropriate in an establishment of this kind. When a customer approaches the counter or display cases, he is attracted by additional display in the corridor at the far end of the store and as this is even more attractive than the store proper, he is tempted to investigate further.

The corridor extends the full length of the first floor from the store to the modern kitchen in the rear. The cashier's cage being located about two-thirds of the way back along this corridor, thus it is necessary for customers desiring to pay their bills in the House Electric to become more familiar with displays than would be the case if the cashier was located in the front. All along one side of the corridor as far as the cashier's cage are tables for display of portable lamps, wall outlets showing display of bracket fixtures and ceiling outlets for the display of various types of semi-indirect fixtures. All of the display tables are wired up and fused, and the lamps on display connected up with plugs under the table. Each table is connected by a disconnecting plug to a single-circuit base-board outlet. The bracket outlets are all controlled in groups by means of wall switches located at one position. The ceiling outlets are all controlled individually by means of ceiling pull-chain switches.

In the rear are shown various electrical household appliances and these are also demonstrated in the kitchen. A view of the latter is shown in one of the illustrations.

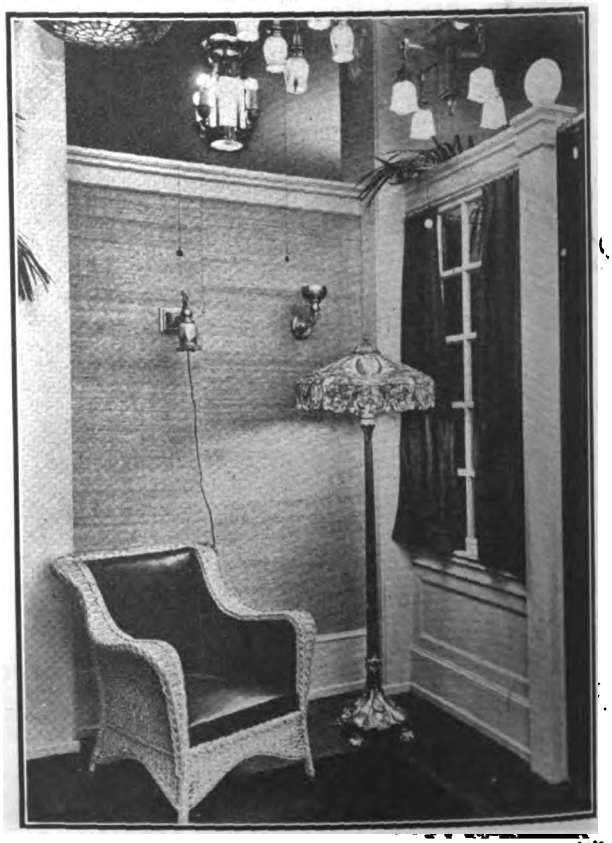


General View of Sales Room.

Numerous Individual Display Rooms

Leading off the corridor on the opposite side are a number of individual fixture display rooms. These are all beautifully decorated and each one is finished in a different decorative scheme. A corner of the first room is shown in one of the views. The woodwork in this room is finished in a light gray and the walls covered with Japanese grass cloth. It will be noted that an individual price tag hangs from each fixture and it is thus a simple matter for the customer to see the price of fixtures for himself.

A second room is finished in mahogany, with heavy



Two Rooms at the Baltimore House Electric Showing Display of Floor Lamps and Variety of Ceiling Fixtures and Wall Brackets.

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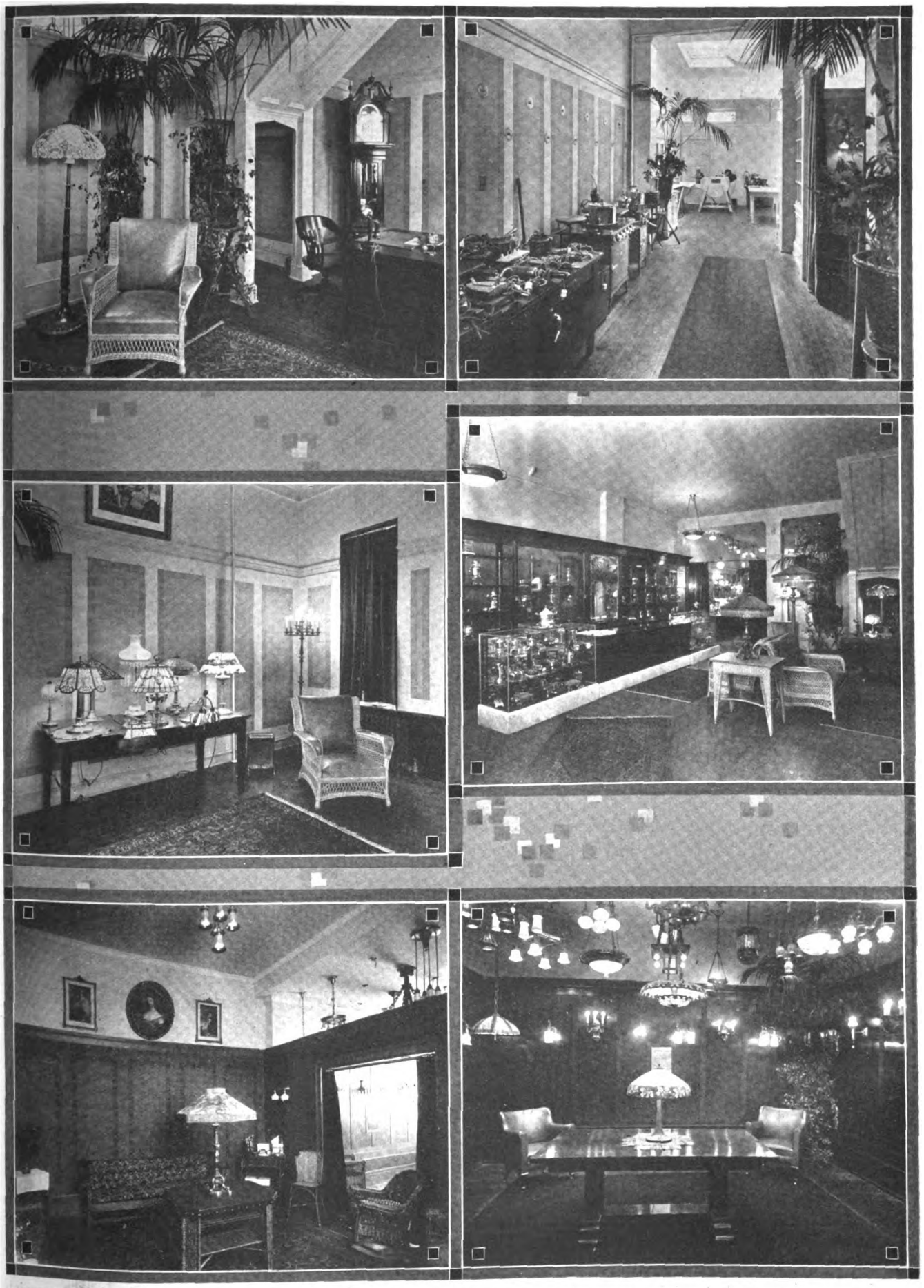

Interior Views of the House Electric of the Consolidated Gas, Electric Light & Power Company, Baltimore.
In this Establishment the Customer Can Be Shown Lamps, Fixtures, Cooking and Heating Appliances and the Great Variety of Other Current-Consuming Devices Under the Same Environments as in a Private Home. All Lamps and Fixtures Are Arranged to Be Controlled Separately by Individual Wall Switches, so that When Desired, Only the Unit Being Displayed Is Lighted.

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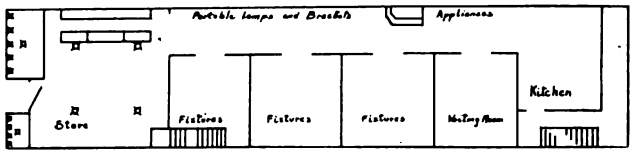
dark-green leather furniture and a dark-green rug on the floor. The size of these show-rooms is about 18 by 20 feet. On the ceiling of each there are 42 outlets from which to hang fixtures and each outlet is controlled by an individual switch, the large gang switch-



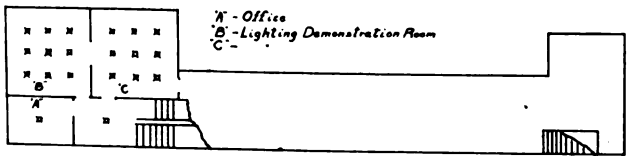
General Plan of First Floor.

plate being shown in the center of the far wall of this display room. Twenty wall bracket outlets in each room are controlled by four switches, two on either side of the entrance of each rooms. In the center of each display room is a large table on which portable lamps are shown and comfortable looking furniture invites the customer to sit down and make himself at home.

The third room is finished in light oak, while the fourth room is papered and finished in dark, soft colors. This room is a rest-room and writing-room for ladies, and tea is also served here to all those who desire it.

Because of the attractive surroundings in all of the display rooms, it is very easy for the prospective customer to imagine the effect of the fixture when hung in his own home, especially as all of the lighting fixtures are hung directly against the ceiling. It will be noted that no daylight enters this entire first floor, except in the store in front, where the sunlight comes in the show windows and doorway. None of this, however, reaches beyond the store proper. Therefore the customer can always judge the effect of the lighted fixture or lamps and imagine the result to be expected in his own home. A great variety of fixtures and portables are shown, and the prices vary widely so as to cover practically every pocketbook. The general plan of the first floor is shown herewith.

On the second floor are two special display rooms for the demonstration of modern illumination. These rooms are about 17 by 18 feet with 11-foot ceilings. The windows are equipped with two sets of curtains, so that it is possible to exclude all daylight. The ceiling outlets in each room are each controlled by an individual wall switch located near the entrance of the room. The center outlet in each room is equipped with a single fixture, either totally indirect or semi-indirect, sufficient to ordinarily light a room of that size for close reading. The four corner outlets are equipped with fixtures of some one style of proper size to illuminate the room from four outlets. The four remaining outlets in the center of each side of the room are equipped with still different fixtures. By the proper arrangement of fixtures on display and proper control of the switches, it is a simple matter to demonstrate the several modern methods of lighting and not only sell the customer lighting fixtures, but also to sell him good illumination. This special display has been pro-



Arrangement of Ceiling Outlets on First Floor.

ductive of excellent results, although it was not originally planned with the opening of the House Electric, and in fact has now been in use for about two years.

The remainder of the second floor is used for office space and stock room, while the entire third floor is used for clerical offices and fixture shop.

Appealing to Men in Vacuum-Cleaner Campaign.

That spring house cleaning is robbed of its terrors to the man of the house, by the introduction of the electric vacuum cleaner, is the appeal which the Central Maine Power Company advances in advertising this useful household appliance. The familiar warning, "You'll have to get out," uttered by the wielder of a duster and broom, is no longer heard in the house. The husband can remain in peace and comfort, the furniture doesn't have to be moved out of the room, nor all the windows opened. "Old fashioned cleaning days, with their wearisome chaos, are but memories," says the ad.

The company demonstrates their use in the prospective customer's home.

Low Operating Cost Will Be Advertised in Fan Campaign.

Two features will be widely advertised in the summer fan campaign to be put on by the Texas Power & Light Company this year. One of these will be a small cash payment and easy terms and the other will be operating cost.

In spite of the fact that all persons having an intimate

Illustration to Be Used in All Fan Advertising of Texas Company.

knowledge of the electrical business know that it costs little to operate a fan, a great many laymen do not understand this, and have a tendency to judge current consumption by the size of the appliance rather than the actual electrical characteristics. To overcome this prejudice a vivid comparison between a 60-watt lamp and a 12-inch fan will illustrate all the advertising matter used in this campaign. The current consumption at various speeds will also be given and the efficiency of the fan commented on. No matter at what price energy is sold, anyone can understand the simple statement that "this fan uses less current than this 60-watt lamp." Complete details of this campaign will be given in a later issue.

Nashville Wiring Advertisement Brings Results.

Taking a "tip" from local successful advertisers, the Nashville (Tenn.) Railway & Light Company has added an interesting feature to its house-wiring campaign by an advertisement in the daily papers written in the form of a newspaper story. The article is a description of the methods by which wiring is done in houses already built. It features the fact that this kind of wiring may be done without tearing up walls and floors or creating any disorder in the house. The fact that this sort of advertising is the favorite method of the proprietary medicine man, whose chief skill is his appeal to the public, indicates that it can be made highly useful. The article itself was taken from a pamphlet on house-wiring but will be read by many who would not heed a circular or an ordinary display advertisement. The company, through the campaign which was described in these columns recently, and in which this is a feature, added more than 100 new customers in March.

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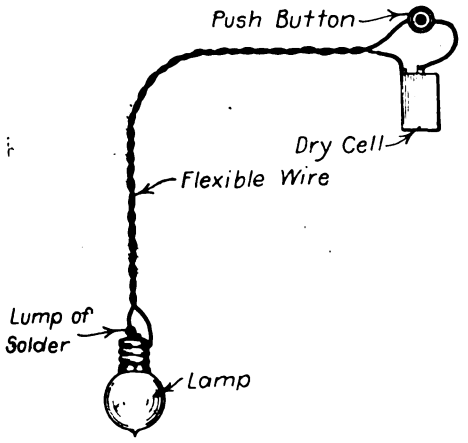
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

SMALL EXPLORING LAMP FOR AID IN FISHING IN PARTITIONS.

By R. F. Cooke.

An excellent exploring lamp that is safe and is valuable in wiring old houses where much fishing has to be done is made as follows: Take a small battery lamp and solder two small flexible wires to it as shown, putting a lump of solder on the end contact or butt to give it weight. To the other ends of the wires connect a push button and battery. This lamp can be lowered into a partition through a small hole and the interior of the partition examined



A Small Exploring Lamp for Aid in Fishing in Partitions.

for some distance each side of the lamp and clear to the bottom. I have seen candles used for this purpose, but this is very dangerous.

An Effective Church Lighting Installation.

An example of unusually efficient interior lighting is that of St. Patrick's Church, Natick, Mass., in which 200-watt nitrogen-filled incandescent units are installed in 16-inch Brascolite bowls. There are 12 groups of fixtures in the nave, six on either side, suspended by chains under

A Noteworthy Lighting Installation in a Massachusetts Church.

the arches, 18 feet above the floor, flush with the top of the columns.

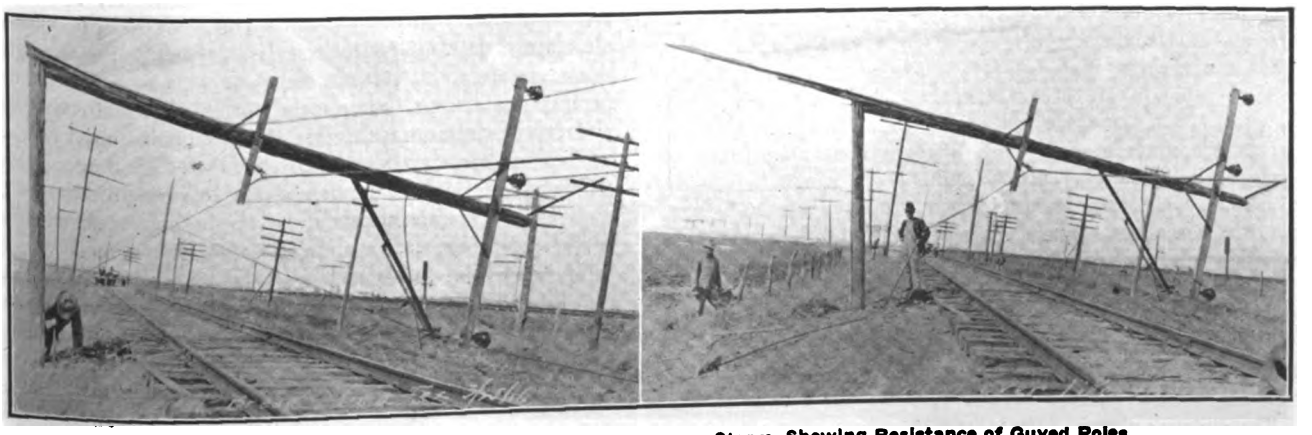
Above each fixture, which is of heavy bronze, are eight candle fittings with frosted balls containing 25-watt tungsten units.

A similar group fixture is installed over the organ space in the gallery and in the vestibule. A like unit, with Brascolite fixture and 200-watt nitrogen lamp, is in the sacristy. Edwin C. Lewis, Incorporated, Boston, was the contractor for the installation.

Benefits of Storm Guying.

The accompanying illustration shows a view of a section of transmission line blown down in a Texas storm. As will be noted, the break is practically square. A large number of poles were similarly broken off or blown over in the storm.

A very noticeable feature was the fact that the last pole standing had side storm guys on it. If it had not been for these guys there is no doubt but that quite a few more poles would have been blown down.



Two Views of a Texas Transmission Line After a Storm, Showing Resistance of Guyed Poles.

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Alternating-Current Motors—I

By Justin Lebovici

The first installment of this article considers the fundamental principles upon which the design and performance of alternating-current motors depend. The next installment will deal with the classification of the different types and the reasons for the possession of different characteristics. While the laws of electromagnetic action are expressed in mathematical terms, the descriptions will be found readable without knowledge of mathematics.

Considering the widespread use of the alternating-current motor in all branches of industry, it becomes important for a great number of persons handling these motors to properly understand and apply the principles underlying the performance of these machines.

Due to the fact that out of thousands of engineers dealing with alternating-current motors, there is hardly one who is called upon to design a machine from the ground up, the writer will omit from the following discussion such matters as are of prime importance to the designing engineer only. More consideration will be given to the performance and test of the various types of motors in order to enable the reader to get to the credentials of the machines in the form of their performance curves and so put him in a position to decide as regards the ability of a certain type of motor to perform the work desired. It is intended to include enough of the calculations to satisfy those who intend to make modifications in an existing motor with a view of meeting special requirements. Such changes consist mainly in modifying the windings or winding connections. For this reason a great deal of space will have to be devoted to a description of the various windings used in alternating-current motors, and some space to the more common methods of insulating and protecting windings against the unavoidable destructive forces at work in such structures.

It is assumed that the reader is in a general way familiar with the fundamental laws of electromagnetism, that he has some knowledge of the lower branches of mathematics and that he is acquainted to some extent with the mechanical construction of the apparatus involved. We will begin with a brief review of the fundamental laws.

The construction and performance of the alternating-current motor rest on relatively few fundamental laws.

The Laws of Electromagnetic Induction.

We shall use the following notations: small letters for instantaneous values and capital letters for effective values of electromotive forces and currents; also small letters for instantaneous values and capital letters for maximum values of flux, Φ, magnetic field strength, H, and magnetic flux-density, B.

In an electric conductor moving relatively to a magnetic field, an electromotive force is generated. Assume the conductor to be one centimeter long and moving in a magnetic field of uniform flux-density equal to B lines per square centimeter with a velocity of v centimeters per second in such a way that the direction of the magnetic field, the direction of motion and the conductor itself are at right angles to each other. Then the electromotive force (e) expressed in volts, induced in the conductor can be computed from the following formula:

$$e=Blv10^{-8} \text{ volts} \qquad (1)$$

For this electromotive force to give rise to an electric current (i) it is necessary that the ends of the conductor be connected in such a way as to form a closed circuit. The product Blv represents the rate of increase or decrease of the flux interlinkages (ϕ) of this circuit.

Coiling the conductor N-fold increases the electromotive force N-fold by increasing the number of interlinkages in turn.

If the flux changes during the time t from the value ϕ_1 to the value ϕ_2 we can write the law (1) in the following form:

$$e=-N(\phi_2-\phi_1)10^{-8}/t \text{ volts} \qquad (2)$$

The negative sign in formula (2) indicates that the magnetic field of the current produced by this electromotive force has a tendency to oppose the magnetic field generating this current, if it be increasing.

The magnetic field produced by the current is called its magnetic reaction. Lenz's law states that the magnetic reaction takes place in such a direction as to oppose the change.

In a one-turn coil, AA_1 (see Fig. 1) revolving with a uniform velocity through a uniform magnetic field, the flux inclosed by the coil at any instant t is equal to $\phi \cos \alpha$, if we denote by ϕ the maximum flux inclosed by the coil at the instant $t=0$, or when the coil is in position aa_1 and by α the angle through which AA_1 has passed in the time t. An electromotive force will be induced in the coil, and from law (2) it can be easily seen that at the time $t=0$ or when AA_1 passes the horizontal, ϕ_2 and ϕ_1 are very nearly equal and of the same sign at two instants very near to each other (for instance for

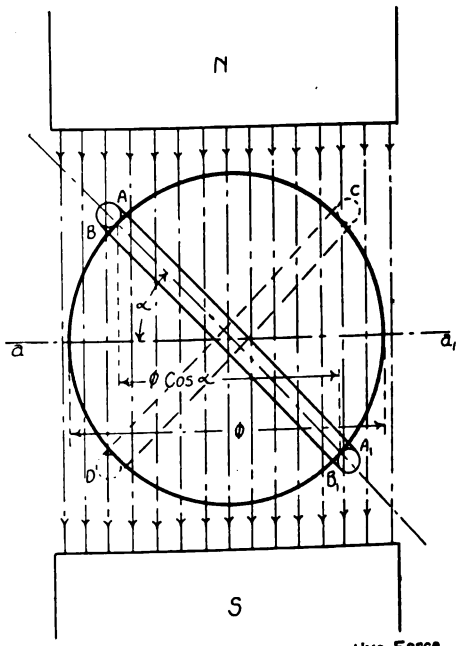

Fig. 1.—Coil Generating Electromotive Force.

$\alpha=5°$) and in consequence the induced electromotive force at this instant is zero. It is to be noted that at this instant the flux interlinked with the coil ($\phi \cos 0°$) is a maximum. On the other hand consider AA_1 when in a vertical position. For $\alpha=85°$ the flux enters the coil from the side AA_1 in a direction opposite to that for the instant when $\alpha=95°$. ϕ_2 and ϕ_1 in formula (2) are again nearly equal, but of opposite sign, and the electromotive force at this instant is a maximum. At this instant the flux interlinked with the coil is zero.

We can express this mathematically by saying that the electromotive force varies according to a sine curve when the flux varies according to a cosine curve. We can show this graphically as in Fig. 2.

Calling T the time necessary for the coil to make one revolution, we note that during this time the wave passes through all its positive and negative values. We call this time a cycle and the frequency (f) is equal to the number of cycles per second.

We can write the following proportion

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$\alpha:2\pi=t:T$ and noting that $fT=1$ we have for the instantaneous value of the electromotive force, according to Fig. 2,

$$e=e_{max}\sin\alpha=e_{max}\sin(2\pi t/T)=e_{max}\sin 2\pi ft \quad (3)$$

Applying formula (2) to the case of the coil for $\alpha=o$ and $\alpha=180°$ we see that $\phi_2=-\phi_1=\phi$ and we obtain for the average electromotive force during one-half cycle

$$e_{av}=2\phi N10^{-8}/t \text{ volts, or since } t=f/2$$

$$e_{av}=4fN\phi10^{-8} \text{ volts} \quad (4)$$

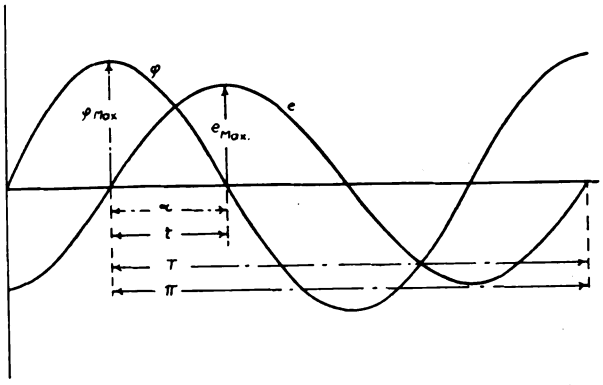

Fig. 2.—Wave Forms of Magnetic Flux and Electromotive Force.
(In this figure, π should read 2π.)

Assuming the maximum ordinate of the sine wave to be equal to e_{max} and the wave-length of the curve equal to 2π, then we have to discriminate between

(1) The instantaneous value $e=e_{max}\sin\alpha$ ..... (5)

(2) The average value of the half wave $e_{av}=0.636e_{max}$ ..... (6)

(3) The effective value, or the square root of the mean square, $E=0.707e_{max}=e_{max}/\sqrt{2}$ ..... (7)

The form-factor $F=E/e_{av}=0.707/0.636=1.11$ ..... (8)

Unless otherwise stated, we shall assume in what follows a sine wave shape for the currents, electromotive forces and fluxes.

It follows then:

$e_{max}=e_{av}/0.636=2\pi fN\phi10^{-8}$ volts ..... (9)

$E=1.11e_{av}=4.44fN\phi10^{-8}$ volts ..... (10)

$e=2\pi fN\phi10^{-8}\sin 2\pi ft=2\pi fN\phi\sin\omega t10^{-8}$ volts ..... (11)

If ϕ be the maximum number of lines of flux inclosed by the coil, ϕ being assumed to vary as a sine function of time (t) with a frequency f, then the effective electromotive force induced in a coil of N turns can be computed from the following formula:

$$E=4.44fN\phi10^{-8} \text{ volts.}$$

If the flux does not vary as a sine function of time, formula (10) may be written generally:

$$E=4Ffn\phi10^{-8} \text{ volts} \quad (12)$$

F is called the form-factor of the wave, and depends upon the distribution of the magnetic flux in the magnetic field and represents the ratio of the effective to the average value as indicated before in (8).

Self Induction. Phase Displacement.

In alternating-current circuits it is to be noted that the maximum values of the electromotive force and current do not always coincide. An important part of the phenomenon called electric current is the magnetic field which appears and disappears and varies with the current producing the same. The flux ϕ_s produced by a current i is proportionate to the current itself and we can write $N\phi_s=Li$, or $L=N\phi_s/i$ where ϕ_s varies, the same as the current i, according to the sine wave.

The factor L or the flux produced by a unit current in this circuit is called the coefficient of self-induction. The flux ϕ_s produces an electromotive force of self-induction e_s according to (2). This electromotive force is called the reactance voltage and according to (11) we can write $e_s=2\pi fN\phi_s10^{-8}\sin\omega t$ volts, or

$$E_s=2\pi fLI=xI \quad (13)$$

the factor $x=2\pi fL$ is called the reactance of the circuit.

Due to the presence of this electromotive force of self-induction the maximum and zero values of the electromotive force and current do not occur at the same time. The current reaches its maximum value a little later than the electromotive force, but the time necessary to complete a full cycle is the same for both the current and the electromotive force. We express this by saying that in a circuit having self-induction the current lags behind the electromotive force or the electromotive force leads the current. The angle (say θ) by which the current lags behind the electromotive force is called the angle of phase displacement.

The magnetic field of the current generates the electromotive force of self-induction in the conductor carrying the current. This magnetic field is sometimes called the magnetic reaction and is always in such a direction as to oppose its cause (Lenz's law).

The phenomenon of self-induction therefore has the effect of an increased resistance to the flow of alternating current in the circuit. This increase in resistance is measured in the same unit as the resistance with which we are familiar from direct-current work, i. e., the ohm.

An alternating current of frequency f flowing through a circuit having a resistance of r ohms and a coefficient of self-induction L, encounters an apparently increased resistance z called the impedance of the circuit, which is measured in ohms the same as the resistance (r) and reactance (x).

$$z=\sqrt{r^2+(2\pi fL)^2}=\sqrt{r^2+x^2} \quad (14)$$

The impedance can be represented graphically as the hypotenuse of a right-angle triangle having as legs the resistance and the reactance as given in the last equation. This is shown in Fig. 3, where

$$\tan\theta=x/r \quad (15)$$

For alternating-current circuits Ohm's law is most conveniently written in the following form:

$$I=E/\sqrt{r^2+(2\pi fL)^2} \quad (16)$$

Multiplying all sides of Fig. 3 by the current I we obtain the diagram shown in Fig. 4, where all sides represent electromotive forces in place of values measured in ohms.

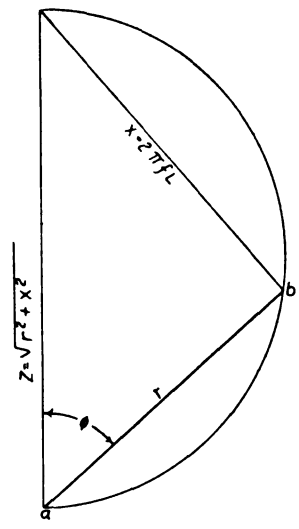

Fig. 3.

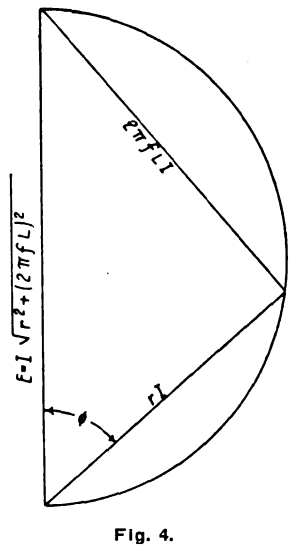

Fig. 4.

Power Consumed in Alternating-Current Circuits.

Referring to Fig. 4 we see that the electromotive force

$$Ir=E\cos\theta=E_w \quad (17)$$

is consumed in the resistance while the electromotive force

$$2\pi fLI=Ix=E\sin\theta=E_1 \quad (18)$$

is consumed in the reactance. The total electromotive force is consumed in the impedance z or

$$E=Iz \quad (19)$$

The power (p) in watts consumed at any instant by the circuit is the same as in a direct-current circuit or

$$p=ei=\sqrt{2}E\sin\alpha\sqrt{2}I\sin(\alpha+\theta) \quad (20)$$

if we denote in equation (3) $2\pi ft$ by α, θ being the phase dis-

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placement between current and electromotive force as explained above. The average power p becomes

$$P=IE\cos\theta=IE_w=I^2r \quad (21)$$

We see that only the resistance consumes power in the circuit. The power consumed in the circuit is independent of the reactance or the self-inductance and the reactance does not consume any power. This is the reason why the component $E_1=E\sin\theta$ given in equation (18) is called the wattless component of the electromotive force. The component E_w (equation 17) is called the watt component or power component of the electromotive force.

From equation (21) we see that the average power is represented by the product $I\times E\cos\theta$, or $E\times I\cos\theta$. The factor $I\cos\theta$ is called the watt component of the current, the same as $E\cos\theta$ was called the watt component of the electromotive force.

The factor $\cos\theta$ is called the power-factor of the circuit and plays an important role in all alternating-current problems. A low power-factor is detrimental to both the generation and transmission of power.

The Magnetic Circuit of a Machine.

A law similar to Ohm's law for electric circuits is the law

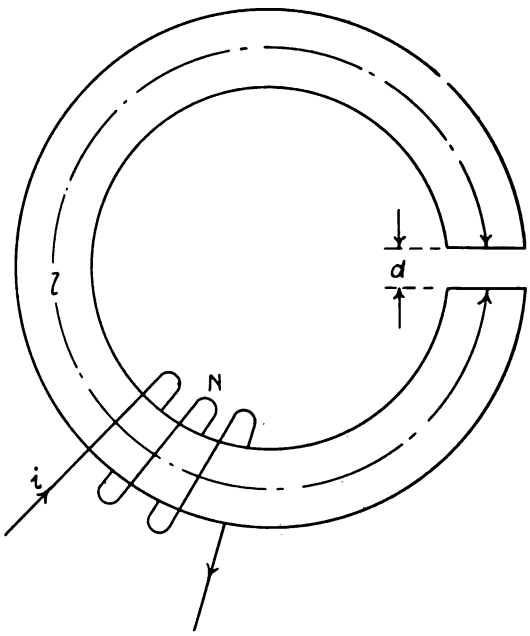

Fig. 5.—Simple Magnetic Circuit.

for magnetic circuits. This law states that the flux (ϕ) interlinked with a coil of N turns carrying a current I (outside of the field of other magnetic forces) can be represented as a ratio of two quantities: the magnetomotive force and the reluctance or magnetic resistance of the path of the flux.

$$\phi=\text{magnetomotive force/reluctance}=0.4\pi\sqrt{2}IN/\text{reluctance} \quad (22)$$

$\sqrt{2}IN$ are called the ampere-turns.

The reluctance varies directly as the length of the path, inversely as its area of cross-section (provided the cross-section is uniform) and is dependent upon the permeability μ of the material forming the path of the flux. If the area of the path is not uniform, it can be subdivided into parts having the same cross-section, for which this last assumption holds. Take the simple magnetic circuit shown in Fig. 5, in which

A=cross-section of the magnetic path in centimeters.
l=the length of the iron path in centimeters.
μ=the permeability (being 1 for air).
d=length of air gap.

$$\phi=0.4\pi\sqrt{2}IN/(A/d+A/\mu l) \quad (23)$$

For the air gap we can write $\phi=BA$ (24)

B being the magnetic flux-density, or the number of lines per square centimeter in a magnetic medium. The number of lines per square centimeter in air produced by the same mag-

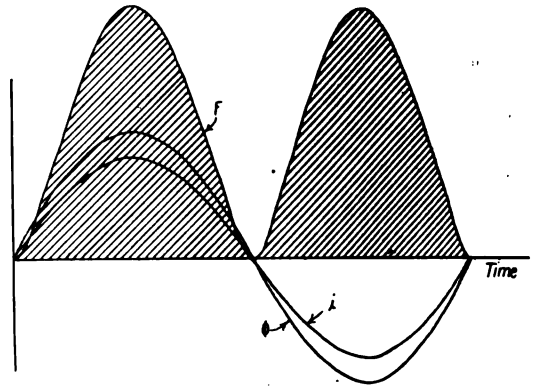

Fig. 6.—Variation of Force.

netizing field is called the field intensity. These two quantities are related to each other as shown by the equation

$$B=\mu H \quad (25)$$

Forces Produced by a Magnetic Field and an Electric Circuit.

A conductor through which a current flows has, when brought into a magnetic field, a tendency to move in a direction perpendicular to the plane formed by the electric conductor and the lines of the field. This force (F) can be computed from the law of Biot and Savart. If the length of conductor be l centimeters and the same be carrying i amperes, the magnetic

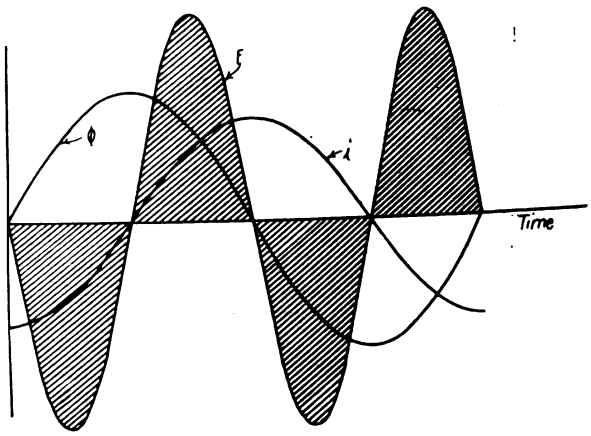

Fig 7.—Average Force Is Zero.

induction be B and the angle which B forms with l be designated α, then the force is

$$F=lBi\sin\alpha/9.81\times10^6 \text{ kilograms} \quad (26)$$

In all motors $\alpha=90°$ so that we can write

$$F=lBi/9.81\times10^6 \text{ kilograms} \quad (27)$$

It is to be noted that the force is maximum when the conductor carrying the current and the flux are at right angles to each other in space, for in this case $\sin\alpha$ becomes unity.

If the current and flux are alternating in character, the time phase of these quantities has to be considered. Suppose the flux to be maximum while the current is zero; evidently in

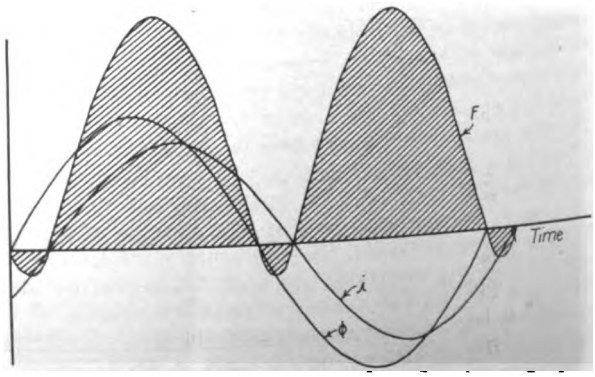

Fig. 8.—Slight Phase Displacement.

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this case the force will be zero, though the current and flux may be in the right space position for producing force by their combination.

It follows that if the flux and current are not constant in value the best condition for producing torque is obtained when these two quantities are in space quadrature and in time phase.

In Fig. 6 the flux ϕ and current i are varying in a sine wave; the product of the two, to which the force is proportional, is shown as line F. In this figure it is assumed the current and flux are in time phase.

In Fig. 7 the flux ϕ and current i are in time quadrature. It is easily seen that in the first case, while the instantaneous force F due to simple alternating fluxes and currents is pulsating in character, it is positive at all instants and the average force due to the sum of the instantaneous values has a positive value. In the second case the resultant average force, which is proportional to the sum of the positive and negative instantaneous values of F, is zero. For any other angle of phase displacement between the current and flux, as shown in Fig. 8, the force is nearer to the ideal case shown in Fig. 6 the smaller the angle or the nearer the current and flux are in phase.

Polyphase Currents.

If in Fig. 1 we place on the revolving cylinder besides the coil AA_1 another coil CD at an angle of 90° with AA_1 then the coil CD will assume in space the same positions as AA_1 and we will have induced in the coil CD all the instantaneous values that have been induced in coil AA_1. The time necessary for the coil AA_1 to reach the position CD corresponds to a

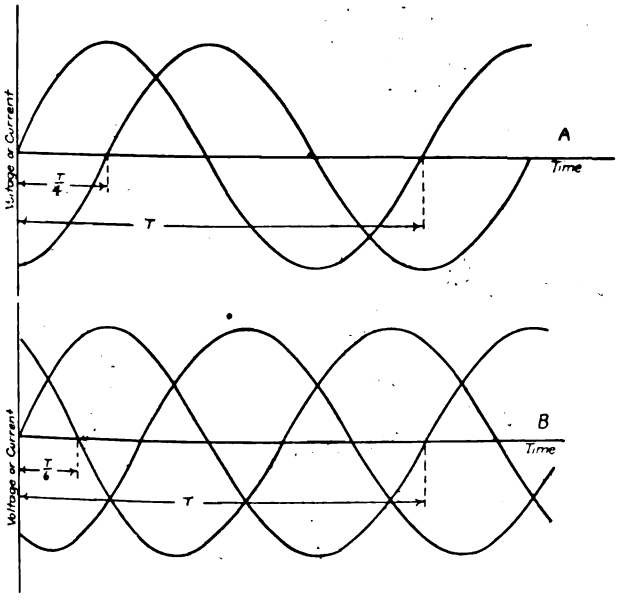

Fig. 9.—Two-Phase and Three-Phase Systems.

quarter cycle. The electromotive forces induced in the two coils AA_1 and CD are independent of each other, their instantaneous values are the same but occur at different times. In the above illustration the maximum values occur $T/4$ seconds apart. T represents the time of a complete cycle, as before. We call this system a quarter-phase or two-phase system. Fig. 9A represents graphically a two-phase system of electromotive forces or currents. If in place of two symmetrical, independent coils we had used three coils 60° apart, we should then have had a three-phase system, Fig. 9B. Analogously we can obtain an n-phase system of electromotive forces or currents.

A circuit using only one phase is called a single-phase system, while an n-phase circuit is called a polyphase system.

All that has been said up to this point applies to any one phase of a polyphase system.

(To be continued.)

AMONG THE CONTRACTORS.

Russell & Company, electrical contractors, 444 Columbus Avenue, New York City, have been awarded the contract for a large residence at Manursing Island, Rye, N. Y. This work includes electric-light and power wiring, rigid conduit throughout, intercommunicating telephone system, electric re-set annunciators, high-tension underground feeders with manholes and transformer vault, high-grade slate switchboards and panelboards in fireproof cabinets. It further includes electric fire alarm, burglar lamps, and electric heating in bathrooms.

NePage, McKenny & Company, electrical engineers and contractors, Armour Building, Seattle, Wash., announce that Samuel A. Sizer has joined the company as secretary-treasurer and principal stockholder. Mr. Sizer is a large real estate and timber owner of Seattle.

The McKeever Electric Company, Columbus, O., has been awarded three contracts for large electrical installations, the Seneca Hotel, of that city, an eleven-story building to cost $400,000, being the largest. The contract covers the electrical work complete, exclusive of fixtures and appliances. A new unit of the Ford automobile assembling plant at Columbus, which will be an exact duplicate of the original building, calls for electrical work to the amount of $4,500. In the Masonic Temple, at Ironton, O., one of the features of the contract will be the wiring of an auditorium with regulation stage.

The Standard Electrical Construction Company, San Francisco, Cal., has been awarded the wiring contract for the addition to the Standard Oil Company's building in that city.

The Hibbard Electric Company, Fitchburg, Mass., took a novel means of inducing prospects to have their houses wired, offering to pay the first month's lighting bill of anyone having his house wired or fixtured by it during the month of April.

The Bradley Electric Company, Council Bluffs, Iowa, has moved into new quarters at 331 West Broadway, giving the company a considerable increase in floor space. New fixtures and store appointments have been installed.

Effect of Imperfect Dielectrics in the Field of a Radiotelegraphic Antenna.

The loss of electrical energy in an antenna is caused by the resistance of the antenna. The so-called radiation resistance is a measure of the portion of the energy usefully dissipated in the emission of electromagnetic waves. The remainder of the resistance causes a useless dissipation of energy that should be reduced to a minimum.

It has been previously noted that, in the region of the longer wave-lengths, the resistance of an antenna increases with increasing wave-length and the explanation has been offered that this is caused by dielectric absorption or a loss of energy such as that which takes place in a poor condenser and that it is probably caused by the ground. However, the Bureau of Standards, Department of Commerce, finds that the loss does not take place in the ground, but in poor dielectrics in the electric field of the antenna, such as wooden masts, trees, insulation, etc. Running the leads into a building may increase the resistance unless the interior walls are covered with metal screen and connected to ground. It is important, therefore, to reduce to a minimum these sources of energy loss in designing an antenna.

The report on this subject is Scientific Paper No. 269, entitled "Effect of Imperfect Dielectrics in the Field of a Radiotelegraphic Antenna," and copies may be procured, gratis, upon application to the Bureau of Standards, Washington, D. C.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

Combining a Moving Element With a "Wire-Your-Home-Month" Display.

The advantage of moving elements in a window display are very well recognized, and a great deal of effort has been made and much ingenuity exhibited in many electrical merchandising windows. A novel display combining a

Commonwealth Edison Company "Electric Shop" Window Display During House-Wiring Campaign.

moving element with "Wire-Your-Home" Month, and also possessing some educational features was shown in the window of the Commonwealth Edison Company's Electrical Shop, 72 West Adams Street, Chicago, Ill.

The moving element was an arrow attached to a motor-operated arm, the latter being arranged to stop at regular intervals before one of five placards which told what a few cents' worth of electricity will do in the home. Monthly costs for average use of an electric percolator, grill, flat-iron and toaster, and cost of 50-minutes' use of a chafing dish were given on the placards. The appliance referred to in each case was placed in front of the placards. Numerous other appliances, which form conveniences only after one has his home wired, formed the remainder of the window display.

Co-operating with the "Wire-Your-Home-Month" Campaign.

Display windows are becoming such a potent factor in good advertising that many companies are making special efforts in that direction. The accompanying illustration is one of a number of window displays made by the Superior (Wis.) Water, Light & Power Company in connection with the "Wire-Your-Home" campaign which ends this week.

The houses shown in the rear of the display were painted on wall board, with windows cut out and lights behind the two end houses. The arrows on the cards pointed out the objects for which the wording was intended. Sweeping compound was spread on the floor and simulated grass very effectively, and the pole line and cement walk added a degree of naturalness.

The company made every effort to make "Wire-Your-Home Month" a success in Superior, and the results have shown a large increase over other years in the number of houses wired during this season. Newspaper advertising, circular letters and personal solicitation were used very effectively. A house owner was advised to secure an electrical contractor for wiring his house, the company paying the contractor for the cost of the work, deducting six per cent for cash. The cost was then divided into 12 payments and added to the monthly bills for service. If the resident of a house owned the property he was given an electric iron or a toaster when the service connection was made.

Sales Manager Christopher stated good results were always obtained when the company tied up its local campaigns with a national campaign such as "Electrical Prosperity Week" or the house-wiring campaign. He expressed the opinion that an impetus was given to a local movement that was not attainable in any other way.

House-Wiring Campaign Display Window of the Superior Water, Light & Power Company.

Merchandising Small Electrical Devices.

In order to dispose of a number of lines of small electric appliances that move rather slowly at times, a certain merchandiser tries the scheme of placing a few of these devices, such as toy motors and transformers, dimalites, multiple sockets and small heating devices, on a table near the entrance to his store. Passing customers stop and pick them up for examination or to "see how they work." The sales efforts amount to practically nothing, but the results are always very satisfactory.

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Sales Factors in a Washing-Machine Campaign

Assembly and Use of Fundamental Sales Principles Results in the Merchandising of a Carload of Electric Washers in Minneapolis

"In union there is strength" is a maxim that has become modernized to "in co-operation there is strength." Usually the thought is of individuals or individual business enterprises co-operating to give greater strength, but the same thought may be applied to uniting the various factors that are of benefit to a movement. Each one of these factors used as a unit of driving power, then amassed, their functions interwoven and used collectively, give the best results in the attempt to accomplish the ultimate end, which, of course, is the desired result.

A thorough understanding of sales factors, which may be enumerated in part as sales organization, analysis of the market, special appeals to the public, window-display, advertising, demonstration, and the like, and which may be termed the levers of merchandising, followed by their coherent and skillful usage is sure to result in merchandising of a highly successful degree. A thoughtful direction of every factor, rather than hurriedly increased effort, brings the highest percentage of net results.

The opportunity and necessity for using sales factors in their highest degree is given to the merchandiser of electrical appliances because in the majority of instances the business requires pure salesmanship, rather than order-taking. The reason for this is that the sale of electrical appliances does not resemble that of staple household necessities. They only become so after their introduction into the home, where their convenience and utility transpose them into necessities. Electrical appliances demand explanation and demonstration before their introduction can be secured; in other words, exploitation. And in exploiting an article all the principles of expert salesmanship are called into use.

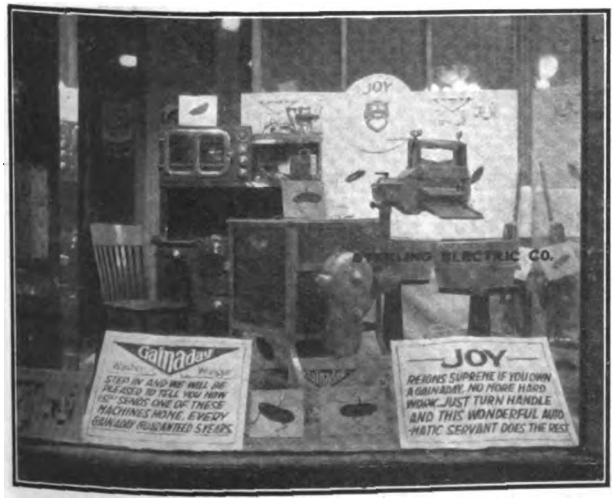
Hence, the necessity for campaigns for the sale of electrical appliances. But a campaign is not a sale. It is much more. The dictionary meaning of campaign is "a connected series of operations to bring about a desired result." And since a "connected series of operations" sounds familiarly like "co-operation," we may say a "co-operation to bring about the desired result" is a campaign; that is, the co-operation of the sales factors.

These opening paragraphs are in explanation of the fundamental principles used in the sales work of the Sterling Electric Company, 33 South Fifth Street, Minneapolis, Minn. They were employed in formulating and carrying out plans for what proved to be a very successful electric washing-machine campaign, which was of two weeks' duration and which ended April 1.

A careful survey of the prospective field was the first movement in the campaign. An analysis was made of the company's list of prospective washing-machine customers and a review of the estimated sales in the city as a whole. In other words, the analysis of the market, which, though briefly stated, meant many hours of detail work and planning. The new residential rate of the Minneapolis General Electric Company for electricity, which became effective March 1, was a stimulus to the public for the use of additional labor-saving and convenient electrical appliances and was an important factor in aiding the Sterling Electric Company's campaign.

A carload of "Gainaday" electric washing machines, manufactured by the Pittsburgh Gage & Supply Company, Pittsburgh, Pa., was ordered some months in advance, and delivery secured so the campaign could be started March 15. It was decided to make two weeks the limiting time in which to dispose of the machines. The established retail selling price of this particular machine is $105, and at no previous time had the price even been varied. However, during this campaign customers were given a special discount of $5. All that was required for the first payment was $5, this to be followed by regular monthly payments of $7.50 until the total purchase price was paid. Under regular conditions the company stipulates a first payment of $20, followed by monthly payments of $10.

With terms established and the stock of machines on hand, the whole plan of the campaign was ready for its unfolding. Preparations were made for getting the public firmly interested, and here the preliminary plans for advertising were called into play. The first indication to the public of an electric washing-machine demonstration and sale was given by the insertion of a number of so-called "teaser" advertisements in the Minneapolis daily newspapers during the week preceding the sale. One of these "curiosity-arousers" is reproduced. The day before the opening of the campaign half-page advertisements appeared in two of the evening newspapers, a full announcement of the demonstration, sale inducements, terms of payment, and description and advantages of the machine being given. Special emphasis was laid on the mode of operation and



A Close-Up View of the Two Contrasting Window Displays of the Sterling Electric Company.

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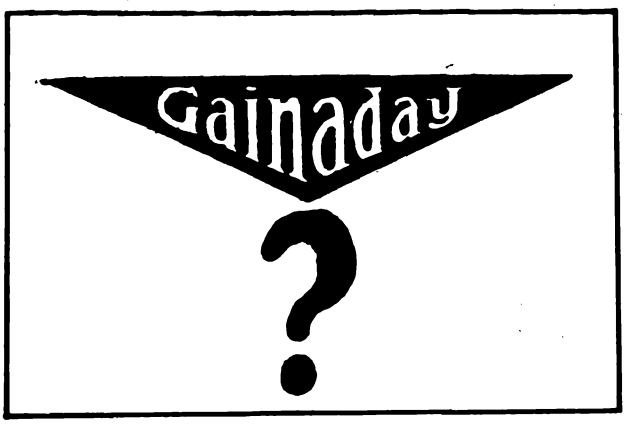

One of the "Teaser" Advertisements.

the fact that a five-year guarantee went with every machine.

Because housewives of Minneapolis do not, as a general rule, read the morning newspapers, all advertising for the campaign was placed in the evening publications. The advertisements were very explicit, being designed to give the interested housewife an opportunity to read many of the answers to questions she would have in mind regarding the convenience and operation of an electric washing-machine in her own home. Avenues were prepared leading up to the desirability of seeing the demonstration and in preparation of opportunities for the demonstrator and salesmen to repeat the talking points given in the advertisements and then climaxing a sale by giving additional talking points. The advertisements were continued during the campaign, being reduced to one-fourth page and inserted every other day, former experiences proving to the company that nearly as good results were obtained in this way as with daily insertions.

Originality and timeliness in window displays have become characteristic of the Sterling Electric Company. In describing this campaign it would not do to recite the number of unique and timely displays made in the past few years, but the accompanying illustrations serve to show the originality used in window display during the washing-machine campaign. The company has two show windows, with the entrance to the store between them, which, added to the fact that there is an alley on one side of the store, gives a maximum of window frontage. The two windows are often used for displaying contrasting exhibits, and this idea was used in the campaign.

The old method of doing the family washing, with its accompanying disorder and inconvenience, was illustrated in one window by a colored "mammy," who performed the operations in a slip-shod manner. "Glooms" were scattered about the window, the large card stating "gloom filled every wash day with hard labor, aches and pains until Gainaday transformed it into—see other window for your answer." Then came the contrast, for in the other window joy in washing was typified, which, as the card stated, "reigns supreme if you own a Gainaday. No more hard work; just turn the handle and this wonderful servant does the rest." A lady demonstrator was obtained from the manufacturers of the machine, and performed the actual operations in doing a washing, displaying cards which explained the successive processes in their order. These were very similar to those given in the newspaper advertisements, and serves as an illustration of the efforts made to link the window display as closely as possible to the printed matter, enabling people who read the advertisements to come and see the operations actually performed. A number of other electrical appliances, including a range, vacuum cleaner and flatirons, formed part of the background of the exhibit in this window.

During the two weeks of the campaign 41 washing machines were sold, and the effects produced by the demonstration and advertising were so lasting that the remainder of the carload of 60 machines was disposed of during the two weeks following the close of the campaign. The company considers these results very gratifying and expresses the opinion that this is the largest number of electric washing-machines sold in the Northwest in the same period of time.

W. H. Vilett is manager of the Sterling Electric Company, which, besides electrical merchandising, does a general electrical contracting and jobbing business. M. V. Rutherford is the company's sales manager and the plans for the campaign, including the preparation of window displays and copy for advertising, were under his immediate direction.

See This Washing Demonstration

By an Experienced Laundry Operator from the "GAINADAY" Factory.

UNTIL APRIL 1st a practical demonstration of modern washing methods will be given in our store by an experienced laundry operator. Every step in the Gainaday Electric Washing and Wringing Process will be shown under actual operation. Each day a limited number of Gainaday Electric Machines will be placed in Minneapolis homes on a small down payment of only $5.00.

$5.00 now saves $5.00

and brings you at once a

Gainaday Washer Wringer

Then small payments made from each month's saving in time, labor and wear and tear on your clothes will soon pay for this modern electric washer and wringer. Remember that by seeing this practical trial and giving us your order now you can save $5.00. Come in today—there is no time like the present to take this labor, time and and money-saving step.

No. 1 Putting the clothes in the washer after filling tub up to water line with boiling water and adding soap. All collar and wrist bands as well as any especially soiled parts should be well soaped.

Putting Clothes in Washer

No. 2 Turning on the electric current by means of a convenient lever, after the cover of the machine is in position.

Turning This Lever Starts Washer

No. 3 Starting the wringer after the washing machine has been running from 12 to 20 minutes. Wringer has a safety latch.

After 20 Min Washing Start Wringer

No. 4 Wringing the clothes into rinse water. Machine is then ready for the second batch of clothes.

No. 5 Swinging the three-position wringer into the second position. A small plunger quickly releases the wringer and holds it firmly in each position.

No. 6 Wringing the clothes from rinse water to the blueing water. Strong motor operates washer and wringer at the same time.

No. 7 Wringing the clothes from blue water to basket with the wringer in the third position. The next batch of clothes can now be taken through the same process.

Read These Advantages Now!

Then study the pictures opposite and you will more fully appreciate the significance of this unusual offer. Your maid's time saved is your time saved.

The "Gainaday" is a washer and wringer combined and is equipped with a ¼ horsepower motor capable of operating them both at the same time. Built on the efficient cylinder system it does its work well, quickly and with the least possible wear and tear on the clothes. All working parts are enclosed and oiled automatically. Copper tub, nine cylinder and long bearings give greatest durability.

A sturdy wringer that swings into three positions, handy levers, and double-rail swivel casters make the "Gainaday" a household device of greatest convenience. The "Gainaday" is guaranteed for FIVE YEARS.

Durable Copper Tub. Copper the most durable of metals, is used on the "Gainaday" Tub. Strong frame-work and heavy copper non-rustable tub give greatest washing qualities.

¼ H. P. Westinghouse Motor. The "Gainaday" is equipped with a genuine Westinghouse ¼ H. P. motor that will positively operate both washer and wringer at the same time. The absolutely safe motor is covered with a heavy metal guard.

Non-corrodable Rust Cylinder. Perforated with over 1,000 holes this cylinder revolves and reverses, forcing hot water and suds through the clothes. This cylinder system does its work well, quickly and with the slightest possible wear and tear on the clothes.

Automatic Oiling Throughout. All gears and working parts of the "Gainaday" are packed in heavy lubricant. Remaining parts of this washer require the least possible attention.

Handy Central Levers. The levers which start and stop the "Gainaday" Washer and Wringer are convenient and easy operation. The wringer is started and reversed by the same lever.

Insulated Drive Shaft. The drive shaft connecting the washer and motor is thoroughly insulated with a heavy hard fibre tube. All electric parts are absolutely safe.

Three Position Wringer. This is an exceptionally strong point in the "Gainaday" machine. In simply lifting a small plunger the wringer can be swung into three convenient positions.

Working Parts Enclosed. All working parts of the "Gainaday" are enclosed. There are no belts, pulleys or sprockets to catch the fingers and clothes. The "Gainaday" is built for efficiency.

Double Rail Swivel Casters. Strong casters with double rail swivel are used on the "Gainaday". They give greatest ease and convenience in moving the machine.

Safety Release Wringer. If clothes get tangled or fastener accidentally pushed in, it can be released by means of the "Gainaday" Release Lever. The "Gainaday" Wringer is built for heavy work.

Long Bearings of Hard Brass. Long life is assured in the "Gainaday" by the use of bearings of hard brass. All working parts will stand heavy wear.

Light Cylinder for Economy. The "Gainaday" Cylinder weighs only 10½ pounds—it is lighter than ordinary wooden cylinders and being made of fine is many times more durable. All other Cylinders rust out and corrode.

Remember Every GAINADAY Is Guaranteed for Five Years.

STERLING ELECTRIC COMPANY

23 South Fifth Street. Phone: Main 241

MINNEAPOLIS, MINN.

Half-Page Newspaper Announcement of Campaign.

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National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y.
WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

SECTION REPRESENTATIVES:
C. H. Fletcher, J. C. Digby, British Columbia
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
M. L. Pomares, O. E. Smith, New York City.
Arthur Kempston, G. A. Cleary, California.

MEMBERS AT LARGE:
K. W. Adkins, St. Louis, Mo.
Emil Anderson, Minneapolis, Minn.
F. G. Hartwell, Boston, Mass.
J. E. Latta, Chicago, Ill.
James B. McCarthy, Detroit, Mich.
H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

California Section.—The Secretary has received a letter from the secretary of this section, in which he states that they held a splendid meeting on March 4, fifteen members attending, and four new members being taken in. Though the number does not sound large it is an excellent percentage, and when it is remembered that the members are widely separated (one traveling 235 miles to attend) it sets a standard for other sections.

The section had for an entertainment an exhibit of motion pictures of the Pittsfield and Schenectady works and processes of the General Electric Company, shown by courtesy of the company, as well as a consideration of the subject "Electricity on the Farm."

The section will hold its annual meeting on April 6. The new members elected were as folows:

J. A. Royster, Pacific Gas & Electric Company, Martinez, Cal.

A. V. Yowens, City Hall, Palo Alto, Cal.

L. Weirda, City Hall, Richmond, Cal.

F. White, Mt. Whitney Power Company, Visalia, Cal.

The Eastern Massachusetts Section held its monthly meeting on April 7 at the quarters of the Wire Department of Boston, by the courtesy of Commissioner Cole, with 25 members present.

Commissioner Cole exhibited the relics of a very interesting case of burn-out in flexible conduit, causing a burning through a lead gas-meter supply, and described the conditions, and the general matter of "equivalent copper conductivity" of flexible conduit was discussed at length.

The main subject for discussion was upon the running of 550-volt, three-phase power circuits in factories, conduit versus open wiring, and whether the operating switches should be open or closed in.

After a full discussion it was decided that conditions varied so much in individual cases that no hard and fast rule seemed advisable, but that the local inspector should have full power to require conduit, if it seemed best to him, and it was the opinion of the great majority that in such work conduit construction was amply superior in most cases to justify requiring it.

New York Section.—The Secretary is advised that the report of the annual meeting of the section is on the way, but has not received it in time to include it here.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

The following gentlemen have become members of the section:

Daniel J. Drummond, 3014 Snyder Avenue, Brooklyn, N. Y.

John L. Lowton, 3103 Snyder Avenue, Brooklyn, N. Y.

Charles Parker, 1557 East Forty-Fifth Street, Brooklyn, N. Y.

The two questions herewith are rather closely related, the first referring to the protection of a low-voltage transformer on a house secondary from surges due to lightning; the second referring to protection of the house secondary from surges due to the appliances on the transformer secondary (which is really a tertiary circuit from the street primaries).

Though not complicated they may be of interest, considering the approaching season—summer lightning on the one hand, and summer vacations for experimental wireless by high-school boys and other students.

Protection of Bell-Ringing Transformers.

Question 322. We have been troubled with bell-ringing transformers burning out during thunderstorms. Is there any simple and yet positive way of protecting these transformers against lightning?

Answer 1(E). I have never experienced difficulty from this cause. Our secondary lines are well protected by lightning arresters and our secondaries well grounded. I am inclined to the opinion that this is why I have had no difficulty.

Answer 2(U). I would suggest putting several convolutions of wire in each lead to the transformer.

Answer 3(R)*. No simple method occurs to me. A small lightning arrester might be procured and tried.

Answer 4(S)*. It has not happened in my territory.

Answer 5(F and G). The only thing we can suggest would be bridging a pair of condensers in series across the supply terminals of the transformer. These would probably absorb the current surge in the same manner as when used in wireless work.

Answer 6(A)*. I never heard of any positive way of keep-

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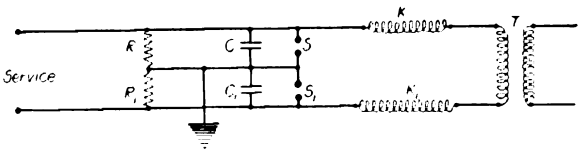
ing lightning out of such places. One might try lightning arresters between service switch and meter.

Answer 7(O). I know of no positive method of protecting transformers against lightning, but would suggest lightning arresters on the service wire; further safeguards would be properly grounding the service (rule 15) and running the wires within the building in iron conduit.

Answer 8(T). I am unable to give any information on this subject, as we have not experienced much trouble with bell-ringing transformers.

Answer 9(M). We are happy to state that we reside in a locality that has *never* experienced lightning or thunderstorms such as frequent other less favored communities, so would not venture an opinion on this question.

Answer 10(N)*. While I know of no actual case of such burning out and know of no positive way of protecting against lightning, I should protect just as I would my wireless trans-



Wiring Diagram for Lightning Protection.

former against "kick back." In the accompanying diagram, R, R_1 are 1,000-ohm graphite rods; C, C_1 are condensers of, say, 0.5 microfarad each; S, S_1 are two very close spark gaps; K, K_1 are a few turns of inductive reactance; T is the transformer. The condensers and gaps may be left in place all the time, but the resistances disconnected from the line (by having fuse plugs on each end which are normally removed) except when there is reason to expect lightning disturbance.

Condensers for Radio Apparatus.

Question 323. When two condensers are used across the line, as required by rule 86e for wireless telegraph apparatus, should they be connected to the electrical system of the building ahead of or behind the meter?

Answer 1(E). They should be between the meter and the wireless telegraph apparatus.

Answer 2(U). I should suppose as the supply company preferred.

Answer 3(R)*. They should be connected to the house side of the meter.

Answer 4(S)*. They should be on the load side of the meter. This is to protect the meter from the high-potential surges which might puncture insulation inside the meter.

Answer 5(F and G). Condensers should be placed between the meter and the wireless transformer.

Answer 6(A)*. On the load side of meter. I should not suppose any company would allow them to be placed elsewhere.

Answer 7(O). They really form part of the wireless set and should not only be connected behind the meter, but should be controlled by the branch fuse and switch which supplies the wireless equipment.

Answer 8(T). Between the wireless and the meter in order to give the latter proper protection from high-potential surges.

Answer 9(M). We believe the condensers referred to in Code rule 86*e* should be inserted in the line ahead of the meter.

Answer 10(N)*. They should be as close up to the wireless transformer as possible, practically forming a part of the apparatus.

The German Electrical Industry.

The hands employed in electrical industry in Germany are among those earning the highest wages, and a wage of one mark per hour is by no means of rare occurrence, while the pay is almost continuously rising. Another distinctive feature is the great number of officials, both in the technical and the commercial departments. The profits of the business are influenced by the keen home competition, as well as the competition on the world's market. In this connection it may be mentioned that during the five years, 1907-8 to 1911-12, the annual revenue of forty-five firms in the electrotechnical industry, reckoned as per cent of the share capital and the genuine reserves, receded from 8.70 to 7.74 per cent, whereas the revenue of the electricity works (89 works) during the same period, rose from 8.50 to 9.99 per cent. The aggregate dividends of the share capital in the two branches naturally show a similar, though not so pronounced movement. The following table contains some interesting statistics for the year 1911-12 about the electrical concerns, as against the total German limited companies:

	All Companies.	Electro-technical Industry.	Electricity Works.
Number of companies	4,712	45	89
	Marks	Marks	Marks
Share capital entitled to dividends	14,550,281,000	231,995,000	689,863,000
Genuine reserves	3,515,432,000	45,101,000	120,054,000
Total capital	18,065,713,000	277,096,000	809,917,000
Debentures	3,499,947,000	90,181,000	469,512,000
Hypothecated	1,438,984,000	6,020,000	18,387,000
Annual revenue	1,470,520,000	21,450,000	80,934,000
Aggregate dividends	1,220,930,000	17,378,000	63,005,000

The following table shows the continuous increase in the number of concerns and hands employed in the "fine mechanics" and electrotechnical branches:

Year.	Number of Concerns.	Increase per Year in per cent.	Insured Full Hands. Total Number.	Insured Full Hands. Increase and Decrease per Year in per cent.	Wages. Aggregate.	Wages. Average Wage per Hand.
					Marks	Marks
1898	1,652	—	46,555	—	50,703,000	1,089.10
1899	1,825	10.5	54,928	17.9	60,890,000	1,108.54
1900	2,017	10.5	61,578	12.1	68,964,000	1,119.98
1901	2,168	7.5	59,010	— 4.2	69,503,000	1,177.82
1902	2,261	4.3	53,809	— 8.8	63,839,000	1,186.40
1903	2,331	3.1	60,006	11.4	71,362,000	1,189.26
1904	2,481	6.4	68,385	14.0	82,169,000	1,201.56
1905	2,718	7.6	82,510	20.3	102,264,000	1,239.41
1906	2,982	9.7	94,472	14.5	121,352,000	1,284.53
1907	3,241	8.7	100,966	10.7	146,919,000	1,455.13
1908	3,475	7.2	108,472	7.4	158,516,000	1,461.35
1909	3,777	8.7	119,395	10.1	172,836,000	1,447.60
1910	4,101	8.6	142,535	19.4	212,113,000	1,488.15
1911	4,587	11.9	169,123	18.7	254,670,000	1,505.83
1912	5,082	11.7	192,714	13.9	298,348,000	1,548.14

The total figure for workmen in 1912 comprises 9,655 workmen employed at electricity works, and 43,587 hands employed in installation, etc., leaving about 138,000 hands for the actual manufacturing industry. From the year 1900 to 1912 the average wage per hand (male and female) per annum has thus risen from 1,120 marks to 1,548 marks, or, about 40 per cent.

Compared with other leading industries, the electrical industry shows decidedly the greatest amount of development of any. There was an increase of concerns of 315 per cent, and an increase in the number of hands employed of 411 per cent. Leaving out the electricity works, the figures are, respectively, 225 and 385 per cent, while the corresponding figures for the branch which comes next, machinery and apparatus, are only respectively 57 and 102 per cent.—*Engineering.*

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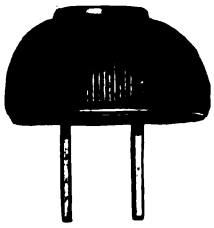
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Cutler-Hammer Standard Separable Attachment Plug.

Several electrical manufacturers have agreed on the making of standard plugs and receptacles, the caps and bodies of the various makes of which can be interchanged. This is proving beneficial and convenient both to those in the electrical industry and to the public. The C-H No. 7700 is the new standard type separable plug made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. This is an all-composition plug, small in size, but having the rating of 660 watts, 250 volts. The accompanying illustration is approximately full size.



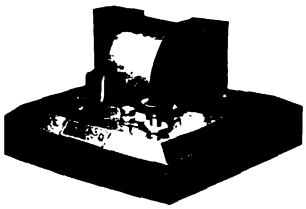
C-H Standard Separable Plug.

The knurled cap does not wear shiny when used, nor show the results of scratches; in fact, it is claimed that the appearance of the knurled cap improves with use, and since the cap is the portion of the plug that shows when in service this is of considerable importance. The contact blades are securely riveted to the cap and held in perfect alinement. No screws whatever are used, except those provided for securing the cord terminals. The live parts are entirely concealed.

Magnetizer for Remagnetizing Magneto Magnets.

All those familiar with the operation of gasoline automobiles know that ignition troubles are very frequently caused by defects or weakness of the magneto. Experienced garage and repair men state that fully 75 per cent of ignition troubles originate from weak magnetos.

To solve this difficulty there has been placed on the market by the Tritt Electric Company, Union City, Ind., what is known as the Teco magnetizer or magnet charger. As shown in the accompanying illustration, this is a compact little magnetizing coil which can be energized from any ordinary six-volt ignition or lighting storage battery, or from five or six ordinary dry cells, or any other low-voltage direct current. The device has no moving parts and nothing that may get out of order. The pole pieces are of liberal dimensions and arranged for convenient magnetizing of the magnets. It is said that with a fully charged 60-ampere-hour storage battery it is possible to fully remagnetize from 75 to 100 magnetos. Therefore, it should be possible with a device of this kind to handle many of the troubles that automobilists are continually meeting and an equipment of this kind should be especially serviceable in garages and repair shops.

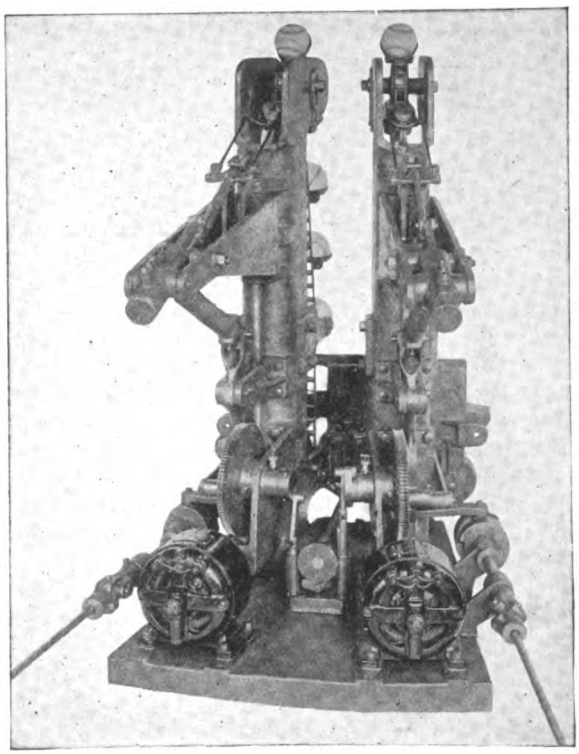


Teco Magnetizer.

Automatic Baseball Game with Electric Pitcher.

Amusement devices for the American people are without number. New ones are continually being developed. One of the cleverest means for recreation is the unique automatic baseball game manufactured by the Automatic Baseball Company, Marquette Building, Chicago, Ill.

Baseball is the national game of Americans as well as a most fascinating sport to both spectator and player alike. Persons from all walks of life and of all ages are its devotees. Its most attractive features are the batting and the scoring, and these are features supplied by the automatic baseball game.



Front View of Duplex Electric Pitching Machine.

With this game, regulation baseballs and bats are used. Two batters can play at the same time. The machine itself can be adjusted for speed, slow balls, hooks and fadeaways, and even the emery ball. The game is played within a screen-inclosed court. The batter stands at one end of the court waiting for the ball to be thrown by the machine provided for that purpose. The object of the game is to so hit the ball that it will strike against a score board at the opposite end of the court to the batter. A record is kept of the performance of the batter according to whether the ball hits the score board on space marked first, second or third base, or home run. Thus the game is not only attractive but is one of skill. It furnishes good training and splendid exercise for the player. An attendant in front of the court acts as starter, stopper, umpire and score keeper.

The machine for throwing the balls operates in the fol-

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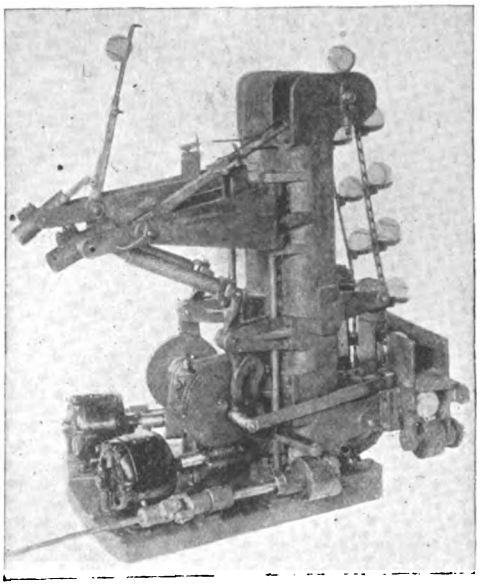
lowing manner: The ball is carried up to the top of the machine, or pitcher, by a conveyor or chain. A spring-actuated arm falls into position to receive the ball. The ball is released and is engaged in the grooves at the end of the arm. The arm then returns to an upright position in readiness to throw the ball. The throwing is controlled by an attendant, by means of a push button.



Side View of Electric Pitcher.

Westinghouse one-quarter and one-third-horsepower motors are used to drive this machine. The standard double court and batting gallery requires space 19 to 24 feet wide, and 60 to 85 feet long, and 10 to 16 feet high. The single court and gallery is about half the width. The cost of the installation is borne by the lessee and varies according to his fancy. Detail instructions for installing are furnished with each equipment, so anyone can set up the device without difficulty. If desired, the company will furnish, at an additional charge, a competent man to direct the installation.

The automatic baseball game is not sold, but the game and equipment with the right to operate it in a specified territory is leased for a term of years. The automatic baseball game is a big money-maker and in many instances the first cost of the investment has been paid in a few weeks' run.

Direct-Reading Portable Ohmmeter.

A line of instruments especially designed for use in the testing of railroad signal systems has been placed on the market by the Roller-Smith Company, 203 Broadway, New York City. This line of instruments includes several combination voltmeter and ammeter instruments of the direct-current and alternating-current types. Each of these is provided with a number of scales and is conveniently put up for portable testing use.

Another instrument in this line is the portable direct-reading ohmmeter, which is illustrated herewith. This instrument is a modified form of the portable Roller-Smith ohmmeter which has been on the market for some years and has been giving excellent satisfaction for various purposes. The new instrument is arranged in the form of a slide-wire bridge with self-contained galvanometer of rugged design but high sensibility; the set also includes a self-contained dry battery of several cells arranged for easy renewal, also a galvanometer key, stylus and several standard resistances. It is made in compact form and mounted in a polished hardwood case with hinged top and leather handle.

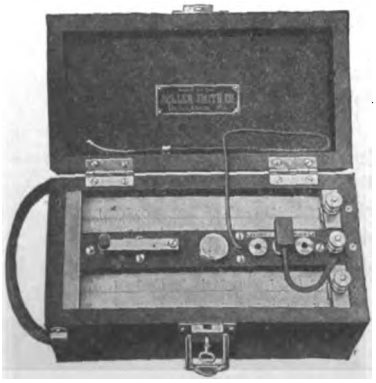
The instrument has three ranges, namely, 0-1, 0-10 and 0-100 ohms. Each of these ranges is marked on a scale 15 inches long and each of them has a different color for ease in identification. In making a measurement, the unknown resistance is connected to the points XX. The plug is inserted in one of the sockets, blue, red or black, these corresponding to the colors of the three scales. The stylus is then tapped along the wire that runs from end to end of the scale. At that point corresponding to zero deflection in the galvanometer balance is obtained and the resistance read off directly from the scale, using the figures of the color corresponding to that of the socket into which the plug has been inserted. If this figure indicates that it is in the range of one of the other scales, a more accurate reading is made possible by merely changing the plug to another socket and repeating the test on the scale which is better adapted to the particular resistance measured.

These ohmmeters have been designed primarily for use in measuring the resistance of electric signaling systems, such as the resistance of relay points, etc. However, they are well adapted to other work within the range of the instrument.

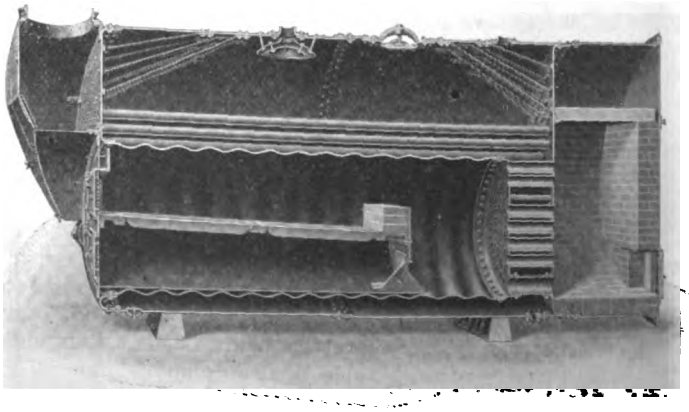
Duplex Internally Fired Boiler.

Although used mostly for marine work, the Scotch type of internally fired boiler is also employed to some extent in stationary boiler plants. An objection to the Scotch boiler, however, is that it has rather poor circulation in the lower part of the boiler. An ingenious improvement on the Scotch boiler, which retains its advantages and overcomes its defects, has recently been developed and placed on the market by the Murray Iron Works Company, Burlington, Iowa. This new boiler is known as the Duplex internally fired boiler and was patented August 24, 1915. A number of these boilers have been installed in electric light plants and have given exceptionally good results.

Like the Scotch boilers, these new boilers are very compact for their capacity, require no external brickwork nor elaborate foundations, and retain substantially all the heat developed in the internal furnace. The absence of outside brickwork eliminates the losses due to leaks therein. The Duplex boiler differs from the Scotch boiler chiefly in having a series of short hori-



Portable Ohmmeter.



Duplex Internally Fired Boiler.

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zontal tubes between the rear head of the furnace and the combustion chamber. These tubes divert the flames downward so as to heat the rear and lower portions of the boiler. This results in a greatly improved circulation and also in increased capacity. The heated gases return through the long upper nest of tubes and pass up the smoke flue in front. A good idea of the general internal arrangement of the boiler is shown in the accompanying illustration.

It will be observed that the boiler has a cylindrical furnace with either corrugated surface, as shown, for the larger sizes, or plain cylindrical surface in the smaller sizes. The rear head and lower tubes in the furnace hold the heat where it must be imparted to useful heating surfaces; they also insure a more thorough mixing of the gases and thus promote improved combustion. Since the bottom as well as the upper part of the boiler are heated, the unequal expansion and contraction of the shell is eliminated.

Duplex internally fired boilers are made of the best materials and very carefully constructed by skilled workmen in a modern boiler shop. They are built in sizes from 8 to 250 horsepower and for pressures ranging from 100 to 200 pounds per square inch. In tests they have shown efficiencies as high as 88 per cent at practically rated load and based on the calorific value of the combustible.

Main Portable and Stationary Lighting Plants.

The demand for electric lighting on isolated farms and in rural houses has become so general as to call for equipments of various sizes and types. In some cases a very elaborate and large sized plant is required. In others the simplest possible and preferably small portable plant is called for. Between

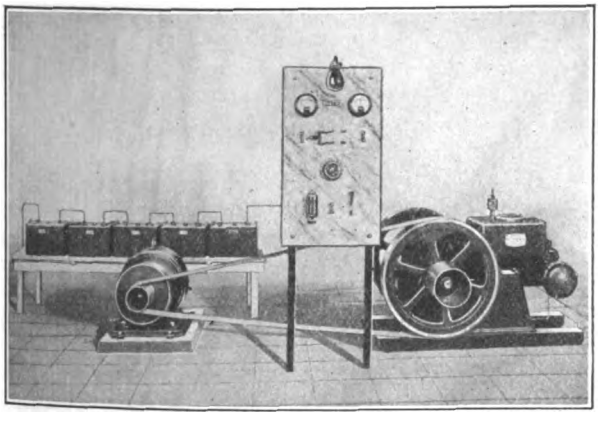

Fig. 1.—Main 0.75-Kilowatt Stationary Lighting Plant.

these extremes are a great variety of equipments that would especially fill requirements.

To meet these varied demands the Main Electric Manufacturing Company, 500-520 Aiken Avenue, Pittsburgh, Pa., has increased the number of sizes and types of lighting plants, the manufacture of which forms its exclusive business. A recent addition to its line is a small, portable, seven-light, 30-volt plant, which sells complete, as shown in Fig. 2, for only $69.95. It is necessary only to provide a gasoline engine, or to belt the outfit to any engine already on the premises. This plant includes a 40-volt, 175-watt dynamo, a 15-cell lead storage battery inclosed in rubber jars, and a simple form of slate folding-type switchboard. This entire set is mounted on skids and is shipped in completely wired and charged condition so that it can be set up for service in a very short time. This plant is intended only for very small country houses. Its rated load is seven 20-watt tungsten lamps. The battery capacity is 35 ampere-hours.

In Fig. 1 is shown a larger and stationary plant. This is rated as a 37-light plant. It includes a 0.75-kilowatt dynamo, 40-ampere-hour, 15-cell lead battery, blue Vermont switchboard, and 1.5-horsepower engine, all complete for $225. Larger en-

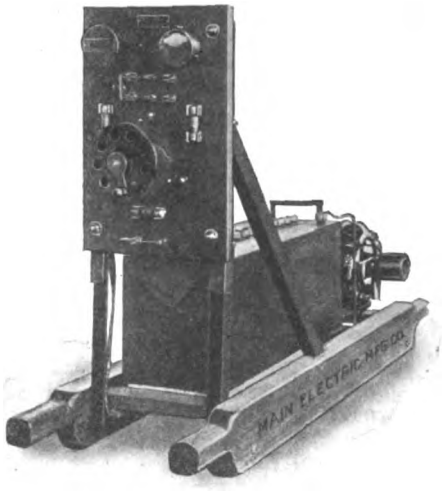

Fig. 2.—Main Seven-Light or Midget Lighting Plant.

gines and batteries are available for this same type of plant. Other plants of similar type are made for up to 1,000 twenty-watt lamps.

Any of the standard Main plants can be furnished in the unit or portable type, such as that shown in Fig. 3. In this case, like the plant shown in Fig. 1, the set is shipped complete in one box, the switchboard folding up for this purpose. The wiring is complete and the plant may be quickly set up for immediate use. Although these plants were designed principally for use on farms, they also serve for any other purpose where 30-volt service is adaptable. Thus for lighting construction work, special display lighting, etc., where portability and ease of setting up the plant is an important feature, these plants have proven very serviceable. Although low in price, they are well built; the low cost is due to production on a large and economical scale.

New Resistance Alloy.

A new alloy intended to be used for electrical resistors has recently been patented. It consists of nickel, copper and chromium in the proportions of 70, 12.5 and 17.5, respectively. This alloy has a resistivity of 113 microhm-centimeters at 20 degrees centigrade and a temperature-coefficient of 0.000078 (per degree centigrade).

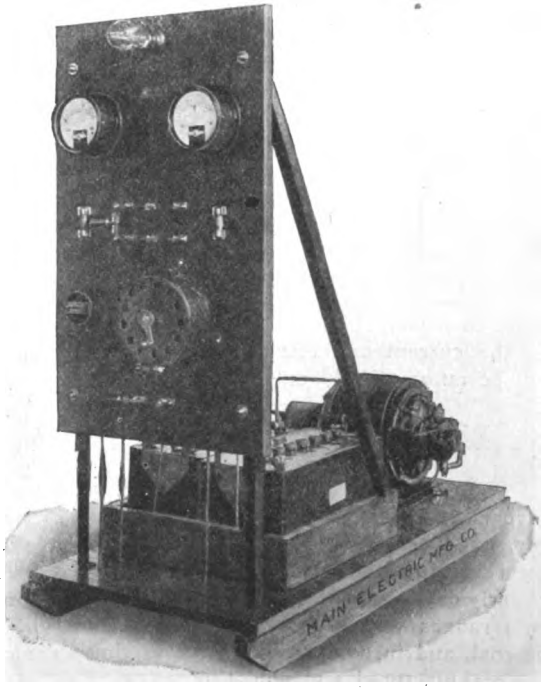

Fig. 3.—Typical Main Unit Type or Portable Lighting Set.

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Electric Ranges Used Exclusively in a Detroit Apartment Building.

In several cities in the West it has come to be the vogue to equip large apartment buildings of the most up-to-date type with electric ranges throughout. As yet relatively little development of this kind has taken place in the eastern portion of the country. However, a large building under way in Detroit, known as the Boulevard Court, is to have an equipment of 36 electric ranges made by the Standard Electric Stove Company, Toledo, O. Naturally, the company is proud of this contract and when the matter was called to the attention of the Toledo newspapers, the Toledo *Times* made a feature article of it as being a distinctive Toledo achievement. A small reproduction of this article is shown in the accompanying illustration.

The ranges installed are of the type known as Model 600, a view of which is shown in the body of the article. Included in this type is an electric cooking compartment of the improved fireless-cooker type. It has heavily heat-

TOLEDO ELECTRIC STOVES ARE INVADING DETROIT

BOULEVARD COURT APARTMENTS ON WEST GRAND BOULEVARD, DETOIT.

Neighboring City to Install 36 Standard Ranges in a Single Flat Building.

Detroit is to be invaded by a battery of Made-in-Toledo electric ranges.

The Standard Electric Stove Company, of this city, has received the order and the 36 ranges of the newest type will be installed in the Boulevard Court apartments on West Grand Boulevard, Detroit, now in the course of construction.

Other bidders of large apartment houses in Detroit have taken notice of the installation and representatives of the Standard Stove Company say that it will not be long before a number of buildings there will have an electric range in each suite. One of these apartment buildings expects to install at least 60 ranges.

The owner of Boulevard Court is W. H. Steger, of Detroit, who states that his total investment is over $140,000. The Standard ranges will be finished in bright royal blue enamel, which finish has distinguished this range for the past two years. It is a noticeable fact that there are no stove pipe or chimney connections in the kitchen and the use of electric ranges does away with all odors, smoke and all disagreeable features connected with open flame cooking.

The range to be installed are known as the model 600 Standard

TYPE OF STOVE INSTALLED.

This particular type of range incorporates the new electric cooking compartment which is a great development over the old "fireless cooker." It also has the new automatic clock regulator attachment which enables a woman to put on her evening meal and go away and leave it knowing that the clock will automatically cut off the current when the food has been sufficiently cooked.

Mr. Steger will guarantee the tenants of his new building that the total current bill for lighting, cooking and the use of electrical appliances will not exceed a very low maximum monthly. Each apartment will have its own meter. The suites will rent from $30 to $40 per month, according to size.

The installation of the range in Detroit by the Toledo company is due to a letter written by Mrs. F. J. Ellsworth, of Buffalo, who lives in the Carlton apartment there, which has had 25 Standard Ranges in use for a year. She stated that she was going to move to Detroit and wanted to know if there was an apartment building there equipped with Standard electric ranges. The Toledo concern got busy with her letter and as a result she will be able to move in an electrically equipped apartment in the spring.

One Toledo family which will probably have one of the suites is that of Mr. Austin F. Bement, secretary of the Lincoln Highway Association, who now lives in Detroit.

Reproduction of Newspaper Article on Use of Standard Electric Stoves in Detroit.

insulated walls and includes an automatic clock-controlled regulator which enables the housewife to put in the food, turn on the current and leave it, knowing that the current will be automatically cut off at the proper time.

Acorn Electric Ranges with Sheathed-Wire Heating Units.

For over three-quarters of a century Rathbone, Sard & Company, of Albany, N. Y., and Aurora, Ill., have been manufacturing ranges for domestic uses.

In the early days wood was the only fuel used, later on the company's ranges were also adapted for the use of hard and soft coal, and in comparatively recent times the company has manufactured and sold thousands of ranges for burning both natural and artificial gas. Its enormous output

Fig. 1.—Acorn Type E-10 Electric Range.

has always been sold under the trade-mark name "Acorn" so that this name has become a household word.

This old established concern has now embarked in the manufacture of electric ranges for domestic use and has placed on the market a most attractive line consisting of six distinctive models. In designing these electric ranges the manufacturer followed, to a certain extent, the well established designs of gas ranges which have become so popular in recent years. The ranges have been developed to meet the requirements of the average kitchen and for the average family, the cooking top being of the right height, the right depth and not taking up too much room in the kitchen. The switches have been located conveniently with proper identification marks for each switch. The size and shapes of the ovens and broilers are such as to commend them to the most fastidious housekeeper. They are equipped with canopies, with high shelves, warming ovens, and in addition are beautifully embellished with white-porcelain-enamel door panels and splashers. The ovens are perfectly insulated. The framework is made of heavy angle iron which makes the

Fig. 2.—Acorn Type E-30 Electric Range.

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range rigid, and all sheet-metal and cast-iron parts are handsomely enameled in black. The ranges have a liberal amount of nickel trimmings.

The Acorn line of electric ranges is equipped throughout with the General Electric sheathed-wire heating units. All the ovens are equipped with two heating units, one being in top for broiling and the other in the bottom for roasting and baking. The new sheathed-wire heating unit of the General Electric Company has been on the market and in steady operation for many months, proving altogether satisfactory. All oven units for baking are arranged for two heats. All cooking-top or hot-plate units are arranged for three heats. In addition a vegetable cooker with a capacity of three quarts, having all the advantages of a fireless cooker, may be substituted for hot plates.

The E-10 type of range shown in Fig. 1, is a standard type of range with oven 18 by 14 by 18 inches with two heating units. The space underneath the oven in this particular type is used as a warming oven and is not fitted with any heating units. In a similar type of range designated as E-20, this space is fitted with a standard heating unit for broiling.

The E-30 type, as shown in Fig. 2, is a most complete range, having an oven 18 by 14 by 18 inches, a broiler 18 by 10 by 18 inches and warming closet 18 by 10 by 18 inches. This range is also equipped with a canopy shelf.

Each of the Acorn line of electric ranges is equipped with a thermometer in the oven door, which is of the safe type with positive latch. Altogether it makes up a most attractive line and well worth the consideration of central-station managers and all others interested in the exploitation of electric ranges.

Electric Range in the Hotel St. Regis.

One of the famous hotels in this country, noted particularly for the excellence of its cuisine, is the Hotel St. Regis in New York City. This hotel possesses one of the most beautiful, best arranged and best equipped kitchens to be found anywhere and in it is an array of electrical appliances, including a large range, an electric toaster, a salamander and broiler.

The range, a line diagram of which is on the next page, was furnished by the National Electric Utilities Corporation, 103 Park Avenue, New York City. This range is 8 feet 10 inches long, has three ovens, and five hot plates on the top, measuring 18 by 24 inches each, covering the entire cooking top of the range. Each oven and each hot plate is controlled by a separate three-heat switch. The high heat is for the purpose of producing the necessary temperature in a hurry, the medium or operating heat holds the temperature at the right point, and the low heat is for simmering purposes. The ovens and hot plates hold their heat fully an hour after the current is all turned off.

The results obtained by this range have been so satisfactory that the famous chef of the hotel, Emile Bailly, has become an enthusiastic advocate of electric cooking. He prefers to do roasting and baking by electricity because the oven has an evenly distributed heat which, under the switch control, can be quickly turned from intense heat to a very mild heat. In this way, when a roast is put in, the surface is evenly and quickly seared so that the juices in the meat or bird or other viand are retained. Not only that, but one does not have to keep turning the roast around to prevent it from being overbrowned or overcooked at any one point.

One of the Assembling Rooms of the Hughes Electric Range Factory in Chicago.

A tour through the plant of the Hughes Electric Heating Company, Chicago, Ill., reveals to the stranger many novel manufacturing processes, especially that by which the asbestos composition blocks, which form part of the range burner, are molded under the tremendous pressure of 4,000 pounds per square inch and baked for several hours. The illustration shows the heating-unit assembly section. In the foreground, the round white objects are the composition blocks, the faces of which have been deeply grooved and are now having the resistance wire inserted and securely fastened. These units are guaranteed for one year, but the resistance wire used by this manufacturer is so tough that it has averaged five years of heavy duty service under a variety of high temperatures. Note the testing board in the left center part of the picture. Here the resistance wire is tested for proper voltage and wattage before it is inserted into the block and becomes a burner, just as the completed range is tested before it is shipped as a perfect Hughes product. The Hughes company has electric ranges in service in all parts of the world.

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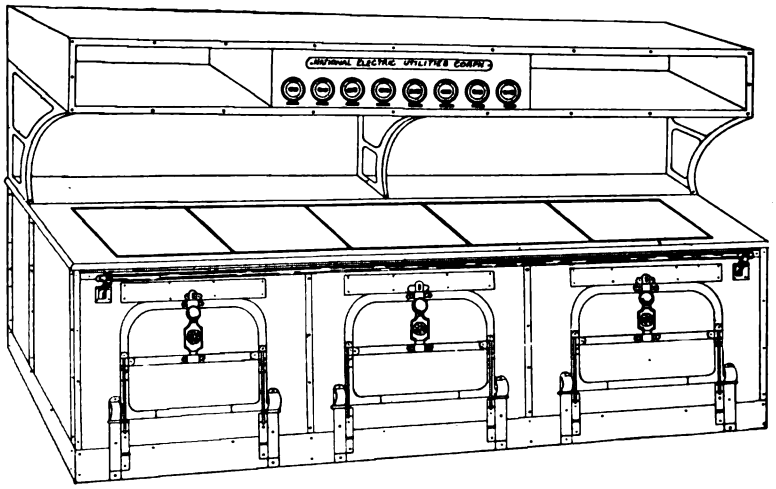
The chef merely lets it remain, simply waiting to see that the cooking process has been compelted. Chef Bailly is also greatly pleased because of the absence of fumes and odors of any kind and there is therefore no need of large flues and special ventilating equipment. Since practically all of the heat is retained in the range, because of its heavily heat-insulated walls, the kitchen is never uncomfortably hot.



Neuco Electric Range in the Hotel St. Regis.

Mr. Bailly finds that the reason why electrically cooked food and electrically broiled steaks have such a superior flavor is because the food does not come in contact with gases caused by combustion, and one of the most important considerations is the fact that meats shrink very much less. For instance, if a 10-pound roast of beef is put into an ordinary oven there is only 7 pounds left when it is roasted, 30 per cent at least of the roast having been consumed, whereas the shrinkage in an electric oven is only 10 per cent. This shrinkage is composed of juices or the nutriment of the meat, and if it was all consumed in the cooking there would be nothing left but a hard, pulpy substance with no nutriment in it. In hotels and restaurants where cooking is done for large numbers of people, the saving in the shrinkage of food alone will almost pay for the cost of current used.

A flue is always necessary in a conventional range to carry off the gases due to combustion and therefore such ranges have an efficiency of 10 to 15 per cent, the remainder of the heat produced going up the flue or out into the room. An electric range, on the other hand, has no flue and has an efficiency of at least 85 per cent, not over 15 per cent going out into the room. That is why eelctric kitchens are cool, clean and sanitary.

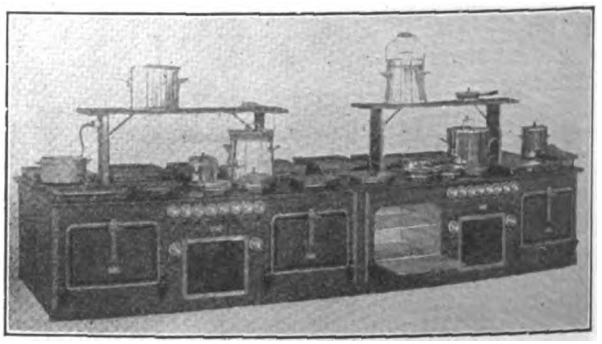
The National Electric Utilities Corporation, which furnished the range and appliances referred to, specializes in the making of heavy-duty electrical equipment of every sort —ranges, toasters, broilers, kettles, salamanders, hot plates, warmers, etc.—for hotels, restaurants, clubs and institutions. It has just completed a new factory at Danbury, Conn.

The Electric Range for Hotel Service.

The subject of electric cooking is receiving attention by all interested in the wholesome cooking of food and notably by the managers of hotels, restaurants, clubs and large institutions. An interesting article on the electric cooking range for such service appeared in a recent issue of *The Hotel World;* it was written by F. W. Hewitt, electrical engineer of the Simplex Electric Heating Company, Cambridge, Mass. Mr. Hewitt shows that this service is entirely distinct and has different requirements from ordinary domestic cooking. Consequently, manufacturers of electric ranges for such heavy service have felt that each case requires a design to specially meet its conditions.

It is generally recognized that the lowest operating cost can be obtained by using steam for low-temperature work and electricity for high-temperature work; that is, the vegetable steamers, soup kettles and hot-water supply will be taken care of by steam, and the electric range can do the baking, roasting, broiling, frying, griddling, etc. In analyzing such a problem as this, the designer lays out the range carefully so as to have nothing in the range that is overaccented and represents unnecessary investment of money and space. The results of the electric range when built for large kitchen work and where they have been designed along the lines outlined above, have been very satisfactory, and a hotel manager can purchase electric cooking equipment for his kitchen with full assurance that he will receive a reliable and durable device. The purchaser must, of course, satisfy himself that he is purchasing the range from a manufacturer who has had ample experience in this line.

Mr. Hewitt cites many advantages of electric ranges for such service, among them being labor saving, economy of space, accessibility, constancy and definiteness of heat supply, etc. Taking up a definite problem, he cites a large institution, which required a range to cook for about 1,500 inmates, the kitchen being so designed that the range could be placed out in the middle of the room; steam at about 20 pounds pressure was available for heating the water and for use in soup kettles and vegetable steamers. The cooking was done in large quantities but of simple nature. This requirement was well met by the Simplex range shown in the accompanying illustration. It was 15 feet long, and 5.5 feet wide, containing six ovens, each 21.5 inches wide, 27 inches deep, with 16 inches high clear working space. As you approach one side, the top is equipped with large disk stoves capable of receiving copper utensils of 15 gallons capacity, or thereabouts, with some smaller stoves suitable for cooking in smaller quantities. The other side of the range was equipped with large flat units about 18 by 24 inches in dimensions, which had raised rims. These devices are unique to electric cooking, but are very satisfactory for cooking in shallow fats, such as ham, eggs, etc. Provision is made so that portable devices can be attached conveniently to this range. Each device and each oven has a separate control switch, with three regulations, and there is ample capacity to take care of the requirements specified. The range itself is substantially made of steel, and years of service can reasonably be expected. This range is far larger than the average hotel range; in fact, is said to be the largest electric range ever built, but is representative of what can be done in this line.



A Simplex Electric Range that Cooks 4,500 Meals a Day.

The advantages of electricity from all points of view are such as to warrant the hotel manager making an investigation of his particular case, to see whether or not it is superior to the form of cooking that he is now using. Mr. Hewitt states that he knows of no case where an electric hotel range has ever been installed and has been replaced by the old method of cooking.

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INDUSTRY ACTIVITIES

Ridgway Dynamo & Engine Company, Ridgway, Pa., has moved its office in Boston, Mass., to 420 Exchange Building, with A. R. Meek in charge.

Sangamo Electric Company, Springfield, Ill., recently has closed a contract with the City of Los Angeles, Cal., for supplying alternating-current meters to be used by the new municipal electric-lighting plant. The first order on this contract called for more than 7,000 meters and many thousand more probably will be required.

The Appleton Electric Company, 218 North Jefferson Street, Chicago, Ill., announces the removal of its office in New York City from 25 West Broadway to 67 Barclay Street, and its office in San Francisco from 680 Howard Street to 221 Second Street, the latter office remaining in charge of Keeler-White Company. The company's office in St. Louis is located at 917 Pine Street, instead of 1007 Pine Street, as announced in a previous issue, and is in charge of R. V. Hawkins.

Voss Brothers Manufacturing Company, Davenport, Iowa, has issued an attractive 40-page catalog on its line of washing machines. A number of styles of electrically operated combination washers and wringers are illustrated and described. These machines have a reversible wringer, operated both by hand-lever and foot-treadle control. The washer and wringer can be operated independently, and are driven by a specially designed motor.

National Coil Company, Lansing Mich., in order to meet the requirements imposed upon it by the large demands for its products, has found it necessary to employ a night force. The prospects for increasing business, due to the success of its small high-tension magneto, has caused anticipation of means to increase the plant capacity, and while no definite action has been taken, additional factory buildings are contemplated. With present orders a steady and increasing production will be needed for the next 12 months.

Lux Manufacturing Company, Hoboken, N. J., announces that Deuth & Company, Incorporated, of 131 East Twenty-third Street, New York City, has been appointed sales agent for Lux lamps for the district of Greater New York. F. R. May and Thomas M. Magiff, who have formerly had charge of this territory for the Lux Manufacturing Company, are now associated with Deuth & Company, and will together with the efficient force of the latter company, be able to give better attention to customers in that territory.

Bleadon-Dunn Company, of Chicago, Ill., manufacturer of the "Violetta" high-frequency generator for medical purposes, opened an agency in New York City. This agency is called the Violetta Company, located at 1182 Broadway, and is conducted by Abbott I. Werner. Trade in the New York territory will be handled from this office, which is opening under the most favorable auspices, with large orders coming in at the start, both domestic and foreign. The sales force is of high caliber and is ready to demonstrate the "Violetta" to those interested in this instrument which has opened up a new field for the electrical dealer and jobber.

Hotpoint Prize Essay Contest on Electric Cooking.—For more than ten years a large number of families in Ontario and Upland, Cal., have been cooking entirely with electric equipment manufactured by the Hotpoint Electric Heating Company, Ontario, Cal. To obtain an opinion from these housewives as to the satisfaction which they enjoyed from electric cooking, the Hotpoint company conducted a prize essay contest, which was open only to the housewives of Ontario and Upland and excluded Hotpoint employees or members of their families. The contest met with very enthusiastic reception and the essays submitted were much in excess of the number anticipated. The prize for the best essay was the choice of any one of the five models of electric ranges just being marketed by the Hotpoint company. The interest manifested was so great that the local power company has since made provision for range demonstration stores in both of the towns mentioned and for installing experienced demonstrators to talk the merits of electric cooking and electric ranges.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., recently brought out some very attractive literature describing its small electric lighting plants. The leaflets will be found to be excellent inserts for circular-letter campaigns carried on by electrical dealers and jobbers. Dealers will also find the 17 by 25-inch hanger very useful in window trimming, store decorating, and in display work. Rural communities, small towns, and outlying suburban districts where central-station service is not yet available are excellent fields for these outfits. The Westinghouse company is advertising these outfits extensively and is co-operating with the dealers in following up this advertising. Dealers interested in the apparatus are familiarized with its terms of sale, installation, operation and advantages.

Domestic Carbons Give Satisfactory Service.—A statement which has gained some credence in the trade is to the effect that since the supply of German arc-lamp carbons, especially flame carbons, has been seriously curtailed by the war, arc lamps have given poor operation with domestic carbons. A specific instance cited is that of the Penn Central Light & Power Company, of Altoona, Pa., quoted as being dissatisfied and about to discontinue the use of these lamps.

"A thorough investigation," says N. C. Cotabish, general sales manager of the National Carbon Company, "has proved that this statement is absolutely unfounded, and the superintendent, Forrest Cole, says he has been getting first-class service with American carbons in both alternating-current and direct-current lamps. Mr. Cole has been urged to replace his arc lamps with an incandescent installation, so has kept a complete record of his lamp operation for the past three years, amounting practically to a continuous test. While Mr. Cole is not publishing his actual cost figures, he is satisfied that he would gain nothing by a change of type. A summary of his outages due to all causes for the last three years amounts to exactly one-half of one per cent and he challenges any city using a different type of illuminant to show a better reliability figure. He has therefore definitely decided to stick to arc lamps. During this time he has used domestic carbons exclusively. Thousands of arc-lamp users all over the country have burned domestic carbons for many years without a complaint and there has been little or no dissatisfaction among those who switched to them after the outbreak of the war, so there need be no apprehension for the future. As a matter of fact, an almost negligible percentage of lighting carbons were ever imported into this country. The American manufacturers have always supplied the market, so it is obvious that any curtailment of the German supply can in no way cripple the industry."

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Sales Campaign on Benjamin "92" Double-Duty Sockets

Representative Group of Dealers' Window Displays in Pittsburgh, Pa., Featuring Benjamin "92" Sockets

Dealers' helps furnished by the manufacturers are the essence of some merchandising campaigns. These helps form an attractive setting for the display of electrical appliances, secure the attention of the passers-by, and succeed in placing a large amount of electrical goods on the other side of the counter. The Benjamin Electric Manufacturing Company, Chicago, Ill., with an efficient line of dealers' helps, is one of the manufacturers that backs these individual helps with extensive advertising in the national periodicals. The above illustrations show a number of campaign drives in Pittsburgh that resulted in repeat orders in the effort to maintain the line.

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PERSONAL AND BIOGRAPHICAL

MR. JOHN F. WARD, who recently became assistant manager of the Northwestern Electric Equipment Company, of St. Paul, Minn., is a native of Chicago, Ill. He received his education in Chicago public schools and at Armour Institute of Technology. In 1897 he entered the employ of the Western Electric Company, Chicago, where he received special training for sales work. He remained in the sales organization of that company for 19 years, in Chicago, St. Paul, and the last five years at Toronto, Canada. At the latter place Mr. Ward was district sales manager and left that position to return to St. Paul and assume his present position. While in Toronto Mr. Ward became a member of the Canadian Electric Association, Engineers' Club, Electrical Section of the Toronto Retail Merchants' Association and other organizations. He is now a Congressman in the

John F. Ward.

Jovian Order and a past Statesman. He was Reigning Chiron in the Fourteenth Jovian Congress.

MR. GARRET A. HOBART, JR., Paterson, N. J., has been elected a director of the Public Service Corporation of New Jersey.

MR. C. A. CALL, formerly in the advertising department of the General Electric Company, has been appointed manager of publicity for the Terry Steam Turbine Company, Hartford, Conn.

MR. CHESTER P. GROSS, who has been connected for some time with the Wisconsin Rate Commission, has been appointed superintendent of the municipal electric-lighting plant at Grand Rapids, Wis.

MR. JOHN W. DAY, formerly president and manager of the Duluth (Minn.) Electrical Company, which has discontinued business, has entered the employ of the Northern Electrical Company, of that city.

MR. WILLIAM L. GOODWIN, vice-president and sales manager of the Pacific States Electric Company, San Francisco, Cal., at a recent meeting of the Home Industry League in that city spoke on "The Attitude of the Federal Commission Toward Business Associations."

MR. W. R. ABBOTT, general manager of the Chicago Telephone Company, was elected president of the Industrial Club of Chicago last week.

MR. T. C. DUNCAN, superintendent of the light and telephone department of Prince Rupert, British Columbia, has resigned his position. He has not announced any definite plans for the future.

MR. A. C. WESTPHAL has been appointed superintendent of the plant of the Mandan (N. D.) Electric Light Company, succeeding MR. B. K. SKEELS. Mr. Westphal has been in charge of the municipal electric-lighting plant at Fergus Falls, Minn., for several years past.

MR. JAMES CLARK, JR., of Louisville, Ky., president of the James Clark, Jr., Electric Company, has been officially authorized to wear the title which is generally bestowed on Kentuckians. He is a "Colonel" in his own right now, having been appointed a member of Governor Stanley's staff.

MR. SAMUEL G. McMEEN, president of the Columbus Railway, Power & Light Company, and of the Ohio State Telephone Company, has been made chairman and secretary of a commission consisting of five Ohio associate members of the government's Naval Consulting Board. This commission was recently appointed and will conduct a state-wide industrial canvass bearing on military preparedness.

MR. W. G. MOORE, who until recently was manager of the Texas Power & Light Company, at Paris, Tex., has resigned to form a partnership known as Collins & Moore, consulting electrical engineers and contractors, of Paris. The new firm will, in addition to doing a general electrical and mechanical engineering and contracting business, handle a complete line of merchandise for both wholesale and retail trade. Mr. Moore is a native of Texas and well and favorably known in the Southwest. He was educated at the Agricultural Mechanical College of Texas, graduating from the college of electrical engineering in 1907. Previous to going with the Texas Power & Light Company, Mr. Moore was manager for Arnold & Wetherbee, electrical engineers and contractors, Oklahoma City, Okla.

MR. JOHN H. LUCAS, one of the oldest of the men associated with street railway and electric light companies in Kansas City, Mo., has been elected president of the Kansas City Light & Power Company. Mr. Lucas came to Kansas City and established a law office in 1879, the firm name being Johnson & Lucas. He early became identified with the legal department of the street railway company, becoming general counsel for the cable railway and later for other street railway organizations as consolidation was effected, being counsel for the Metropolitan Street Railway Company since 1902. When the Kansas City Electric Light Company was organized in 1884, he became counsel for that. He continued as legal adviser for both companies through the street railway receivership, handling the usual detail of legal work and assisting in the reorganization plans.

MR. E. E. RINES, who was recently appointed western sales manager of the Century Manufacturing Company, of Elizabethtown, Pa., manufacturer of electric displays, has established headquarters in Chicago, Ill., at 105 North Clark Street. Mr. Rines became identified with the electrical industry 34 years ago when he was employed at the Edison Machine Works, Schenectady, N. Y., the forerunner of the General Electric Company. He attended Cooper Institute and Columbia University and learned the three-wire system of distribution in a class taught by Thomas A. Edison. He remained with the Edison Works until 1889, installing many of the first lighting systems in the East, and came to Chicago, entering the employ of the old Chicago Edison Company and making many prominent wiring installations there. In 1903 Mr. Rines became a salesman for

E. E. Rines.

the Wesco Supply Company, St. Louis, Mo., remaining with that concern until 1908 when he became connected with the Federal Sign System, of Chicago, Ill., for which he did special work, installing signs and conducting sales campaigns. He remained with this company until he accepted his present position.

OBITUARY.

MR. CHARLES FOWLER BALDWIN, of Montclair, N. J., died in Pittsburgh, Pa., April 9, aged 41 years. He was a graduate of Kenyon College and Massachusetts Institute of Technology, class of 1897. Mr. Baldwin was associated with the Western Electric Company for 19 years, and served as chief engineer for that company in Antwerp and London.

MR. ARTHUR J. WALSH, manager of the Wisconsin Gas & Electric Company, died in Kenosha, Wis., April 11, aged 30 years. He received his early training in the public schools of New Richmond, Wis., and was graduated from the University of Wisconsin in 1906. Mr. Walsh was active in many organizations in Kenosha and was widely known among men of the electrical industry in Wisconsin.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

LISBON FALLS, ME.—A committee of citizens is investigating the establishment of a municipal electric-lighting plant.

SACO, ME.—Plans are being discussed to make extensions in the ornamental street-lighting system on York Hill.

HARDWICK, VT.—The municipal electric plant has signed contracts to supply electric service to the town of Greensboro.

TILTON, N. H.—Nitrogen-filled lamps will be substituted for the present arc lamps on the streets of this town, the Tilton Electric Light & Power Company supplying energy at $47.50 per year for 400-candlepower incandescents. The rate charged for the arcs has been $77.50. Professor H. E. Clifford, of Boston, has been retained to relocate the street lights in the best possible manner.

ACTON, MASS.—Plans are being made to install a new electric-lighting system here.

BECKET, MASS.—F. W. Munch, of Canaan, N. Y., has applied for a franchise to erect and operate an electric-lighting plant here.

MIDDLEBORO, MASS.—The municipal light plant of Middleboro is planning to extend its lines into the town of Lakeville, and has asked the Light Commission's approval.

MILFORD, MASS.—A contract for street lighting has been signed with the Milford Electric Light & Power Company, which includes the addition of about 300 lamps.

NORTH ADAMS, MASS.—The Adams Electric Light Company is making extensions to its distribution system here. Additional extensions are being considered by Manager B. K. Cook.

SALEM, MASS.—Electric wires on Bridge Street are to be placed underground by July 1.

NEW LONDON, CONN.—Contracts for a new ornamental lighting system on State Street will be signed in a few weeks.

THOMPSONVILLE, CONN.—The Northern Connecticut Light & Power Company will build a two-story addition to its present plant on Central Street. The first floor will be used as a show room for electric supplies, and the second floor will be used for the company's office. Some substation equipment will also be installed.

AMSTERDAM, N. Y.—Approval of a $400,000 bond issue of the Edison Electric Light & Power Company has been made by the Public Service Commission of the Second District. A small part of the issue will be used for extensions and betterments.

BATAVIA, N. Y.—Chester & Flemming, of Pittsburgh, Pa., are preparing plans for the rearrangements of the municipal electric-lighting plant.

BUFFALO, N. Y.—Plans for an ornamental lighting system on Genesee Street are being considered by G. E. Zeller and others.

CHATHAM, N. Y.—The Albany Southern Railroad Company, of Hudson, has signed a ten-year contract to supply energy to the Chatham Electric Light & Power Company, which operates the lighting system here. The work of constructing the transmission line between the former company's substation at Valatie and Chatham has been started. The Albany company is also seeking franchises to operate in the villages of Poestenkill, Averill Park, Defreestville and other towns in that vicinity.

EAST AURORA, N. Y.—Mayor Brotherhood has announced plans for installing a new electric street-lighting system here.

ELBRIDGE, N. Y.—The Jordan (N. Y.) Electric Light & Power Company has installed generating equipment here and is furnishing electric service.

GREEN ISLAND, N. Y.—A franchise has been granted to the Adirondack Electric Power Corporation to furnish electrical energy for power and light to consumers here. The franchise was objected to at first by residents here, but the objections have been removed since the company will not directly compete with the municipal electric lighting plant.

LEWISTON, N. Y.—The Sanborn-Pekin Electric Power Company has petitioned for the privilege of erecting an electric-lighting system here.

NEWARK, N. Y.—The Board of Directors of the Custodial Home for Feeble-Minded Women at Newark has returned the bids on alterations to the power plant and will readvertise the work. The action was taken because of an error in the bid of the R. T. Ford Company.

SANBORN, N. Y.—The Sanborn-Pekin Electric Power Company has petitioned for a franchise to build and operate an electric lighting plant here.

SKANEATELES, N. Y.—The application of the Niagara, Lockport & Ontario Power Company to extend its transmission lines in that city has been granted by the Public Service Commission.

WEST SENECA, N. Y.—At the regular meeting of the Town Board a petition was presented by taxpayers living between this village and Springbrook for the establishment of electric street-lighting district No. 3.

BAYONNE, N. J.—The Central Broadway Business Men's Association is considering the installation of a private electric power plant to furnish service for the proposed new street-lighting system on Broadway. Frank Davis is a member of the committee on the improvement.

BAYONNE, N. J.—The City Commission is negotiating with the Public Service Electric Company for a new five-year street-lighting contract. The company agrees to install an underground conduit system to cost $25,000 the first year, with extensions to cost $10,000 each year for ten years thereafter.

BELVIDERE, N. J.—The Board of Freeholders has granted a 50-year franchise to the Hackettstown Electric Light Company for the installation and operation of a light and power system.

BRIDGETON, N. J.—The local electric-lighting plant has been sold to the International Electric Company, which is controlled by the American Railways Company. Plans are being made to increase the size of the power plant here, and orders for some of the necessary equipment have already been placed. B. F. Hires, formerly superintendent of the Bridgeton Electric Company, has been appointed general manager for the South Jersey district of the new holding company.

LONG BRANCH, N. J.—The City Council is planning for the installation of a new street-lighting system in the business section.

MOUNTAIN LAKES, N. J.—The Borough Council will build an addition to the municipal pumping plant.

NEWARK, N. J.—In a report to the Board of Works, Fire Chief Paul J. Moore recommends the immediate installation of an underground conduit system for fire-alarm wires.

BOSWELL, PA.—Th Union Light, Heat & Power Company has petitioned the City Council for a franchise to furnish electrical energy for light and power here.

DILLSBURG, PA.—The Dillsburg Light, Heat & Power Company will extend its transmission lines to Wellsville, eight miles from here, to furnish light and power for that district.

CLARKSBURG, PA.—The Clarksburg Electric Company is preparing to extend its service to Norwood, Grasselli, Tinplate and Owens, resulting from the recent completion of its power plant in this city.

MILLERSBURG, PA.—The Millersburg Electric Light, Heat & Power Company has been purchased by Farley Gannett, consulting engineer, with offices in the Telegraph Building, Harrisburg. Mr. Gannett is planning to enlarge the plant and make a number of improvements.

NEW CASTLE, PA.—A new substation costing about $150,000, will be erected in this city by the Mahoning & Shenango Railway & Light Company. The substation will be of steel, concrete and brick and will take the place of the present building. It will be used to transform the energy from the Lowellville plant, the new substation to have three times the capacity of the old one.

MINERAL, VA.—The question of issuing bonds for the purpose of establishing an electric-lighting and water system here will be submitted to vote April 25.

SPARTANBURG, S. C.—The Southern Railway Company, W. H. Wells, chief engineer, Washington, D. C., will build substations at Spartanburg and Central, S. C., and Cornelia, Ga., and generating machinery will be installed in the power house at Greenville, S. C., for operating automatic block signals and lighting stations between Spartanburg and Central, and Cornelia and Gainesville. Each substation will have a capacity of about 30 kilowatts and will supply energy at 4,400 volts, three-phase, 60-cycle.

SUMMERVILLE, S. C.—The holdings of the Summerville Ice & Power Company have been sold to the Carolina Central Electric Company for a reported consideration of $50,000. The purchasing company is interested in a number of lighting plants in this state, and it is reported that plans are being made to enlarge the Summerville plant.

ATLANTA, GA.—Details of the route of the trolley line to Emory University were announced by the Georgia Railway & Power Company in applications for a franchise. Work will be begun as soon as the franchises are granted and material obtained. The extension will be about three miles long.

LAKE HAMILTON, FLA.—E. C. Stuart, of Bartow, Fla., contemplates establishing an electric light and power plant here.

OCALA, FLA.—Benjamin Thompson, of Tampa, contracting engineer, has been awarded the contract to build and equip the new Ocala power plant and pumping station. The Council accepted Mr. Thompson's blanket bid of $98,000 for the plant complete, except the water tank and tower.

TAMPA, FLA.—The Tampa Electric Company has asked the County Commissioners for a franchise to build and operate lines of railway and extend its lighting system into a number of subdivisions adjacent to the city.

TAMPA, FLA.—Representing capitalists in the Middle West who will invest $1,000,000 to build an interurban trolley line between this city and Lakeland, by way of Plant City, E. J. Binford, who has been here for several months working on the project, has asked the Board of County Commissioners to grant a franchise.

NORTH CENTRAL STATES.

COLUMBUS, O.—E. R. Sharp, vice-president and treasurer of the Sciota Valley Traction Company, gives out the information that his company will build a terminal station here this summer, which will represent an investment of $800,000. The site was secured a year or two ago, being bounded by four streets in a central location. The architect's plans will be ready for figures within the next thirty days.

CANFIELD, O.—An electric-lighting system probably will be installed here in the near future. Energy will be secured from the Mahoning and Shenango Railway & Light Company, of Youngstown.

DAYTON, O.—The Dayton Power & Light Company has petitioned the State Public Utilities Commission for authority to issue $1,250,000 five-per-cent mortgage bonds, the proceeds to be used in making plant additions and betterments.

MANSFIELD, O.—Extensive improvements are to be made by the Mansfield Light & Power Company. A new power plant, which will ultimately cost about $500,000, is expected to be completed for operation by early fall. The company is a subsidiary of the Cities Service Company, of New York.

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OTTAWA, O.—Plans for the establishment of a municipal electric-lighting plant are being discussed here.

HAMILTON, O.—The Park Board is planning to install an ornamental electric-lighting system in the city parks.

COLUMBUS, IND.—Citizens of East Columbus are planning to incorporate and establish a municipal electric-lighting system.

PERU, IND.—Manager Herren, of the electric light department has made a requisition to the City Council for a carload of poles to be used in re-establishing the city electric-distribution system.

ROACHDALE, IND.—The Roachdale Electric Company has been incorporated with a capital of $50,000 by R. F. Edwards, Harvey Chastain and G. E. Turner.

CLARKSTON, MICH.—Arrangements are being made for the establishment of a street-lighting system here.

BELOIT, WIS.—Work has been started on a large addition to the main west side power plant of Fairbanks, Morse & Company, making possible the housing of the entire equipment in one building. The capacity of the plant will be increased 1,000 horsepower and will be 3,000 horsepower when completed.

CHATFIELD, MINN.—The Chatfield Electric Light & Power Company has been granted a new franchise which will extend over a period of 21 years.

FERGUS FALLS, MINN.—The Otter Tail Power Company, C. B. Kidder, general manager, is planning to build a transmission line to Wilmot this summer.

FISHER, MINN.—The Red River Power Company, of Grand Forks, N. D., has been granted a franchise to operate a street-lighting system here.

NEW ULM, MINN.—Plans are being made by A. J. Mueller, superintendent of the municipal electric-lighting plant, for making repairs and extensions to the switchboard, estimated to cost $7,000.

SAUK CENTER, MINN.—City officials are planning to install a new system of gas-filled lamps for street lighting.

THIEF RIVER FALLS, MINN.—The question of issuing bonds for the purpose of providing extensions to the municipal electric-lighting and water systems will be decided at an election to be held soon.

BELLEVUE, IOWA.—Bonds in the sum of $1,000 have been voted to provide for improvements to the municipal power plant.

IOWA CITY, IOWA.—The Iowa City Light & Power Company is increasing and improving the equipment of its plant at Coralville, by the installation of 400-kilowatt additional generating capacity, together with exciters, protecting and controlling devices, new switchboard and other auxiliary apparatus.

LOCKBRIDGE, IOWA.—The Lockbridge Light & Power Company has been incorporated with a capital of $5,000 by Ralph Torrance and P. A. Coleson, to furnish electric service here.

QUASQUETON, IOWA.—J. L. Cross has been granted a franchise to construct and operate an electric-lighting plant here. He has an option on a water-power site, and will build a hydroelectric plant. A transmission line will be erected from this city to Walker.

EMMA, MO.—Charles Derking and others are interested in the construction of a transmission line from Sweet Springs (Mo.) municipal plant to furnish light and power to this city.

ENSIGN, KANS.—An electric-lighting plant is being installed in the Sutton garage. Service will be furnished for the Sutton Block and for residential lighting.

FORD, KANS.—Bonds have been voted for the establishment of an electric-lighting system here.

PRATT, KANS.—The City Commissioners have closed a contract to furnish energy from the municipal plant to the town of Preston for electric lighting. Coats, another small town near here, is also planning to make similar arrangements with local authorities.

NORTON, KANS.—The city is considering a proposition of entering into contracts to furnish energy for electric lighting for Lenora and Nocatur, two small towns near here, that are plannng to get electric service. Energy would be supplied from the municipal plant here.

GRAND ISLAND, NEB.—The Central Power Company, in order to rush the construction work on its hydroelectric plant at Boelus, has put on an increased force of men.

FAIRBURY, NEB.—The towns of Plymouth, Daykin and Western are considering a plan to secure energy from the local municipal plant for electric-lighting systems in the three towns. Superintendent Myers, of the municipal plant, has suggested the erection of a main transmission line ten miles north from Fairbury for the purpose.

HURON, S. D.—Petitions are being circulated by the business men on Wisconsin Street asking that the City Commissioners order an extension of the five-cluster ornamental lighting system which is used on the other business streets in this city.

MARION, S. D.—Work has commenced on the construction of the new electric-lighting system for this city. Foundations for the power house also have been commenced.

GRAND FORKS, N. D.—Extension of the transmission lines for distribution of power obtained from the hydroelectric plant at Crookston, Minn., controlled by the Byllesby interests, is being considered, and proposals have been placed before officials in a number of North Dakota towns north from Grand Forks.

DATES AHEAD.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

HOPKINSVILLE, KY.—The Kentucky Public Service Company, which operates electric power plants at Hopkinsville, Owensboro, Bowling Green and Frankfort, in Kentucky, and Clarksville, Tenn., is recording a $2,000,000 mortgage on its properties. The company is preparing to supply Guthrie with energy for light and power.

LEXINGTON, KY.—The City Council is preparing plans for the installation of a municipal electric-lighting plant.

PEMBROKE, KY.—S. G. Ragsdale, general manager of the South Kentucky Power Company, has made the announcement that his company has secured franchises for electric-lighting systems at Elkton, Adairville, Auburn, Lewisburg and Franklin, in Kentucky, and Adams, Cedar Hill and Portland, in Tennessee.

MAYFIELD, KY.—The Mayfield Water & Light Company, which has been in receivership, has been restored to its owners by the Circuit Court, and the company has elected D. B. Stanfield president and Ed Gardner general manager. The company will make some improvements, among which will be the installation of meters for all consumers.

BIRMINGHAM, ALA.—The city has asked the Birmingham Railway, Light & Power Company to replace all arc lamps with tungsten lamps.

BIRMINGHAM, ALA.—The Alabama Power Company is preparing plans to more than double the capacity of its substation at Anniston, Ala.

BIRMINGHAM, ALA.—The Board of Commissioners voted to call an election for June 5 to pass upon a bond issue of $500,000 for converting the North Birmingham lighting plant into a municipal plant for the whole city. Julian Kendrick, city engineer, has prepared plans for the improvements.

CHATTANOOGA, TENN.—The Chattanooga Aseptic Cotton Company is having plans drawn for a factory building to replace the plant which was destroyed by fire. Electric drive will be used throughout the new plant. Clarence T. Jones is the architect.

COVINGTON, TENN.—R. H. Green and others are making plans to establish a hydroelectric plant to furnish service here.

MURFREESBORO, TENN.—The Murfreesboro Electric Light & Gas Company has been sold by Davis & Elam to J. C. Beesley, George Beesley and J. M. and John Butler, for a reported consideration of $65,000. The new owners promise a rate of 7 cents per kilowatt-hour, a material reduction of the present rates. Some improvements will be made.

NEW TAZEWELL, TENN.—J. W. Rose and M. B. Carr, of Tazewell, have under consideration the removal of the lighting and power company's plant to New Tazewell.

HUNTSVILLE, ARK.—M. L. Shuster has new generating equipment and this city will now have permanent lighting service.

BLACKWELL, OKLA.—The issuance of $10,000 in bonds for extensions to the municipal electric-lighting plant and distribution system is being considered by voters here this week.

DALLAS, TEX.—The City Commission is considering plans for the building of a municipal electric-lighting plant, to cost about $500,000.

KAUFMAN, TEX.—The Texas Light & Power Company is extending its high-tension transmission line to Kaufman, and will sell energy to the Kaufman Light Company.

M'ALESTER, OKLA.—The Choctaw Railway & Lighting Company, which has been sold to C. M. Mason, chairman of the bondholders' protective committee, of New York, for $450,000, will be equipped with new machinery and improved in other respects.

WESTERN STATES.

FROID, MONT.—S. J. Dorothy and others are interested in a plant to establish an electric-lighting plant here.

HINSDALE, MONT.—The town of Hinsdale recently petitioned the Valley County Commissioners for the establishment of a special electric-lighting and water district. The cost of the entire project is placed at $27,700. Protests against the creation of the district will be heard at Glasgow, May 2.

HYSHAM, MONT.—The town has voted for water and electric-lighting bonds, according to reports. Mayor Lyndes states that the construction of both systems will be started early this summer.

CLOVIS, N. M.—Bonds in the sum of $35,000 have been voted for improvements to the municipal electric-lighting and water systems.

SANTA FE, N. M.—The Rio Grande Light, Heat & Power Company, C. G. Wilfong, president, has filed with State Engineer French the estimated cost of a proposed hydroelectric development at the mouth of the White Rock canyon of the Rio Grande.

SILVER CITY, N. M.—Orders have been issued for the establishment of an underground telephone system at Fort Bayard. Assistant Electric Engineer W. S. McDonald has been assigned to do the work.

PRICE, UTAH.—A special election will be held May 15 to submit the proposition of selling the municipal electric-lighting plant, valued at $50,000.

SALT LAKE CITY, UTAH.—Announcement has been made that the Utah Power & Light Company has taken over what is known as the church power plant, which supplies the electricity for the Temple Block, the Hotel Utah, Deseret News Building and several business blocks in the immediate vicinity. The plant was purchased from the Mormon Church.

HAILEY, IDAHO.—The Silver Creek Power Company has applied to the Public Utilities Commission for authority to install an electric-lighting plant to serve the residents of Carey and Picabo. It is planned to erect a power plant costing about $8,000.

WALLACE, IDAHO.—The City Council has granted a right-of-way through the city to the Washington Water Power Company, which is preparing to construct a power line to the mines up Placer Creek.

ELMA, WASH.—According to reports, the Northwest Electric & Waterworks Company, of Montesano, Wash., has purchased the Elma (Wash.) Light & Power Company's plant. Both the Northwest and the Elma companies have franchises to operate in Gray's Harbor County.

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SPOKANE, WASH.—The Spokane Traction Company has applied for a franchise to operate a street car line on Grand Boulevard between Thirty-third and Thirty-eighth Avenues.

BAKER, ORE.—Business men and property owners have been asked by the Commercial Club and the City Commisioners to assist in financing the installation of cluster lights on certain streets here.

COTTAGE GROVE, ORE.—The General Electric Company, of Portland, according to reports, has signed orders for several thousand dollars' worth of electrical equipment, to be installed in a mine owned by the Black Butte Quicksilver Mining Company near here.

OREGON CITY, ORE.—The Rasmussen-Grace Company, of Portland, has been commissioned to prepare plans and specifications for the construction of the power plant for the new mill of the Hawley Pulp & Paper Company, which is to be erected below the Willamette Falls in Oregon City. Construction work will start in June.

WESTLAKE, ORE.—It is reported that a large electric power plant will be constructed between Westlake and Clear Lake by W. G. Campbell, of Westlake.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded a contract by the Board of Supervisors for street lights in the Sherman Lighting District.

LOS ANGELES, CAL.—Sealed proposals will be opened in the Supervising Architect's Office, Washington, D. C., May 8, for a vacuum cleaning machine for the United States postoffice and courthouse in Los Angeles.

LOS ANGELES, CAL.—An expenditure of $50,000 has been authorized by the directors of the San Joaquin Light & Power Company for the completion of power house No. 2 in Crane Valley, upon which approximately $250,000 was spent three years ago. It is located a mile and a half south of North Fork, and will utilize the fall of water between power houses No. 1 and No. 3. The new plant will develop 3,000 kilowatts, as compared with 18,000 kilowatts developed by power house No. 1 and 2,000 kilowatts developed by No. 3.

MARTINEZ, CAL.—The Martinez & Concord Interurban Railway Company has filed with the Railroad Commission an application for authority to issue 1,050 shares of its common stock at not less than $45 a share; $125,000 face value of its first-mortgage bonds at not less than $90, and $125,000 of its cumulative participating bonds at not less than par. These shares are to be issued only as an equivalent amount of first-mortgage bonds are paid and canceled. The company proposes to locate its main line along Escobar Street and Payton Road, to the easterly limits of Martinez, thence to a connection with the Oakland, Antioch & Eastern Railway and the Bay Point & Clayton Railway at Government ranch, two miles south of Bay Point and three miles north of Concord. The total length of the proposed line is 6.5 miles.

NEEDLES, CAL.—The Board of Trustees has approved an ordinance granting to the Needles Gas & Electric Company the right to construct and operate for a period of years electric, telephone and gas systems in this city.

PASADENA, CAL.—The City Commissions has called for bids for $15,000 worth of extra equipment for the municipal light and power plant.

SAN FRANCISCO, CAL.—A joint pole agreement is under consideration by city officials and the electric light, power, telephone and telegraph companies and other corporations that maintain poles and overhead wires in this city, where at present each company has its own poles.

SAN FRANCISCO, CAL.—Contracts have been awarded by the Great Western Power Company for the construction of a large class A substation, to be erected on property on the north side of Bush Street and Grant Avenue. The building will have an area of 68 by 137 feet and will cost about $90,000.

SAN PEDRO, CAL.—Petitions are being signed for the installation of ornamental street lights on Sixth Street between Beacon and Pacific Avenues. The plans call for a lamp every 120 feet and four lamps at each street intersection.

SAN RAFAEL, CAL.—The Pacific Gas & Electric Company has purchased a site at Fourth and E Streets for the erection of a one-story reinforced concrete office building, to cost about $24,000.

SEAL BEACH, CAL.—The Trustees have signed a contract with the Southern California Edison Company for the installation of a complete city electric-lighting system.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,719. ELECTRICAL SUPPLIES.—A commercial agent of the Bureau writes that a business man from Spain is now in the United States for the purpose of establishing commercial relations with American manufacturers of electrical supplies. Catalogs should be sent immediately. Correspondence may be in English but is perferred in Spanish.

NO. 20,740. ELECTRIC AUTOMOBILES.—An American consular officer in Norway reports that a firm in his district is in the market for 100 electric pleasure and 200 electric commercial automobiles. Quotations f. o. b. New York and catalog should be sent. It is stated that cash will be paid against documents. Correspondence may be in English.

NO. 20,738. TELEPHONE EQUIPMENT.—An American consular officer in Venezuela reports that a man in his district desires to receive catalogues and price lists from American manufacturers of equipment for a small telephone system. Correspondence and literature should be in Spanish, if possible.

NO. 20,753. PAY TELEPHONES.—An American consular officer in Peru reports that a man in his district desires to be placed in touch with American manufacturers of slot telephones for the Peruvian 5 and 10-centavo piece.

New Incorporations

NEWPORT NEWS, VA.—Radcliffe Electric Company. Capital, $15,000. Incorporators: W. H. Radcliffe and W. L. Cooke.

CHICAGO, ILL.—Fleer Electric & Manufacturing Company. Capital, $10,000. Incorporators: E. A. Fleer, C. A. Woolley and T. W. David.

JOHNSON CITY, TENN.—Tennessee Electrical Supply Company of Washington County. Capital, $10,000. Incorporators: J. W. Ring, T. A. Cox and others.

TALLAHASSEE, FLA.—Dixie Supply Company. Capital, $5,000. Deal in electrical supplies, automobiles and accessories. Incorporators: B. W. Brown and others.

JACKSONVILLE, FLA.—Florida Electric Supply Company. Capital, $150,000. Manufacture electrical apparatus and supplies. Incorporators: G. C. Henry, Lake Jones and N. C. Overton.

ST. LOUIS, MO.—Semi-Automatic Transmitter Company. Capital, $5,000. Manufacture semi-automatic transmitters. Incorporators: J. H. Mueller, E. H. Springmeier and C. G. Eck.

ROCHESTER, N. Y.—Smith Lighting Company. Capital, $15,000. Install lighting systems. Incorporators: A. W. Chaddock, 45 Enterprise Street; W. F. Smith and L. F. Mignona, Rochester.

PORTLAND, ME.—Choctaw Power & Light Company. Capital, $1,250,000. Construct and operate railways. Incorporators: S. I. Gould, C. H. Tolman, J. T. Fagin and S. D. Rumery, of Portland, and E. L. Jones, of Gorham.

NEW YORK, N. Y.—Auto Electric Service Company. Capital, $5,000. Manufacture electrical apparatus for automobiles, etc. Incorporators: George Strasser, 426 West Fifty-seventh Street; W. C. Wolf and Henry Berlinghof, New York City.

Financial Notes

The Newburyport (Mass.) Gas & Electric Company has asked the Gas and Electric Light Commission's approval of an issue of 570 shares of stock at $130 per share.

The statement of the Jeffersonville (Ind.) Water, Light & Power Company shows that gross earnings of the company last year were $35,942.30, and net earnings $13,508.82. The company's capital, $150,000, is paid up and there are outstanding $112,500 of first-mortgage bonds.

The California Railroad Commission has denied the application of the Pacific Gas & Electric Company, San Francisco, Cal., for authority to issue $1,021,100 par value of common stock. The company applied for permission to issue additional common stock to refund its sinking fund payments for all of this year and part of 1915.

The Youngstown & Niles Railway Company has applied to the Ohio Public Utilities Commission for authority to issue $100,500 common stock to reimburse the Mahoning & Shenango Railway & Light Company, a subsidiary of the Republic Railway & Light Company, for financing the electric railway line the former company is building between Warren and Youngstown. The Mahoning & Shenango Railway & Light has advanced $60,000 and is willing to advance $40,000 additional to purchase right of way between Youngstown and Niles.

Northern States Power Company, of Minnesota, has sold to a syndicate composed of H. M. Byllesby & Company, the Guaranty Trust Company, William P. Bonbright & Company, and Spencer Trask & Company, $8,000,000 10-year six-per-cent notes which are being offered at 99 and interest. The company also has sold to the same syndicate for a later offering $18,000,000 25-year five-per-cent first and refunding bonds. Proceeds of the notes and bonds will be used to provide for the payment of $7,210,000 Consumers' Power, Minnesota, 20-year five-per-cent bonds and $1,434,500 six-per-cent collateral-lien notes of the same company called for payment May 1, and $5,000,000 Northern States Power six-per-cent notes and $3,000,000 Minneapolis General Electric six-per-cent notes called for June 1, and for other refunding obligations, with $2,000,000 of the proceeds for general corporate purposes and requirements of operated properties. The indenture of the notes provides for a permanent noteholders' committee to act for the noteholders during the life of the notes. Lewis B. Franklin is to become a director of Northern States Power and he with W. C. Lane will be two members of the note committee. The issue of the note and bonds is part of the plan for bringing about a simplification of the financial and operating organization of the Northern States Power Company and its subsidiaries which is expected to result in many economies in operating and financing of the corporation and its affiliated companies. The Guaranty Trust Company and associates announce that the $8,000,000 ten-year six-per-cent notes of the Northern States Power Company of Minnesota, have all been sold.

Dividends.

	Term	Rate	Payable
Cape Breton El., com	Q	$1.50	May 1
Cape Breton El., pf	S	$3	May 1
Col. Ry., Pw. & Lt.	Q	1.25%	May 1
Col. Ry., Pw. & Lt., pf. B	Q	1.25%	May 1
Com. Pw., Ry. & Lt., com	Q	1 %	May 1
Com. Pw., Ry. & Lt., pf	Q	1.5 %	May 1
El. Bond & Sh., com	Q	2 %	Apr. 15
El. Bond & Sh., pf	Q	1.5 %	Apr. 15
Havana El. Ry., Lt. & Pw.	S	$3	May 13

Reports of Earnings.

PHILADELPHIA ELECTRIC.

At the annual meeting of Philadelphia Electric Company, retiring directors were

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 17	April 10
American Tel. & Tel. (New York)	128	128
Commonwealth Edison (Chicago)	141	144
Edison Electric Illuminating (Boston)	236	239
Electric Storage Battery common (Philadelphia)	—	61¾
Electric Storage Battery preferred (Philadelphia)	—	61¾
General Electric (New York)	165	165½
Kings County Electric (New York)	130	129
Massachusetts Electric common (Boston)	6¾	6¾
Massachusetts Electric preferred (Boston)	35	35
National Carbon common (Chicago)	—	—
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	134½	136
Philadelphia Electric (Philadelphia)	28	27¾
Postal Telegraph and Cables common (New York)	78	79¼
Postal Telegraph and Cables preferred (New York)	68	68
Western Union (New York)	90	90
Westinghouse common (New York)	62½	69¾
Westinghouse preferred (New York)	70	74

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re-elected. Philadelphia Electric Company reports income account for fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$8,777,924	$8,160,025
Total income	2,414,550	1,978,979
Dividends	1,574,311	1,574,311
Surplus	840,239	404,670
Total surplus	2,311,986	1,471,747

UNITED RAILWAYS, BALTIMORE.

United Railways & Electric, of Baltimore, reports income account for fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross earnings	$9,028,144	$9,293,839
Net	4,885,445	4,891,400
Total income	4,893,778	4,916,121
Fixed charges, taxes, rentals, etc	3,066,832	3,030,327
Discount on securities	37,950	37,950
Interest on income bonds and dividends on preferred stock	560,000	560,000
Dividends on common	818,448	818,448
Surplus	410,548	469,395

In both 1914 and 1915, the surplus after dividends was carried to the credit of depreciation reserve, this amount in 1915 being 4.55 per cent of gross earnings. The profit and loss surplus of the company, December 31, 1915, was 1,008,058, there having been added in the year sundry credits of $4,270.

WESTERN UNION TELEGRAPH.

Comparative earnings report for the three months ending March 31, the month of March, 1916, being estimated, is as follows:

	1916	1915
Total revenues	$14,390,372	$11,568,175
Maintenance repairs and reserved for depreciation	1,863,477	1,776,642
Other operating expenses, including rent of leased lines and taxes	8,870,305	7,618,070
Total expenses	10,733,782	9,394,712
Balance	3,656,590	2,173,463
Deduct interest on bonded debt	332,963	334,300
Net income	3,323,627	1,839,163

AMERICAN TELEPHONE & TELEGRAPH.

Comparative earnings report for the three months ending March 31 is as follows:

	1916	1915
Dividends	$6,619,568.58	$6,306,103.50
Interest and other revenue from associated companies	3,380,850.18	3,445,001.28
Telephone traffc (net)*	2,141,482.13	1,570,773.48
Other sources	450,207.91	272,615.68
Total earnings	12,592,108.80	11,594,494.04
Expenses	1,338,871.00	1,317,798.18
Net earnings	11,253,237.80	10,276,695.86
Deduct interest	1,758,005.13	1,876,605.69
Dividends paid	7,653,970.29	6,968,759.99
Balance	1,841,262.38	1,431,330.18

*One month estimated.

BELL TELEPHONE SYSTEM IN THE UNITED STATES.

Earnings report for two months ending February 29 of the American Telephone & Telegraph Company and Associated Holding and Operating Companies in the United States, not including connected independent or sub-licensee companies. All duplications, including interest, dividends and other payments to American Telephone & Telegraph Company by Associated Holding and Operating Companies, are excluded.

	1916	1915
Gross earnings	$42,012,644	$37,732,280
Operation	14,632,105	13,453,436
Current maintenance	4,950,532	4,635,587
Depreciation	7,736,230	7,094,523
Taxes	2,354,021	2,164,067
Total expenses	29,672,888	27,347,613
Net earnings	12,339,756	10,384,667
Deduct interest	3,122,313	3,196,216
Balance net profits	9,217,443	7,188,451
Deduct dividends (estimated for two months)	5,718,490	5,200,139
Surplus earnings	3,498,953	1,988,312

UNITED GAS & ELECTRIC.

Consolidated earnings of subsidiary companies of United Gas & Electric Corporation for fiscal year ended December 31, 1915, compare as follows:

	1915	1914
Gross	$13,564,410	$13,129,132
Operating expenses, including maintenance	6,836,119	6,912,293
Net income	6,728,291	6,216,839
Taxes	821,428	761,050
Gross corporate income	5,906,863	5,455,788
Fixed charges	3,419,897	3,344,298
Balance available for renewal finances and dividends	2,486,966	2,111,490

STANDARD GAS & ELECTRIC.

Standard Gas & Electric Company reports for the fiscal year ended December 31, 1915, as follows:

	1915	1914
Gross of subsidiaries	$15,539,281	$14,354,689
Net after taxes	7,585,602	6,741,231

Income account of Standard Gas & Electric compares as follows:

	1915	1914
Gross income	$1,618,467	$1,475,029
Net after expenses	1,575,441	1,435,418
Surplus after charges	742,377	619,964
Preferred dividends	471,398	785,663
Balance	270,979	*165,699

*Deficit.

WISCONSIN EDISON, INC.
(North American Company Subsidiary.)

	1916	Per Cent Gain over 1915
February gross of subsid.	$ 827,103	18.33
Expenses and taxes	463,236	5.63
Net earnings	363,806	39.88
Bal. available for dep.	225,330	86.88
Twelve months' gross of subsid.	8,884,100	3.10
Expenses and taxes	5,226,860	2.22
Net earnings	3,657,240	4.39
Bal. available for dep.	2,025,788	7.93

Appropriation for depreciation of subsidiaries for twelve months ended February 29, 1916, was $904,213, an increase of 5.43 per cent over that for the preceding twelve months.

NORTHERN STATES POWER.

Northern States Power Company reports for the twelve months ended February 29, 1916:

	1916	1915
Gross earnings	$5,307,438	$4,507,040
Net after taxes	2,966,760	2,454,620
Interest charges	1,517,994	1,383,650
Preferred dividends	587,524	587,069
Surplus	861,241	483,900

Proposals

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9545, Brooklyn, N. Y., 5,500 feet of telephone cable, 2,000 feet of single-conductor wire; Boston, Mass., 8,000 feet of rat-tail wire for aerials; Portsmouth, N. H., 6,400 feet of galvanized steel conduit. Schedule 9552, Norfolk, Va., five 0.5-kilowatt radio motor-generators, 5 starter panels and seven 2-kilowatt radio transformers. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

MOTORS AND ACCESSORIES.—Sealed proposals will be received at Room 710, City Hall, Chicago, Ill., until April 25, for furnishing and delivering all motors and accessories required for dryer houses Nos. 4 and 5 and the new extractor building at the municipal reduction plant, located at Thirty-ninth and Iron Streets, according to plans and specifications on file in the office of the Department of Health. John Dill Robertson, Commissioner of Health.

ELECTRICALLY DRIVEN PUMPS.—Sealed proposals will be received by the clerk of the City Commission of Middletown, O., until May 1 for furnishing two electrically driven centrifugal pumps with a capacity of 2,100 gallons per minute, and one steam pump with a capacity of 3,000,000 gallons per day.

ELECTRIC-DISTRIBUTING SYSTEM.—Sealed proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 20, 1916, for furnishing and installing an electric-distributing system at the Naval Hospital, Washington, D. C. Plans and specifications may be obtained on application to the Bureau of Yards and Docks.

New Publications

ELECTROTYPING SOLUTION.—Bureau of Standards, Scientific Paper No. 275, entitled "Relation Between Composition and Density of Aqueous Solotions of Copper Sulphate and Sulphuric Acid," tells how to determine the composition of electrotyping bathes, which usually contain only copper sulphate and sulphuric acid.

CUSTOMS TARIFFS OF VENEZUELA.—A report of 53 pages, devoted to the customs tariff of Venezuela has just been issued by the Bureau of Foreign and Domestic Commerce, of the Department of Commerce. The purpose of the publication is not only to enable the American manufacturer and exporter to ascertain the rates of duty levied in Venezuela on various products, but also to call his attention to certain aspects of the tariff that may enable him to compete more successfully in that market, by making certain changes in his products, so as to bring them under a lower tariff classification. The rates of duty are given, both in Venezuelan currency and in United States money, inclusive of surtaxes.

Electrical Patents Issued April 11, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,178,497. Electric Regulation. J. L. Creveling, assignor to Safty Car Heating & Lighting Co. of New Jersey. Voltage regulation of dynamo and battery car-lighting system.

1,178,501. Electrolytic Cell. H. M. DuBois, Detroit, Mich., assignor to Pennsylvania Mfg. Co. Special arrangement of electrode and diaphragm.

1,178,503. Fire-Alarm-Box Protector. J. F. Eder, Baltimore, Md. Key has prepared surface registering finger prints.

1,178,507. Wireless Signaling. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Current produced by received waves interacts with local magnetic field of different frequency to produce indication.

1,178,510. Electric Igniting Device for Gas-Burners. D. P. Fuller, Denver, Colo. Combination of make-and-break igniter and gas valve.

1,178,511. Protector for Telephones. J. E. Fullmer and E. L. Bullis, Kilbourn, Wis. Electromagnetic grounding device.

1,178,535. Automatic Circuit-Maker and Breaker. B. R. Mulford, Orange, Tex. Special structure of rotary contactor.

1,178,537. Illuminating Appliance. O. A. Mygatt, assignor to Holophane Glass Co., New York, N. Y. Comprises spaced outer diffusing reflector and inner open-mouthed, prismatic reflector. (See cut, next page.)

1,178,538. Spark-Plug. L. Rose, New Orleans, La. Has adjustable central electrode and chamber accessible to gases of explosion with special provision for keeping products of combustion, etc., off face of insulator.

1,178,539. Insulator. F. Schaub, Jersey City, N. J. Reversible cleat.

1,178,542. Electrical Gas Lamp. F. Skaupy, assignor to Deutsche Gasgluehlicht Aktiengesellschaft, Berlin, Germany. Special passage between cathode and light chambers in sealed bulb having light chamber filled with a rare gas.

1,178,561. Key-Socket. B. C. Webster, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. Details for lamp socket.

1,178,576. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co. of New Jersey. Voltage regulation of dynamo and battery car-lighting system.

1,178,584. Circuit-Controller. C. T. Henderson, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Lubrication of contact reciprocating over stationary contacts.

1,178,587. Method of Making Insulating Joints. F. E. Layman, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Insulation molded about connecting members and joint enclosed in gripping and reinforcing shell. (See cut, next page.)

1,178,591. Electrolytic Cell. F. J. Metzger, New York, N. Y., assignor of one-third to H. T. Beans and one-third to M. C. Whitaker, New York, N. Y. Has diaphragm of birchwood with ends of grain presented to electrolyte.

1,178,596. Governing Device. P. Okey, Columbus, O. Has number of centrifugal governing elements automatically operable at different speeds.

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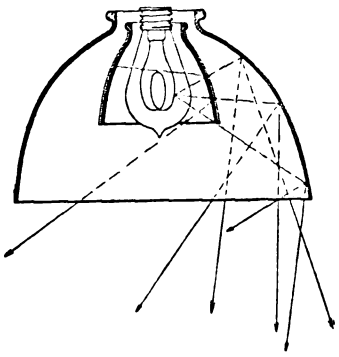
1,178,680. Pneumatic - Tire - Protecting Magnet. D. Rosenthal, Boston, Mass. Electromagnet picks up tacks, etc., in front of wheel.

1,178,703. Pneumatically Operated Electrical Switch. J. F. Bentz and J. A. Sertl, Schenectady, N. Y. Cylinder with hand-operated piston has ends connected with ends of cylinder having piston carrying switch contact.

1,178,713. Protective Apparatus for Electrical Instruments. J. T. Green, assignor to the National Electric Specialty Co., Toledo, O. Arrangement of fused clips and arrester.

1,178,718. Means for Mounting Electric Generators and the Like on Motor Vehicles. E. A. Haslieb, assignor to North East Electric Co., Rochester, N. Y. Cross bar on front ends of springs supports machine in front of automobile radiator.

1,178,719. Electric Signaling Device. J.



No. 1,178,537.—Illuminating Appliance.

Hildebrand, Yonkers, N. Y. When device is disturbed so as to dislocate ball holding switch open, alarm circuit is closed.

1,178,732. Barber Pole. W. F. Koken, assignor to Koken Barber Supply Co., St. Louis, Mo. Is in transparent housing and electrically lighted and driven.

1,178,733. Barber Chair. W. F. Koken, assignor to Koken Barber Supply Co. Electrically operated pump controls fluid operating chair stem.

1,178,742. Signal Lamp. C. Mawer, Bucyrus, O. Structure of reflector and casing for headlight projection.

1,178,753. Direct-Service One-Point-Control Dumb-Waiter. H. Rowntree and B. Rowntree, assignors to Burdette-Rowntree Mfg. Co., Kenilworth, Ill. Apparatus at controlling station automatically starts car and stops it at desired floor, car returning to station on closing of landing door.

1,178,771. Rotor for Dynamoelectric Machines. A. Zehrung and R. Rundenberg, assignors to Siemens-Schuckertwerke, G. M. B. H., Berlin, Germany. Arrangement of ventilating ducts.

1,178,772. Electrical Measuring Instrument. J. G. Zimmerman, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Current recorder controlled by differential coils.

1,178,777. Electrical Heating Device. P. F. Apfel, Seattle, Wash. Rod-like unit for heating water by immersion in receptacle.

1,178,792. Electrical Switch. L. W. Flack, Toledo, O. Pull switch.

1,178,797. Metal Punching Mechanism. J. K. Graham and G. Rasmussen, Roanoke, Va. Electrical selective control of punches by pattern.

1,178,822. Electrically Driven Vehicle. R. Schlaepfer, assignor to Busch-Sulzer Bros.-Diegel Engine Co., St. Louis, Mo. Car with electrical internal-combustion engine drive.

1,178,873. Direction Signal for Automobiles. E. Potter, Rochester, N. Y. Control of electrical head and tail-lights.

1,178,878. Telegraphy and Telephony by Submarine Cables, Long-Distance Overhead Lines and the Like. J. Schiessler, Baden, Austria-Hungary. Apparatus for relaying currents.

1,178,879. Electromagnetic Typewriter. J. Schnyder, Kriens, Switzerland. Operation of the various parts by a single electromagnetically operated bar controlled by key circuits.

1,178,882. Electrical Receiving Apparatus. T. N. Slocum, Aberdeen, Wash. Diaphragm of telephone receiver connected to rock mirror.

1,178,883. Electric Stove. T. N. Slocum, Aberdeen, Wash. Vertical heater adapted to have articles detachably secured to sides.

1,178,890. Radiotelegraph Station. G. G. Von Arco and A. Leib, assignors to Gesellschaft Fur Drahtlose Telegraphie, M. B. H., Berlin, Germany. Alternate connection of transmitting and receiving devices with antenna controlled by transmitter key operation.

1,178,905. Intensifier for Spark-Plug. E. F. Cogley, Omaha, Neb. Details of electrodes and casing.

1,178,927. Galvanic Cell. M. L. Kaplan, assignor to Beacon Miniature Electric Co., New York, N. Y. Process of making dense but highly active depolarizer.

1,178,928. Flash-Light. M. L. Kaplan, assignor to Beacon Miniature Electric Co. Details of portable battery device of well known tubular form.

1,178,956. Steam Generator. J. M. Seymour, Newark, N. J. Arrangement of igniter for charges in combustion chamber in boiler shell and in communication with water chamber.

1,178,975. Spark-Plug. J. Z. Tucker and L. W. Markwort, St. Louis, Mo. Structural details.

1,179,009. Method of Producing Malleable and Ductile Bodies of Tungsten or Tungsten Alloys. A. Just, assignor to General Electric Co., Schenectady, N. Y. Metallic tungsten is fused with boron material.

1,179,030. Coil Separator. E. R. Pearson, assignor to General Electric Co., Schenectady, N. Y. Device for separating coils of electrical machine to promote ventilation, etc.

1,179,059. Hanger for Light Reflecting Bowls. E. L. White, assignor to J. A. White Mfg. Co., Brooklyn, N. Y. Detailed structure of arm having lamp-socket receptacle, bowl seat and chain hook.

1,179,107. Thermal Circuit-Breaker. J. M. Johnson, Kansas City, Kans., assignor to United States Automatic Fire Alarm Co. Fuse-plug.

1,179,108. Indicating Switch. W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Rotary switch has auxiliary indicating positions for actuator.

1,179,109. Dimmer Switch for Lighting Circuits. W. Kaisling, assignor to Kellogg Switchboard & Supply Co. Compact device comprising resistance and push button operated shunt.

1,179,117. Telephone. E. D. Lowry, Philadelphia, Pa. Arrangement of diaphragms in loud-speaking receiver.

1,179,127. Insulator. H. R. Markel, Columbus, O. Two-part nail-attached knob.

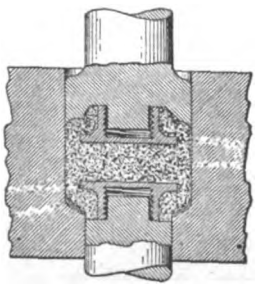
1,179,174. Refillable Cartridge-Fuse. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Details.

1,179,175. Telephone System. E. A. Graham, Brockley, London, England. Special arrangement of transmitter and receiver circuits.

1,179,238. Trolley Wheel. J. W. Swain, Norfolk, Va., assignor of one-half to W. N. Marshall, Norfolk, Va. Structural details.

1,179,239. System for Converting Direct Current into Alternating Currents of Different Frequencies. P. Thalassinoz, Philadelphia, Pa. Commutator arrangement.

1,179,260. Automatic Call and Lighting System. R. L. Wood, Jr., and G. E. Crow-



No. 1,178,587.—Method of Making Insulating Joints.

ley, Tallulah Lodge, Ga. For hotels, etc.; drop rings bell and lights lamp.

1,179,276. Fire-Alarm System, Including a Thermal Circuit-Closer. C. S. Bullock, assignor to Bullock Safety Appliance Co., Poughkeepsie, N. Y. Special circuit arrangements.

1,179,293. Selective Relay. F. L. Dodgson, assignor to General Railway Signal Co., Gates, N. Y. Comprises two electromagnets exercising circuit control jointly and independently.

1,179,306. Signaling Apparatus for Vehicles. P. R. Harsh, Toledo, O. Steering-wheel-controlled switch for direction-indicating apparatus.

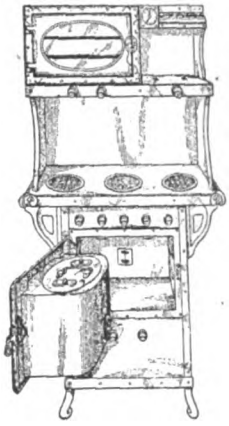
1,179,313. Apparatus for Treating Ores. E. R. Holden, Los Angeles, Cal. Vertical tank having vertically distributed openings; cathode wire connected to copper lining has rotary shaft with plates at different heights and connected to anode wire.

1,179,340. Heating Appliance. L. D. Smith, assignor to Standard Electric Stove Co., Toledo, O. Oven door carries cooker automatically placed in circuit when door closed. (See cut.)

1,179,353. Wireless Telegraphy. L. F. Fuller, assignor to Federal Telegraph Co., San Francisco, Cal. Transmission system comprising an arc.

1,179,354. Auxiliary Alarm System. C. G. Furman, assignor to Gamewell Fire Alarm Telegraph Co., New York. Combination of signal-box mechanism and annunciator.

1,179,373. Electrical System of Distribution. J. W. Jepson, Buffalo, N. Y., assignor to Gould Coupler Co. Dynamo and



No. 1,179,340.—Heating Appliance.

battery system; voltage regulation by carbon-pile resistance.

1,179,380. High-Potential Electricity-Arrester. F. R. Parker, Chicago, Ill. Has piece of glass cloth as dielectric member.

Reissue 14,103. Electric-Lamp Socket. G. W. Goodridge, assignor to Bryant Electric Company, Bridgeport, Conn. Original No. 1,121,348, dated December 15, 1914. Relates to securing together of cap and shell.

Reissue 14,104. Motor Control. W. P. Jackson, assignor to General Electric Co., Schenectady, N. Y. Original No. 1,077,717, dated November 4, 1913. Relates to control of series motor.

PATENTS EXPIRED.

The following United States electrical patents expired April 18, 1916:

623,136. Safety Cable System for Electric Railways. H. B. Cox, New York, N. Y.

623,141. Apparatus for Starting Electric Elevators. D. H. Darrin, Cranford, N. J.

623,142. Electric Elevator Switch. D. H. Darrin, Cranford, N. J.

623,172. Junction Box. T. J. Murphy and B. F. Neilson, New York, N. Y.

623,195. Electric Accumulator. A. Werner, London, England.

623,223. Electric-Railway System. W. Stein, Hamburg, Germany.

623,242. Means or Apparatus for Producing and Exhibiting Animated or Changing Pictures on Advertising Appliances, etc. W. Friese-Greene, London, England.

623,275. Electric Letter for Signs. C. A. Chase, Chicago, Ill.

623,279. Arc Lamp. T. E. Drohan, Chicago, Ill.

623,293. Electrically Connected Printing Machine. C. A. Shea, M. and J. J. O'Lalor, Medford, Mass.

623,316. Induction Apparatus. T. B. Kinraide, Boston, Mass.

623,317. Electrical Break. T. B. Kinraide, Boston, Mass.

623,318. Electrical Spark Gap. T. B. Kinraide, Boston, Mass.

623,329. Electric Arc Lamp. A. Mougin, Paris, France.

623,352. Duplex Switch for Telephones. G. C. Buell, Boston, Mass.

623,363. Electric-Light Hanger. W. Gierth and F. Peters, Newark, N. J.

623,323. Motor-Vehicle. F. A. Pocock, Philadelphia, Pa.

623,393. Electric Current Controller. J. B. Breeding, San Antonio, Tex.

623,433. Electric Fan. S. L. Shellenberger, South McAlester, I. T.

623,437. Telephone Switchboard Circuit. E. H. Smythe, Freeport, Ill.

623,441. Automatic Fire and Burglar Alarm. H. E. Thompson, Cameron, N. C.

623,444. Electric Railway Signaling Device. D. Valentine, Brockton, Mass.

623,480. Electric Cigar Lighter. S. F. Kessler, Auburn, Ind.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

CO-OPERATION BETWEEN ARCHITECT AND ILLUMINATING ENGINEER.

Architecture is one of the oldest arts. Consequently it is rich in artistic traditions and uses many beautiful conventional forms that have become well established through long centuries. On the whole, its tendency is strongly conservative, in important buildings, at least. Artificial illumination is a quite modern art, however, and in the last few decades has received extraordinary impetus through the development of new illuminants of high power and efficiency. It is only during the last ten years that the principles of scientific illumination have received much study, resulting in their application through a newly developed branch of engineering.

Architects have hitherto scarcely concerned themselves with the problems of illumination, because until artificial illumination came into vogue both the exteriors and interiors of buildings were viewed almost exclusively by natural light. Even recently the artificial illumination has been given very minor consideration by the architect, whose primary concern as a rule has been the artistic effect. In fact, although he should be deeply interested in the principles of illuminating engineering, he has held himself aloof from association with the illuminating engineer, who at first could talk only in terms of efficiency and neglected reasonable efforts to harmonize his ideas with artistic or architectural requirements.

During the last few years, however, illuminating engineers have devised means and produced installations wherein the architectural features, both of interiors and exteriors, have been greatly enhanced by judiciously designed artificial lighting; indeed, very pleasing effects unforeseen by the architect have been produced. The architect is therefore becoming aroused to the possibilities of artificial illumination and is beginning to see the value of co-operation with the illuminating engineer.

A marked evidence of this wholesome tendency was shown in the paper read by Mr. C. A. Carpenter before the Chicago Section of the Illuminating Engineering Society last week, as briefly reported in this issue. Representing one of the large architectural firms in the country, Mr. Carpenter showed that in many cases it was desirable to modify the architectural design in order to secure improved illumination. This is a very notable concession on the part of the architect. It shows that by the exercise of reasonable tact by both illuminating engineer and architect it is possible to meet on a common ground and produce results which will satisfy the ideals of both. Every possible encouragement should be given to this co-operative tendency, which is capable of achievements valuable not only to the parties bringing it about but to the public in general.

ADVANTAGE OF GROUPING SMALL TOWNS ON TRANSMISSION SYSTEMS.

Usually in considering the question of whether electrical service in a small town shall be supplied by a local power plant or by a larger plant in another town over a transmission line, the decisive emphasis is placed upon a comparison of the cost of generating the electrical energy locally by means of small units with the cost of transmission combined with the lower generating costs at the distant station. In many cases the latter proves to be the most economical, but even when it is not, the question should not be decided upon this basis alone.

There are other considerations which should be given considerable weight in solving this problem, since the cost of delivering electrical energy to the local distribution system is not the only cost involved in the business. This was very pointedly brought out in the paper presented by Mr. A. Hardgrave at a meeting of electrical engineers held in Chicago this week. The centralized management of electrical service in a group of neighboring towns has all the advantages of economy in management, in purchasing supplies and securing engineering talent, etc., that have been demonstrated to be so advantageous in the case of the holding company which manages a number of electric utilities in different parts of the country. Centralized supply has, however, other advantages which even the utilities operated by such holding companies do not enjoy. Neighboring communities may have predominating loads of different types, one being distinctively residential in character, another presenting an important industrial load, while a third town may be a commercial center, the fourth a mining town, etc. Towns of such different characteristics lend themselves especially well to joint supply, since the diversity in characteristics implies at the same time diversity in time of maximum load. The advantages from the point of economy of a large diversity-factor are well appreciated, and this is one element of advantage which centralized supply holds over isolated generating stations.

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The same diversity in the character of communities also adds to the security of an investment for joint supply as compared with the investment in an isolated central station for supplying electric service. The possibilities of serious loss of load, of decreasing population or actual abandonment of important industries, present a much less serious problem in the diversified territory. Consequently the financial aspect of the proposition is much more inviting.

Even with all other things being equal, the use of transmission lines for serving isolated communities has still one advantage over the local power plant and this resides in the possibility of securing business at points along the line by supplying service to farmers or intermediate communities for whom no one could think of supplying service otherwise on account of the diminutive size of the possible load to be secured. Many instances have been brought to the attention of our readers from time to time where the use of an outdoor substation connected in upon a transmission line has made it possible to serve such communities at some profit, thus adding to the total load and to the diversity of the entire system.

TWO IMPORTANT RATE CASES.

The two Massachusetts commissions charged with the regulation of public utilities are now deeply engaged in rate investigations of far-reaching significance. The Public Service Commission is in the midst of a profound inquiry into the petition of the Bay State Street Railway Company for authority to increase its fares from a five-cent to a six-cent unit, and the Gas and Electric Light Commission is getting well started in an arbitration of street-lighting rates at Boston which bids fair to become one of the most interesting cases in this field in recent years.

In the Bay State case, some ninety municipalities served by the 900 odd miles of track on the system, are now attacking the evidence of the company that it must increase its rates in order to yield a fair return to its stockholders, pay good wages to its men, and maintain standards of service demanded by the public, with all that that implies. The company's experts, at a cost of approximately $120,000, have prepared an extraordinary amount of ammunition and discharged a good share of it in the form of ten volumes of unit and total costs showing as nearly as possible the detailed outlay which the company had to make in every part of its Massachusetts system for physical plant and property, and indicating, on the basis of route apportionments, the total costs and consequent revenues necessary on all parts of these lines to put the road on a satisfactory footing.

In the Boston street-lighting case, the Edison Electric Illuminating Company has presented a monumental study of this branch of its service, based upon an analysis of the cost of installation and operation of the system required for illuminating the streets of Boston proper. A more interesting example of the application of engineering judgment to cost apportionment would be difficult to find. The company concludes that with between three and four thousand 6.6-ampere magnetite arc lamps in service, the investment per lamp exceeds $625, including all the items in the company's property which in its opinion are chargeable with a share in the cost of street illumination.

This figure, which is more than twenty times the bare cost of the lamp itself and certainly more than seven times the cost of a lamp and supporting pole, indicates how much specialized equipment is properly located behind the scenes, as it were, in street-lighting, and illustrates the difficulties the average citizen inevitably must encounter in attempting to pass judgment, as he sometimes does, upon the fairness of a given price for such service. In the Boston case the city has retained an expert electrical engineer from the Harvard University staff to look after its interests, while the company was fortunate enough to be able to draw upon its own electrical chief of staff for this work. As the hearings progress, the work of the engineers in both the Bay State and street-lighting cases is sure to be of great technical interest. It goes without saying that the findings of the two commissions probably many months hence, will be based upon a most exhaustive examination of the operations and contentions of the companies concerned, and will establish conclusions which will be of the widest interest in the public-utility field.

THE COMING CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The program for the convention of the National Electric Light Association, to be held next month in Chicago, indicates that the convention will be one of unusual interest. The program, which is given on other pages, is longer than usual, and includes sessions for the Company Sections and for the Electric Vehicle Section, the latter resulting from the affiliation of the Electric Vehicle Association of America. As usual in recent years, the activities of the Commercial Section dominate the program, and six sessions have been arranged for, including a number of novel and valuable items. Among these may be mentioned the report of the Committee on Electric Ranges, the reports of the Industrial Electric Heating and Lighting Sales Bureaus, the lecture by Mr. Durgin, and the report of the Committee on Competitive Power Sources. Altogether, 22 sessions have been scheduled, of which four are general sessions. This does not include the Public Policy session, which will be a closed meeting for Class A members only.

The central location of the convention city, combined with the attractive program of reports and papers, and the excellent arrangements which are being made, should insure a convention which, from the standpoint of both interest and attendance, will be the most successful ever held by the Association.

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WINDOW DRESSING.

The indifference of many electrical contractors to the appearance of their show windows is truly astonishing. It is a sad reflection upon their merchandising ability, yet it must be reluctantly admitted that some pay absolutely no attention to this subject, and frequently the window of an electrical contractor's shop or store is the least attractive to be found upon the street. It is occasionally worse than that—even positively repellent.

What is the reason for this neglect? Evidently the contractor does not realize the benefits to himself to be derived from the best use of window displays. In some cases the electrical contractor is a contractor simply, and does not attempt to carry on a store. He does not carry a stock of appliances, and makes no effort to sell wiring material or other supplies. He therefore thinks a window display has no value for his business and will not bring any returns. This is a mistake—a failure to appreciate human motives and influences or the psychology of business. Many a new customer will be repelled by an unattractive exterior and will carry his inquiry for wiring to a more inviting door. Many a possible prospect who might be started to thinking of wiring his home or his factory by a suggestive or thought-compelling display will be inevitably lost to that particular contractor. Contractors of this class would be better off without a show window. They should be located in the rear of some building, in a basement or upper story, like a carpenter shop, or else have merely an office and not a store in which to receive visitors and transact business. They are wasting good money when they pay rent for a first floor front.

When the electrical contractor is also a dealer there is less excuse for the neglect of window dressing. Whether his trade is confined to supplies, or also includes the sale of current-consuming devices, his show window represents his greatest advertising asset. Too often he lets it become a liability, solely through neglect. Of course the dealer who simply conducts a retail business unaccompanied by contracting realizes the value of his show window and bestows some attention upon it, for if he did not show this much merchandising acumen, he would not long remain in business. But the average contractor piles as great a variety of his stock as possible into his window, postpones changing it until he has nothing else to do, and in the meanwhile lets it accumulate dust and other earmarks of neglect. Even when newly dressed the window is not attractive if it contains a great variety of miscellaneous articles. It may prove as bewildering as a Chinese puzzle, and the observer leaves without having his attention concentrated upon any one object or idea. He carries away in his mind no permanent impression from the jumble.

Two suggestions may well be considered here in connection with window dressing. One is to have a definite purpose in view every time the window is dressed, and concentrate the attention of the observer upon some particular object which is capable of arousing his interest. This has two advantages. The passer-by may be stimulated to purchase, and he will at least receive some definite impression which tends to fix in his mind the fact that there is such a proprietor doing business in such a place. That is one of the aims of advertising and this form of advertising is secured at little cost.

The other advantage of this method is that it does not exhaust the resources of the window dresser, and the next week he can make an entirely new display, featuring some other article in his stock. And similarly the week following, and the next after that. He not only has a window which will attract attention, but he can make a fresh display whenever desired.

The other suggestion is to dress the show window frequently, say once a week, so that when passers-by have discovered that there is a window in this location worth looking at, they will find a new interest at frequent intervals, and will not be wearied with a monotonous repetition whenever the eye is permitted to wander to this display. A reputation for progressiveness in this direction will carry with it the idea that the contractor is up to date in his installation methods and familiar with the latest and most approved materials of construction.

DISPOSING OF WOOD WASTE.

The question of disposing of the sawdust, shavings, scraps of wood, etc., from the various types of woodworking plants is often a serious one, and sometimes it is the deciding one when the application of central-station energy is being considered. It is brought to our attention once more by the communication from Mr. F. A. Coffin in this issue. It is undoubtedly true that a solution of the problem often depends upon bringing into contact the consumer and the producer of this wood waste, and that the alert power solicitor can often be the means of bringing this about.

In this effort the power solicitor is to have the help of the United States Government. The office of Industrial Investigations of the Forest Service has instituted a wood-waste exchange and is compiling information regarding the supply of wood waste and the demand for it. This information is made available in the form of specific quotations from *bona fide* buyers and sellers of waste who co-operate by supplying complete information regarding the exact form, species, sizes, and amounts of waste available or desired. Schedules requesting this information were sent to a number of wood-using establishments and a list has been gradually built up. It now contains the names of several hundred manufacturers. By communicating with the Forest Service, opportunities for profitably disposing of waste may be brought to light which would otherwise remain unknown.

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Happenings in the Industry

American Institute Sections to Hold Joint Meeting by Aid of Telephone—Court Decides on Flaming-Arc Carbons—Tie Line Authorized in Massachusetts—Important Power Developments in Mining Districts of Tennessee—Massachusetts Commission Considers Boston Street-Lighting Contract—Miscellaneous News Notes

Long-Distance Telephony at Annual Meeting of American Institute.

On Tuesday, May 16, simultaneously with the meeting of the American Institute of Electrical Engineers in New York City, meetings of sections will be held in Boston, Philadelphia, Atlanta, Chicago and San Francisco, and all of these meetings will be connected together by long-distance telephone. Arrangements are being made to supply each one in attendance in these different cities with receivers, which will be connected to a line joining them all. A number of transmitters will be in service at each one of the meeting places, and what is said by the speakers in each of these cities will be heard by all of those in attendance at the various meetings.

The telephone facilities necessary for this remarkable feat will be supplied by courtesy of the American Telephone & Telegraph Company, of which President J. J. Carty of the American Insitute is chief engineer. While long-distance telephony has already been utilized from coast to coast and conversations heard by audiences at each end, this is said to be the first time that so many audiences have been simultaneously put into communication with each other. The necessary connections to the long-distance circuit will be made at 8:30 p. m. Eastern standard time. This will be 7:30 p. m. in Chicago and 5:30 p. m. in San Francisco. It is proposed not only to have short addresses in the various cities which may be heard by all, but to actually transact some of the business of the annual meeting by telephone communication.

New York Court Decides on Duty on Flaming-Arc Carbons.

The United States Court of Custom Appeals, New York, has handed down an important decision stipulating the duty to be imposed on flaming arc carbons, sustaining a contention of manufacturers and importers that a rate of 40 cents per 100 feet was applicable under the proper classification.

This test case, brought in the name of H. M. Hirschberg Company, is of unusual importance and interest. The action was based upon the view taken by the Collector of the Port of New York, in holding that electric-light carbons came under the recently adopted clause of "carbons for flaming-arc lamps" and exacting a duty of 30 per cent. The importers contended that an assessment of 40 cents per 100 feet should prevail in consideration of the first part of the same clause, reading: "Carbons for electric lighting composed chiefly of lampblack or terort carbon."

The Board of General Appraisers in passing upon the case held that the testimony was not sufficient to show which provision of the classification (paragraph 82) should apply, and, furthermore, that the testimony given was not convincing enough to warrant a change in the collector's decision.

In its ruling, the Court of Custom Appeals says: "The Board of General Appraisers failed to accept at its value the testimony which was adduced on behalf of the importers. The question presented was whether the latter clause in the paragraph was to replace the provision for carbons for electric lighting if composed chiefly of lampblack or retort carbon, at the specific rate of 40 cents per 100 feet, under the present law."

Massachusetts Lighting Commission Authorizes Stock Issue for Tie Line.

The Eastern Massachusetts Electric Company has been granted authority to issue 1,250 shares of stock, at $100 par, to pay part of the cost of building a transmission line to connect the plants of the Salem, Malden and Suburban lighting companies in Massachusetts. An outline of the project was published in a recent issue. The company applied for approval of $250,000, the amount of the authorized capital, but the Commission deems it expedient to postpone, until completion of the line, its approval of the balance of stock necessary for construction.

The Commission says: "The importance of the new line to the future destinies of the three plants which it will connect is manifest. Its justification must rest upon its resulting in a more efficient supply of electricity for all three of the communities served."

Some objection was voiced to a new corporation being formed to build the line, some urging that one of the existing companies should be sufficient to carry out the project. The majority of the Board holds that this is not open to discussion; but Commissioner Schaff, in a dissenting opinion, claims that the creation of this corporation is a departure from the policy of the state, in that the transmission company will be a subsidiary of a holding company, the North Boston Lighting Properties, which owns and controls the Salem, Malden and Suburban companies. It will have as its sole customers fellow subsidiaries of the North Boston Lighting Properties, and Commissioner Schaff points out the danger of absorbing the surplus profits of the other companies, which should go to writing off dead capital which it duplicates. The state provides reasonable facilities for the activities of corporations, and there seems to the Commission to be no justifiable reason for a "go-between corporation."

Dependence of Architecture on Illuminating Engineering.

At a meeting of the Chicago Section, Illuminating Engineering Society, held in the Edison Building, Chicago, on April 20, a paper on "The Relation of the Architecture of an Interior to its Illumination" was presented by C. A. Carpenter, electrical engineer of Graham, Burnham & Company, architects. The paper touched on numerous instances in which modifications of the architectural designs of interiors were made in order to secure greatly improved illumination. Among such cases cited were a long narrow concert hall, multi-sided show windows, art galleries, interior fountains, etc. The illumination should bring out the architectural features. Frequently by a slight modification of the design this may be accomplished to great advantage. Where the artificial illumination comes in a different direction from the natural illumination, weird effects are frequently produced. Co-operation and mutual tact on the part of the designer and illuminating engineer produce the best illumination results.

The paper was discussed by Morgan Brooks, E. W. Lloyd, J. R. Cravath, M. G. Lloyd, W. A. Durgin, Frank F. Fowle, Albert Scheible, J. Stair and F. H. Bernhard.

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Power Developments Necessary in Mining Districts of Tennessee.

The great increase in the demand for minerals developed by the war has made the extensive mineral fields of Eastern Tennessee highly attractive and has led to a big enlargement of operations among the companies that have mines in that section. This has been accompanied by an increased power use at the mines. A number of large installations and developments are being made and a still greater amount of work along this line is being planned.

The Aluminum Company of America, which has a smelter at Maryville, Tenn., near its bauxite properties, is installing a steam plant which will add 10,000 horsepower of electrical power for mining and hoisting use. In addition the company has purchased riparian rights on the Little Tennessee River and has planned a project of a series of seven dams which will furnish 300,000-horsepower. The company has already made settlements with the railroads along this river to cover the cost of elevating their tracks above the overflow.

The American Zinc Company, of Mascot, Tenn., will purchase 5,000-horsepower additional from the Tennessee Power Company. This corporation has recently sunk a number of deep shafts and has increased its output materially. The Tennessee Power Company has also extended its transmission lines to the properties of the Tennessee Copper Company, at Copper Hill. The power for this line is taken from the No. 2 hydroelectric plant on the Ocooe River. The same power company has also contracted with the Ducktown Sulphur, Copper & Iron Company to furnish the latter with 1,500 kilowatts. The power company has started construction on the Caney Fork River which will add 1,200 to 2,400 kilowatts within the next few months and a considerably larger amount of power whenever desired and the greater part of this will be used for industrial purposes similar to those mentioned.

The Chattanooga & Tennessee Power Company is adding four new turbines at its dam at Hale's Bar to develop 20,000-kilowatts additional.

While none of the large smelters in that section are using electric furnaces of large size, the Chattanooga Steel Company, which was recently organized at Chattanooga, will install equipment of this kind.

BOSTON LIGHTING CONTRACT CONSIDERED BY COMMISSION.

Data on Cost of Street Lighting Presented by Edison Electric Illuminating Company of Boston.

The Massachusetts Gas and Electric Light Commissioners, on April 20, took up the consideration of a tentative contract between the city of Boston and the Edison Company for street lighting, made November 16, 1914, for a 10-year term. The city and company agreed jointly to request the Commission to investigate and determine whether the schedule E rates charged are fair. If, after investigation, the Commission shall find that a fair price is less than the total amounts to be paid under schedule E, one or more of the rates may be reduced by the board.

The rate for 800-candlepower magnetite 500-watt arc lamps, burning 3,828 hours per year, works out at $87.53, this being a fixed cost of $36 and a running cost of 1.6 cents per lamp hour. There are 4,543 lamps of this type, making up the principal item in street illumination.

For the 24 Thoran 500-watt direct-current arcs, the rate is $148.05 each, and for 2,910 40-candlepower and 1,157 60-candlepower incandescents, $18.33 and $21.14, respectively. These, with a few larger incandescent units, make up the total of $479,718.

The company, in a very complete tabulation of costs and apportionments, claims operating and maintenance expenses, on account of the city street service, of $284,627, leaving a gross profit for proportion of general expenses, dividends and depreciation of $195,092.

Costs of operation and maintenance are given as follows:

Production cost, delivered to the substation high-tension bus, 13,406,884 kilowatt-hours, @0.7375 cent		$98,875.77
Operating and maintaining lamps:		
Trimming arcs	$48,568.06	
Patrolling arcs	9,248.71	
Repairing arcs	12,916.22	
Incandescent lamps	36,358.39	
		$107,091.38
Operating lines and fixtures:		
Arcs	$8,568.62	
Incandescent	2,620.52	
		$11,189.14
Maintaining lines and fixtures:		
Arcs	$51,691.81	
Incandescent	7,170.46	
		$58,862.27
Stock-room expense:		
Arcs	$4,567.00	
Incandescent	2,041.50	
		$ 6,608.50
Records and billing		2,000.00
Total		$284,627.06

The Edison Company assigns 4.9 per cent of general office, lands, buildings, laboratory, records, transportation and repair equipment and general stock, to the city street lighting. Substations are apportioned to the extent of 2 to 87 per cent on account of street lighting, while proportion of the L Street generating station is so assigned, on the basis of 3,223 kilowatts, at $116. The total investment assigned to arc street lighting is $2,900,118, or $635.01 per arc lamp. Investment in series incandescent lighting is $180,860, and in multiple incandescent, $288,470.

Details of investment for arc lighting are per lamp:

	Per 6.6-amp. Arc Lamp.
General offices, land, buildings	$ 9.21
Service property	17.08
Laboratory	.92
Records, plans, agreements	1.07
Transportation and repair equipment	4.15
General stock, supplies, fuel, etc	6.28
Arc lamps and parts, stocks	1.20
Substation lands and buildings	14.35
Generating station, L Street	81.86
Transmission lines	4.84
Switching apparatus	.78
Converting apparatus	61.29
Lamp poles	61.06
Arc lamps	27.71
Conduit for arc circuits	109.94
Cable for arc circuits (572 ft.) (No. 6 underground cable, installed, 0.2524 per foot.)	165.95
Manholes	31.54
Poles and attachments	19.59
Wire (404 ft.)	16.15

Investment in the L Street generating station is given in details as follows:

Land	$ 400,464.64
Buildings	2,059,054.02
Boilers, piping and accessories	2,055,154.51
Generating engines	164,146.00
Turbines and generators	1,548,666.83
Engine generators	127,050.57
Accessories and electrical equipment	41,551.28
Miscellaneous accessories	904,738.26
Coal handling apparatus	386,541.33
Miscellaneous equipment	36,752.87
	$7,724,120.32
Deduct value of Brush machines and equipment	154,918.00
	$7,569,202.32
Investment per kilowatt (total capacity, 105,000 kilowatts)	$ 72.00
Maximum load of entire system, 1914, 65,342 kilowatts	
Total investment per kilowatt of maximum load	$116.00
Maximum load, Boston arc light system, 3,181 kilowatts	
Per arc lamp	$ 81.86

Operating expenses per arc lamp are as follows:

Production and substation costs	$17.80
General expenses, generating stations	.77
General expenses, substations	.49
Repairing overhead lines	3.12
Repairing underground cables	4.71
Repairing underground conduit	.45
Repairing lamp poles and fixtures	3.02
Operating overhead lines	.75
Operating underground cables	.48
Operating underground conduit	.51
Rental of attachments	.14
Trimming	10.63
Patrolling	2.03
Repairing	2.84
Stock room expense	1.00
Recording and billing expense	.22
Total	$48.96

Corresponding expenses for series incandescent lamps average $12.98 per unit and for multiple lamps, $15.59.

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Present Selling Policy is Chief Topic at Meeting of Electrical Jobbers.

The Central Division of the Electrical Supply Jobbers' Association held a two-day session, April 20 and 21, at Excelsior Springs, Mo., with an attendance of 50 from the leading supply houses in that district. A. J. Selzer, of Chicago, Ill., named chairman of the division at the Detroit meeting of the national association, presided. The chief topic of the meeting was that of the proper selling policy under the conditions of advancing prices of materials. There was a consensus of opinion that the present prices of finished articles, based on the cost of replacing them on the shelves, represented the full values, and probably would be much lower than prices that might prevail later if the advances in the cost of manufacture continued.

The program Thursday morning was opened by an illustrated talk by N. G. Harvey on "Selling Policy." He pointed out the rapid increase in the costs of materials during the past few months. F. M. Bernardin, talking on the same subject, gave statistics on the advances in the costs of materials and of manufacture. The subject "Supply—How It Affects a Selling Policy," was discussed by W. W. Low and H. P. Andrae, who went into even more detail than the previous speakers as to the shortage of supplies. Friday morning's session was devoted to other phases of the marketing problem. The first paper was by H. L. Grant, on "Co-operation." He discussed the need of closer co-operation among jobbers and retailers that the facts of the war situation might be more clearly and generally understood, and that a demoralization of the market and prices might be avoided, a demoralization that might seriously affect the distribution of electrical equipment and mechandise. S. E. Kennedy talked on "The Abuse of the Cash Discount."

There were expressions, in the discussions which followed the papers, and among the members, of confidence in the business outlook, which was advanced as a clinching reason for not making sacrifices of proper profits by selling goods below the cost of replacement.

The Central Station in Small Cities.

At the joint meeting of the Chicago Section, American Institute of Electrical Engineers, and the Electrical Section, Western Society of Engineers, held on the evening of Monday, April 24, the subject for discussion was the central station in cities of less than 50,000 inhabitants.

The first speaker was Albert J. Goedjen, of the Merchants' Heat and Light Company, Indianapolis, who contrasted the conditions in large and small cities, and pointed out the reasons for failure in the latter in so many instances. The local capitalists instituting such ventures are often without experience in the business, and practice is far from being standardized, various voltages, frequencies and numbers of phases being used. An example was given of replacing a small generating station by a transmission line connecting to a larger plant.

A. Hardgrave, of the Middle West Utilities Company, showed the importance of the load-factor and diversity-factor with respect to supplying small communities from a large distribution system, and pointed out how the central station in small cities is handicapped by an inexperienced staff, by low density of population, low load-factor, small revenue per customer, and the necessity for keeping the investment low. Conditions are improved by grouping towns on transmission systems.

Adam Gschwindt, of the Rockford Electric Company, described the requisite qualifications for a good manager, which include judgment, diplomacy, mental bravery, etc. The aim of the manager should be to give perfect service.

R. L. Fitzgerald, city manager of Winnetka, Ill., pointed out the duties and qualifications of a city manager, which largely involve engineering matters. The papers were discussed by Messrs. Hatch, King and Junkersfeld.

Mr. Junkersfeld also told of the work of the Industrial Preparedness Committee, which has been organized by the Naval Consulting Board, and Mr. Grant presented the Octave Chanute medal in mechanical engineering to H. E. Goldberg.

Dallas Utility Election to be Contested.

As acting head of the city, the mayor of Dallas, Tex., has been officially notified that the recent election, at which electric-lighting and street-railway franchises were passed and a $500,000 bond issue for a municipal plant voted, will be contested by the Stone & Webster Management Association, as managers of the Dallas Electric Company.

Claim is made that voters were allowed to cast their ballot after the legal closing hour; that the election was not in accord to the city charter; and that the amendments did not receive votes equal to a majority of the qualified voters in the city.

The mayor has stated that the matter is being considered by the city attorney and that the city will pursue its proper legal course. He feels that the election was legal and maintains his stand that the franchises will be put into effect. No official action, however, has yet been taken by the city.

Independent Electrical Jobbers Elect Officers.

The annual meeting of the Metropolitan Independent Jobbers' Association was held at its quarters in New York City on Monday evening, April 10, 1916, with C. P. LaShelle, presiding. There was a remarkably large attendance of members, and also of representative independent jobbers from Chicago, Boston, and other cities. All those attending the meeting expressed enthusiasm over the success of the Association, and what it had accomplished during the past year. Important plans were made for the coming year, and there was exhibited every evidence of even greater co-operation among the independent jobbers, than during the successful year just closed.

The following officers were unanimously chosen for the ensuing year:

President, C. P. LaShelle.
Vice-president, L. D. Baily.
Treasurer, Meyer Zucker.
Secretary, Meyer Rutkin.

Electrified Oat and Potato Crops.

Miss Dudgeon, of Dumfries, Scotland, has for some years conducted important experiments observing the effects of electricity upon the growth of potato and oat crops. Most satisfactory results were experienced with the potato crops in three successive years, the increased yield per acre with electricity being 1,204 pounds in 1912, 1,456 pounds in 1913, and 2,576 pounds in 1914.

In oats the difference was most conspicuous right from the beginning of the experiment, and the electrically treated crops suffered less than others from the drought which prevailed. The difference amounted to 31 per cent in grain and 31 per cent in straw in favor of electricity. The Dumfries' experiments prove that under the influence of the electric discharge the ingredients in the soil ar more soluble and more easy of assimilation; that by t aid of electric current sap is enabled to flow mc vigorously and the formation of sugar and starch increas also that respiration, absorption and evaporation are celerated.

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Miscellaneous NEWS NOTES

Lectures on Thermoprotection.—Sidney N. Baruch, chief electrical engineer of the Baruch Electric Controller Corporation, San Francisco, Cal., an authority on thermoprotection of electrical apparatus and thermoelectrostatic protection of cables, lectured on these subjects April 18 at the University of California.

Wireless Patents Sustained.—The Italian courts have sustained the priority of invention by Alessandro Artom of the triangular dirigible aerials and the radiogoniometer as set forth in Italian patents Nos. 88,765 and 88,766, German patent No. 203,139 and French patent No. 378,186. Priority in the case of the radiogoniometer was claimed by Bellini and Tosi.

Thieves Steal Copper.—Sensing the high value of copper, thieves at Lynn, Mass., removed 3,600 feet of feed wire serving a pumping station, a stretch of 12 poles being stripped. The wire was the property of the Lynn Gas & Electric Company and was valued at $870. The line carried 2,300 volts, and it evidently was removed by men who were able to take the necessary precautions.

Youngstown Plant Short-Circuited by Kite.—The Lowellville plant of the Consolidated Gas & Electric Company, Youngstown, O., was out of commission for a quarter of an hour a few days ago as a result of a kite-string breaking. The kite fell across the wires and caused a short circuit, interrupting service in various parts of the city for about fifteen minutes.

Long-Distance Cable to Havana.—Announcement has been made by the American Telephone & Telegraph Company, that soon after the long-distance telephone line has been completed to Key West Fla., the next step will be the laying of a submarine cable between Key West and Havana. When the work has been completed the Cuban capital will be provided with direct long-distance telephone connection with the Bell system in this country.

Contracts Declared Invalid by State.—Nine contracts inherited by the Richmond (Ind.) municipal plant through the purchase of the electric plant of the Richmond Light, Heat & Power Company were declared invalid by the Indiana Public Utilities Commission. These contracts were entered into prior to the establishment of the Commission, and were, for the most part, rate agreements lower than the printed rate schedules of the company. These patrons must accept regularly established rates.

Ohio Companies Consolidate.—The Lorain County Electric Company, Elyria, O., has purchased the electric properties of the Ely Realty Company, the Elyria Milling & Power Company and the Citizens Gas & Electric Company, all of Elyria. During the past three years the business of the Lorain company has been conducted first in the name of George E. Milligan, and later in that of R. E. Burger, Agent. These trade titles have been displaced and the properties will be operated under the name of the Lorain County Electric Company, of which J. B. Johnson is general manager.

New Research Laboratory at M. I. T. Contains Unusual Equipment.—The Electrical Research Laboratory at the new Massachusetts Institute of Technology, Cambridge, Mass., will be situated under the central dome and in the east extension. Its equipment will include the finest collection of artificial electric conduction lines in the world. There will be a 2,000-Nautical mile artificial submarine cable, corresponding in character to usual under-water telegraph cables, a 2,500-mile long-distance aerial telephone line, a 35-mile artificial telephone submarine line and two artificial power transmission lines 800 miles in length. The laboratory will have a number of measuring devices of unusual type, and a large amount of specially built research apparatus.

Manufacture of Chemicals by Electricity Described.—J. W. Beckman, electrochemical engineer with the Great Western Power Company, San Francisco, Cal., presented a paper before a recent meeting of the company section of the National Electric Light Association describing in detail the manufacture by electrical means of caustic soda and bleaching powder from sea salt and limestone as contemplated in the half-million dollar plant under construction at Pittsburg, Cal.

Canadian Pacific to Electrify in British Columbia.—The Canadian Pacific Railway is considering a plan to electrify its lines through the mountains on the British Columbia division, according to a statement made by Grant Hall, vice-president and general manager of the western lines. Ability to haul heavier loads with greater speed over the mountains, to master snow and cold, to effect economies in operation and to travel longer distances without overhauling were some of the arguments in favor of electrification given by Mr. Hall.

Edison Company of Boston Largest City Taxpayer.—The Edison Electric Illuminating Company of Boston continues to be the city's largest taxpayer, this year being assessed for $25,407,800, $7,157,800 being on real estate and $18,250,000 on personal property, the tax bill being $457,340, compared with $420,563 last year. The Edison company for several years has paid the largest personal property tax, but not until 1913 did it take front rank as the largest corporation taxpayer. The tax of the New England Telephone & Telegraph Company has more than doubled in the past three years, due to real estate holdings.

Public Utilities Discussed at Kansas City.—The first of a series of monthly dinners at which civic problems are to be discussed was held April 20 by the Real Estate Board of Kansas City, Mo., the subject being "Public Utilities." The chief speaker was Frederick C. Howe, Commissioner of Immigration at the Port of New York, whose subject was "Municipal Ownership." Mr. Howe declared himself in favor of municipal ownership of public utilities. E. M. Stevens, consulting engineer of the Kansas City (Kans.) municipal electric-lighting plant, gave a description of that plant and its operation.

Possibilities of Telephony Outlined at Boston.—J. J. Carty, chief engineer of the American Telephone & Telegraph Company, was the guest of a reception at Symphony Hall, Boston, April 19, when 1,500 employees of the New England company met and heard this distingushed telephone expert. Mr. Carty described some early experiences with the telephone and predicted that the time will come when it will be possible to talk around the world by wireless telephony. A demonstration between Boston and Tokyo is not far distant. Instead of reducing the use of wires, wireless will increase it, as it will not be possible for all mankind to use the air as one conductor. The real function of wireless will be between ships and with the shore, he thought.

County Held as a "Municipality."—The Board of Public Utility Commissioners of New Jersey has decided a novel issue in connection with the status of a county as considered with a municipality, holding that a county is a municipality within the meaning of the limited franchise act of 1906 of the state. The board accordingly has withheld approval of an ordinance granted by the Board of Freeholders of Middlesex County granting the New York Telephone Company permission to construct and operate a line across Park Avenue, near the Metuchen road, on the ground that the company in obtaining the municipal consent failed to comply with the provisions of the limited franchise act, which requires notice and a public hearing before the granting of a franchise.

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Cleveland's New Street-Lighting Installation

Nitrogen-Filled Lamps in Specially Designed Antique Lanterns Used with Marked Success in Business District—Initial Cost Is $228 per Unit

The rapid extension of Cleveland's business district developed a demand for greater and more ornate lighting on streets which formerly had been used for residential purposes. Upon investigation it was deemed advisable to change the entire down-town lighting system. The question then arose as to what type of illuminant to choose and the style of globe or fixture in which it should be installed. The gas-filled tungsten was finally decided on for the following reasons:

First: Simplicity and reliability. There are no moving parts or intricate mechanisms to get out of order. With series transformers located near the lamp standard a break in the lamp circuit or lamp burn-out does not open the main circuit, but allows the remaining lamps to burn. The series transformer allows the use of a safe low voltage up the standard to the lamp.

Second: Uniform, unwavering illumination of high intensity on the streets and side walks. The system also furnishes adequate illumination for the lower portions of buildings without clashing with sign or window lighting.

Third: Low first cost per unit and estimated reasonable operating cost; unskilled labor being used for cleaning and lamp renewing.

The standard and lantern were designed especially for Cleveland, and have a pleasing and artistic daylight as well as night appearance. Ideas used by the Egyptians and Romans were incorporated in the design of the lantern; it has also some points of similarity to the lanterns used in the thoroughfares of ancient London. Mechanically it is constructed of heavy sheet copper, it being possible to renew independently any one panel of glass in case of breakage. One of the panels is hinged, allowing access to the interior for cleaning and renewing lamps. The over-all dimensions of the lantern are approximately 20 inches diameter by 30 inches in length. The column brings the light source about 15 feet from the ground.

The lamp is supported vertically, tip down, a Holophane refracting glass band surrounding the bulb from 25 degrees below to 30 degrees above the horizontal. This band diverts into useful directions light from the lower hemisphere which would produce glare and light from the upper hemisphere which might detract from sign lighting.

The standards are built with a cast-iron base, fluted-steel column and cast-iron capital, all of which are firmly held together by three one-inch tie rods. The shaft is thoroughly galvanized and guaranteed by the manufacturer for 20 years.

Lamps of 1,000 and 1,500 candlepower, 20 amperes, were used, the higher candlepower being used on the larger and more important streets. The spacing is 80 to 90 feet, standards being set opposite each other on each side of the street.

Alternating current from 4,000 to 5,000 volts is stepped down by individual transformers, placed in a manhole built near the base of the standard, to 20 volts, being that required for the lamp. These transformers are so designed that the maximum voltage created in the secondary when open is 110, which makes the installation very safe for lamp trimmers and in case of street accident. The primary cables are lead cased and carried through the

Night View of Cleveland Business Street Equipped with New Street-Lighting Units.

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Euclid Avenue, Cleveland, Equipped with 1,200-Candlepower Type C Lamps in Special Lanterns.

streets in separate duct lines built just for this purpose.

The circuits are planned for 50 units in series. Each is supplied from a 6.6-ampere constant-current regulator, through the usual type of plug switching panels.

Though the installation is not fully completed, from the 630 standards so far installed the following cost figures have been derived. The entire equipment, including standards, lanterns, series transformers, ducts, manholes, cables and substation equipment cost $114,867.97 or $182.33 per unit. Adding to this the demand proportion of the main station and cables, brings the total initial investment chargeable to the "White Way" system to $142,167.97 or $225.66 per unit. Differentiating this for the 1,000-candlepower and the 1,500-candlepower units, the initial cost becomes $228.05 and $233.27, respectively.

During the limited time that the system has been in operation the results so far obtained show an operating maintenance cost for 2,000 hours annual burning service, of $47.49 for the 1,000-candlepower units and $55.56 for the 1,500-candlepower units. These figures include only the cost of lamp renewals, based on an estimated life of 1,000 hours burning and electricity at one cent per kilowatt-hour.

Consolidation Plans of New England Power Companies.

At a recent hearing at Boston before the Massachusetts Gas and Electric Light Commission on the petition of the Connecticut River Transmission Company and New England Power Company for consolidation, Henry I. Harriman, representing these two affiliated companies, which generate and distribute hydroelectric energy throughout central New England, stated that in the whole system there is about 3,500,000 pounds of copper, which if bought today, would cost about $500,000 more than when purchased. Steel transmission towers, 1,850 in all, which were purchased for $100 to $140 each when erected, now would cost at least $210 each. Mr. Harriman said he did not expect to see copper go back to 12 or 13 cents, but that a price around 20 cents is probable for the next five or six years.

Costs of the power company's four plants on the Deerfield River, in western Massachusetts, exclusive of lines, averaged less than $100 per installed horsepower. The cost of the 54 miles of lines first constructed averaged about $13,000, while the 127 miles of "new lines" cost an average of $11,000 per mile. The latter were built 10 towers to the mile, while earlier construction was with 14 per mile.

Comparative costs of transmision lines in various parts of the country were given as follows:

	Cost per Mile.
Keokuk Dam-St. Louis, 144 miles (involving heavy right-of-way costs)	$19,000
Big Creek to Los Angeles, 241 miles	17,000
White River to Seattle, Wash., 8 miles	18,000
Line from Montreal, Quebec, 5 miles	14,300
Turners Falls to Springfield, Mass., 43 miles	13,400
Average cost of Conn. River Trans. Co. lines	11,500
Average for the country, about	15,000

Recent expansion of the system was in the direction of tide water, a line being built from the Massachusetts-Rhode Island boundary to Pawtucket and Providence, where two steam plants are tied in, giving the system the benefit of efficient steam generation at seasons of low water, these plants taking power from the Transmission-Power Company at seasons of high water. The plants connected are those of the Narragansett Electric Lighting Company and the Blackstone Valley Gas & Electric Company. It was stated that the Power Company contemplated building a steam plant on Long Island Sound, but instead may contract with existing stations.

The proposal is to bring about a consolidation of all the companies in the system as opportunity offers. The total amount of securities is $26,261,000, the New England Company being the holding company for the system. By consolidation of the properties in Massachusetts outstanding securities will be reduced by $1,300,000, the stock of the Transmission Company now held as collateral for bonds of the Massachusetts Company, a holding company, to be retired.

The Transmission Company has $1,195,000 common stock and no bonds. It is proposed to reissue this stock, in the consolidation, in the form of $1,000,000 common and $195,000 preferred stock, and to issue securities amounting to $3,219,000 to acquire, by the New England Power Company—the new consolidated corporation—the "new lines" built and now owned by the New England Company.

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Electricity in the Manufacture of Gears

A Description of the Process Involved and the Machines Used in Manufacturing Raw-Hide Gears, With Data on the Motor Equipment of a Typical Plant

Industrial Power Series—Article No. 162

In this article the electric motor equipment of the New Process Gear Corporation is described, and the principal manufacturing processes outlined to illustrate the motor applications. This company manufactures "New Process" raw-hide gears, cut gears of steel and gears for automobiles. The gears cut include spur, bevel and internal types, in sizes up to 60 inches in diameter for spur gears; planed gears of 50 inches in diameter and under, and generated bevel gears from three to 12 pitch up to 18 inches in diameter. The plant contains over 200 special machines, including automatic and engine lathes for turning blanks from bar stock, castings and forgings; milling and hobbing machines, for spur, spiral and helical teeth; rotary cutters and planers for blocking out bevel teeth; Gleason generators for finish cutting bevel-gear teeth; Fellows planers for planing spur and internal gears; grinders for truing the bores of hardened steel gears; drilling, boring and milling machines; power presses, etc.

Both group and individual drives are used. The motors are squirrel-cage induction machines operating on a three-phase, 440-volt, 25-cycle system of distribution, the service being supplied by the Syracuse Lighting Company. The first process in the manufacture of raw-hide gears is the preliminary treating of the raw hides, where the thickness is reduced to about one-sixteenth of an inch. The suitable portions of the hides are blanked out into disks by three power punches and a disk cutter, group drives by a 10-horsepower motor operating at 1,725 revolutions per minute. This motor also drives a band saw. The disks range from 1.75 to 36 inches in diameter, as determined by the size of the gears to be cut from them.

Disks are then dipped into a vat of special glue, assembled between steel and blocks into a blank about 10 inches long, after which they are subjected to hydraulic pressure varying from one to 15 tons, depending upon the size of the disks. This process squeezes out the surplus glue and the blank is kept compressed for several days by drawing up nuts on surrounding stay bolts terminating in the metal end blocks. The outer diameter is turned in lathes and the blank sawed in pieces corresponding to the width of the gear face desired. The necessary turning, drilling, etc., are done by a group of machines consisting of 15 engine lathes, four small drill presses, and six Baker drills. These machines, together with a grinding machine and a tool grinder are group driven by a 20-horsepower motor operating at 1,735 revolutions per minute. The teeth are cut by four Brown & Sharpe gear cutters and a Prentiss gear cutter. These machines, together with six small engine

Group of Punches in Raw-Hide Department of Gear Factory, Driven by 15-Horsepower Motor

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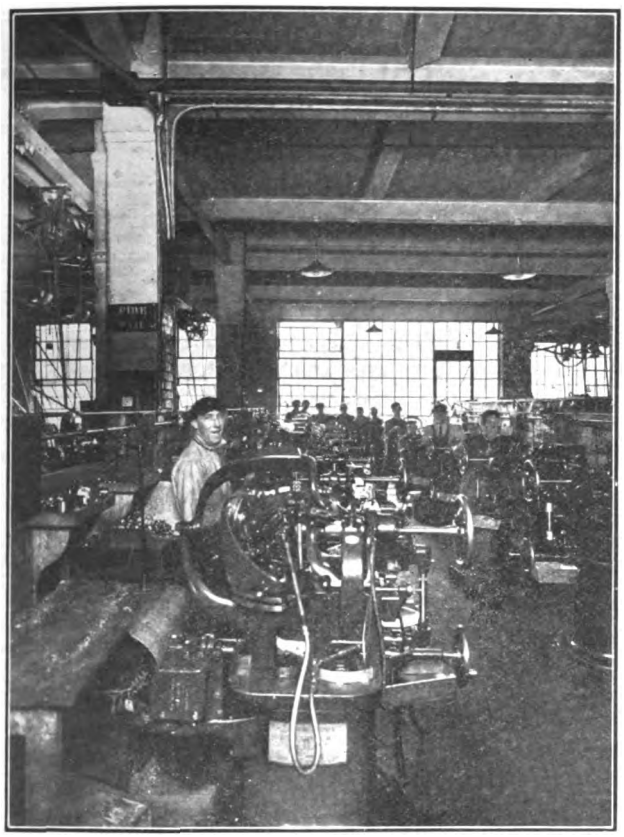


Group of Small Gear Machines.

lathes, are driven by a 10-horsepower motor operating at 1,735 revolutions per minute. In this department there are seven broaching presses for forming square centers in gears, which are driven by a 10-horsepower motor with a speed of 1,725 revolutions per minute.

In the metal gear-cutting department there is an interesting individual motor installation consisting of 14 small gear-generating machines each driven by a two-horsepower motor through gearing. The starters are of the drum type and mounted on the machines in close proximity to the operator. The gear-generating machines are interesting, as the work done is entirely automatic. The gear blanks with the rough-cut teeth are placed in the machines and are cut to proper shape, the gear revolving the distance of one tooth as fast as each tooth is finished. As far as possible the work in the various departments is turned out on automatic machines. The accompanying motor data sheet enumerates the machines used together with the horsepower and the characteristics of the motors driving them.

Advantages of Motor Drive.

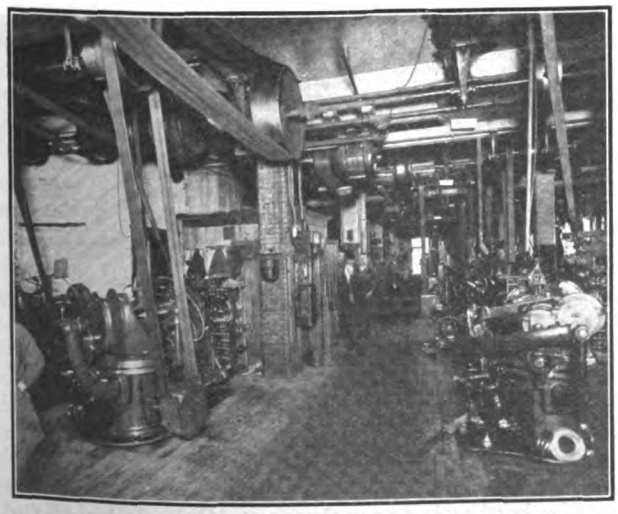
Within the last few years electric power in manufacturing establishments has become the rule rather than the exception, as it is realized that there is no problem of more vital interest to the manufacturer than that of obtaining a cheap, reliable, simple and continuous source of energy. This question is often the dominating factor in determining the location of a manufacturing plant.

There are many well-lighted, well-ventilated and easily accessible locations for shops and factories which would serve admirably for manufacturing purposes if power facilities were at hand. The electric motor sets aside the limiting features entirely and affords 24-hour service.

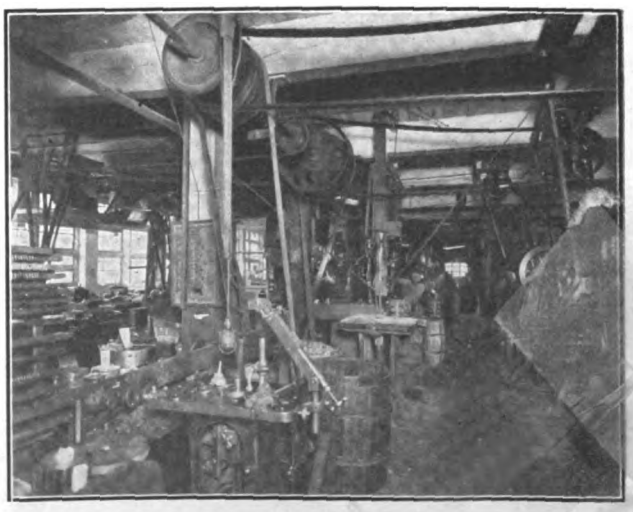
With the electric motor deriving its energy from a central station, there is a great deal of flexibility in the matter of power. All of the customers are never using the maximum at the same time and pay only for the actual energy used. Take the case of a circular saw, the power demand of which, under maximum working conditions, is five horsepower. If the manufacturing is of such a nature that the saw is used but intermittently, then where electric motor drive is used, electric energy would be charged for only in proportion to the work the saw performed. This argument applies to machinery of all classes. It is immaterial whether the manufacturing is carried on in the basement, first, second or third floors; one place is as acceptable as another for electric power. Where mechanical power is used, the manufacturer is dependent on the operation of an engine with the attendant shafts and belts. If any of these elements give out work must be suspended until repairs are made.

In the case of motor-driven machinery the problem is entirely different, as central-station service insures continuity of service. Another feature to consider is that the preparation of raw material in many industries occurs only through a part of the working day, and where mechanical drive is employed long shafts and belts must be operated uselessly for the other portions of the day. When such conditions exist it is difficult to determine whether the machinery is working at its best advantage or not, and whether there are any undue friction loads developing. With motor drive it is easy to determine from time to time the amount of power consumed when the machines are running light, and if this amount shows a perceptible increase at any time it indicates at once that there is undue friction which can be easily located and the necessary alterations or repairs made. This in itself is a valuable feature of electric drive, as it is often the means of discovering the abuse of the machines by the operatives.

The application of motors for driving machine tools in a manufacturing establishment may be divided into four



Group of Gear Generating Machines Driven by 25-Horsepower Motor.



Miscellaneous Machines in Rawhide Department, Motor-Driven.

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classes: (1) Group drive at a constant speed. (2) Individual drive at a constant speed. (3) Individual drive at an adjustable speed. (4) Cranes, hoists, elevators, etc. The selection of the type of motor and the question of groups of individual drive depends upon the number of factors, viz., nature of the work, size or location of machine tool, percentage of time that machine is in operation.

In determining on the motor outfit for operating machine tools, one of the most difficult questions to decide is that of group or individual driving, and the most general solution is a combination of these two methods. The ideal method, and the one coming more and more into general use, is to have the motor form an integral part of the machine. This method entirely eliminates belting and shafting, both main-line and jack shafts. The saving in cost of these mechanical transmission parts partially compensates for the installation of motor and controller.

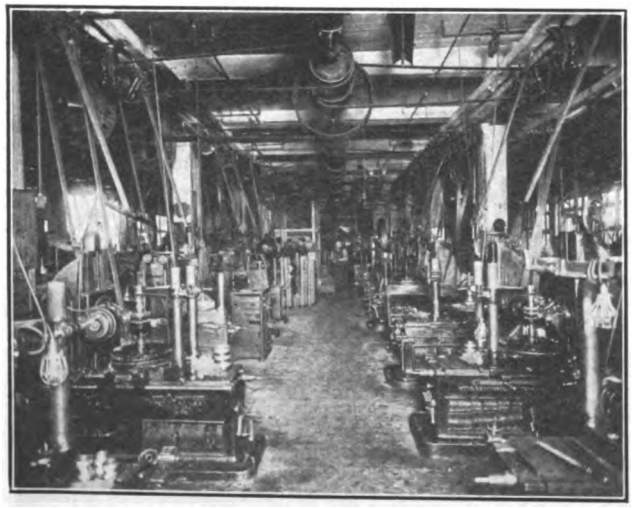
The slip of belts introduces an uncertain factor in power supply which is entirely absent with individual motor drive. Furthermore, with individual motor drive the power delivered to the driven machine is automatically controlled and, in case of heavy demands, may greatly exceed the rated power of the motors, even for considerable periods of time. Thus a motor-driven machine is always capable of maximum production, while with belt drive and poorly adjusted belts the machine frequently balks before the full capacity of the machine is reached.

The even and easily manipulated speed control of machines individually driven increases their productive capacity to a very material extent.

The advantages of individual motor drive may be summed up as follows:

(1) Better control and greater range in speed and closer speed regulation. The average increment of speed increases in a belt-driven machine tool is about 50 per cent. In an adjustable-speed motor it is 10 per cent to 20 per cent.

(2) Increased output and decreased cost of production, due in part to increase in amount of power available in motor over that transmitted by belts.



Spur-Gear Cutting Machines Driven by a 35-Horsepower Motor.

(3) Increased light and cleanliness by elimination of dust and belting.

(4) Greater economy in transmission, especially when tools are running only part of the time, as there is no loss due to driving belts and shafting when the tools are idle.

(5) Reduced cost of repair and maintenance, owing to absence of shafts, hangers, pulleys and belts.

(6) Head room for cranes.

(7) More economical disposition of floor area and more convenient location of tools. Machines can be placed to best possible advantage with regard to light and sequence of operation. Additional tools can be readily added to equipment or location changed without any changes which are necessary in shafting when belt-driven tools are employed.

(8) Use of portable tools which permits of bringing one or more tools to the work and thus performing several operations at the same time.

(9) Reduced cost of buildings, as absence of shafting simplifies construction.

(10) Reduced cost in installation in many cases, especially for tools in isolated positions where expensive shafting and hangers would exceed cost of applying individual motors.

(11) Greater reliability and steadiness of power and freedom from stoppage of a number of tools, as in the case of a hot bearing or broken belt. Only the tool affected need be stopped.

MOTOR DATA.

New Process Gear Corporation, Syracuse, N. Y. Service from Syracuse Lighting Company; 440-volt; 3-phase; 25-cycle motors. Standard pulleys.

No.	Horse-power	Speed r.p.m.	Application
1	35	1735	Hand milling machine, small engine lathe, 30-inch engine lathe, 18-inch engine lathe, nine small boring mills, six hand turrett lathes.
1	35	1735	Four medium engine lathes, one grinding machine, eight milling machines, vertical grinding machine.
1	10	1720	Landis grinding machine.
1	10	1720	Landis grinding machine.
1	55	1735	Fourteen grinding machines.
1	35	1735	Thirteen Gleason gear generators, two shapers, large Gleason gear generator.
1	35	1725	Sixteen Gleason gear generators.
1	35	1725	Ten Gleason gear generators.
1	25	1735	Three Gleason gear generators, two Gould & Eberhardt gear shapers, grinding machine.
1	35	1735	Seventeen Gleason gear generators.
1	35	1735	Sixteen Gleason gear generators.
1	35	1735	Nine Gleason gear generators, seven Gould & Eberhardt blockers.
1	35	1735	Seventeen spur-gear cutting machines.
1	35	1735	Seventeen spur-gear cutting machines.
1	35	1725	Sixteen spur-gear cutting machines.
1	25	1725	Five Fellows gear shapers.
1	25	1735	Six vertical milling machines, five Landis grinders, screw threading machine, two Lucas presses.
1	35	1725	Grinder, twelve multiple drills, seven gear testing machines, nine large multiple drills.
1	10	1725	Three power punches, disk cutter, band saw.
1	20	1735	Fifteen medium engine lathes, four small presses, grind stone, six Baker drills, grinder.
1	35	1735	Seven broaching presses.
1	10	1725	Six small engine lathes, four B & S Gear cutters, Prentiss gear cutter.
1	10	1730	Three frog machines, two thread milling machines.
1	35	1725	Ten turrett lathes.
1	35	1735	Fourteen turrett lathes.
1	35	1735	Twenty-five turrett lathes.
1	25	1725	Four automatic screw machines, tool grinder.
1	25	1725	Six Automatic screw machines.
1	35	1725	Sixteen turrett lathes.
1	25	1735	Four turrett lathes.
1	25	1735	Two turrett lathes, five automatic screw machines.
1	25	1725	Seven automatic screw machines, four turrett lathes.
14	2	.....	Fourteen small gear generators.
1	20	1735	Fourteen gear generators.
1	25	1735	Ten automatic screw machines.
1	25	1725	Ten automatic screw machines, turrett lathe.
1	60	1725	Six gear facing machines, multiple drill, eight turrett lathes.
1	15	1725	Seven Automatic screw machines.
1	15	1725	Four cut-off saws, power hack saw.
1	25	1735	Ten Gleason gear generators.

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Arrangements for Big N. E. L. A. Convention

Preparations for the great annual convention of the electricity supply men, with their thousands of allies and friends (counting the ladies as both allies and friends), are proceeding with great vigor and enthusiasm, both in Chicago, where the convention is to be held, and in New York, which is the headquarters of the association.

President E. W. Lloyd, of Chicago, is busily at work, and back of him is a general convention committee, of which Samuel Insull is chairman and Louis A. Ferguson is vice-chairman. In the New York office, Secretary T. C. Martin and his corps of assistants are as busy as the proverbial bees in pre-convention activity.

REMEMBER THIS

Event: Annual convention of the National Electric Light Association.

Time: May 22 to 26 (inclusive), 1916. Sessions Daily.

Place: Auditorium and Congress Hotels, Chicago

Preparations: Biggest Ever

The convention headquarters in Chicago will be in the Auditorium and Congress Hotels on Michigan Boulevard, overlooking Lake Michigan. According to the present plan there will be four convention halls, two in each hotel, so that four sections can meet simultaneously. The hotels face on Congress Street, as well as on Michigan Boulevard, and are connected by a marble-lined tunnel underneath Congress Street, so that visitors can proceed from any part of one of the large hotels to any part of the other without street wraps, in any stress of weather.

The exhibition of electrical appliances, in charge of the exhibition committee, of which J. Perry, of New York, is chairman and H. J. McConnaughy, of 229 Broadway, New York, is secretary, will be held in the large Auditorium Theater, which is in the same building as the Auditorium Hotel. The seats in the theater will be roofed over with a temporary floor and the exhibit booths will be placed here. Convention headquarters, registration booths, and the numerous other convention activities will be placed in the ante-room and foyers of the Auditorium Theater.

Committee reports and papers of the utmost value to the central-station industry will be presented at this convention. The program of papers is appended herewith.

Registration and transportation arrangements are announced in a "general information" circular issued from the New York office of the Association. The hotel committee has issued a circular giving a schedule of the principal hotels in Chicago, with their rates. This circular also contains a map of the central portion of Chicago, with convention headquarters and railroad terminals indicated. There will be three special trains, one from New York and Boston, via Buffalo and Cleveland; one from New York and Philadelphia, via Pittsburgh, and one from St. Louis. G. A. Freeman is master of transportation and E. A. Edkins is chairman of the hotel committee. Both may be addressed at 72 West Adams Street, Chicago.

A special registration circular has been prepared for the local Class B members by O. R. Hogue, chairman of the local registration sub-committee of the general convention committee. The circular gives instructions to the local Class B members—that is, the Class B members of the N. E. L. A. who reside in Chicago and its immediate vicinity—in relation to advance registration. Every effort will be made this year to make the registration, both of out-of-town and local members, as easy and as expeditious as possible. As an attendance of 5,000 is expected, this is a considerable undertaking in itself.

The entertainment committee of the general committee, of which Homer E. Niesz, 72 West Adams Street, Chicago is chairman, is not quite ready to announce its plans. It hints knowingly that it has something pretty clever up its sleeve. However, there will be the usual opening reception, a grand rejuvenation of the Jovian Order, automobile rides, an afternoon tea for the ladies, and some other big "stunts," which can only be hinted at vaguely at the present writing.

A special effort will be made to make the convention a memorable one for the visiting ladies. The ladies' auxiliary committee promises a very warm welcome to the women visitors.

A feature will be the visits to local industry points of interest. One committee, of which W. L. Abbott, 72 West Adams Street, is the chairman, is giving all its attention to this matter.

Tentative Program.

The program herewith indicates that a large amount of important business now arranged carries over until Friday, to say nothing of what may possibly develop in the meantime. There are three special new features of the program this year. In the first place, three sessions are occupied by the new Electric Vehicle Section, and in the second place two are devoted to the new Company Section Committee which is doing splendid work in the development of this branch of Association usefulness. The third item of change is that the Public Policy meeting will not be a big spectacular affair this year, but an executive session, open only to Class A operating companies and their representatives, to discuss and determine the inner matters of management and outer aspects of relationship to regulatory bodies. It will be noted that there are many new items on the program evidencing the broader and newer conditions of the industry. A more attractive program was never presented to the membership than that which follows:

TUESDAY, MAY 23, 10 A. M.

First General Session.

1—Welcome to the City—Mayor Thompson; 2—Address of President Lloyd; 3—Announcements; 4—Report of Committee on Organization of the Industry (Membership)—George Williams; 5—Report of the Secretary—T. C. Martin; 6—Report of Insurance Expert—W. H. Blood, Jr.; 7—Report of Committee on Progress—T. C. Martin; 8—Report on *Question Box*—S. A. Sewall; 9—Report of Committee on Relations with Educational Institutions—J. F. Gilchrist; 10—Report of Committee on Company Sections—F. J. Arnold.

TUESDAY, 2:30 P. M.

First Technical and Hydro-Electric Session.

1—Chairman's Address—Holton H. Scott; 2—Report of Committee on Meters—C. G. Durfee; 3—Report of Committee on Electrical Measurements, Values and Terminology—A. E. Kennelly; 4—Paper: *Lightning Protection for Transformers*—D. W. Roper.

TUESDAY, 2:30 P. M.

First Accounting Session.

1—Chairman's Address—H. M. Edwards; 2—Election of Nominating Committee; 3—Report of Executive Committee; 4—Report of Membership Committee—E. J. Allegaert; 5—Report of Committee on Classification of Accounts—Wm. Schmidt, Jr.; 6—Report of Committee on Cost Accounting and Statistics—T. J. Walsh; 7—Report of the Library Committee—Alex Holme.

TUESDAY, 2:30 P. M.

First Commercial Session.

1—Chairman's Address—J. F. Becker; 2—Report of Committee on Finance—E. A. Edkins; 3—Report of Committee on Membership—H. N. McConnell; 4—Report of Committee on Publications—C. A. Littlefield; 5—Report of Committee on

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Salesman's Hand Book—M. S. Seelman; 6—Report of Committee on Education of Salesmen—F. R. Jenkins; 7—Paper: *The Way to Make a Salesman*—Earl E. Whitehorne; 8—Report of Committee on Merchandising and Recent Developments in Electrical Appliances—W. G. Stetson.

TUESDAY EVENING, 8:30 P. M.

Second General and Executive Session.

1—Report of Committee on Public Policy—W. W. Freeman; 2—Report of Committee on Taxation of Public Utilities—John A. Britton.

WEDNESDAY, MAY 24, 10 A. M.

Second Accounting Session.

1—Report of Committee on Form of Annual Report—C. H. Hodskinson; 2—Report of Committee on Customers' Records—E. J. Fowler; 3—Report of Committee on Purchasing and Storeroom Accounting—H. F. Frasse.

WEDNESDAY, 10 A. M.

Second Commercial Session.

1—Report of Committee on Wiring—R. S. Hale; 2—Report of Committee on Lamps—Frank W. Smith; 3—Report of Committee on Electric Ranges—W. R. Putnam; 4—Election of Committee on Nominations.

WEDNESDAY, 10 A. M.

Third General and Executive Session.

1—Report of Treasurer—W. H. Atkins; 2—Election of Committee on Nominations; 3—Report of Committee on Rate Research—Alex Dow; 4—Report of Committee on Constitution and By-Laws—R. S. Orr; 5—Report of Committee on Geographic Sections—Louis D. Gibbs; 6—Address: *The Society for Electrical Development*—J. M. Wakeman.

WEDNESDAY, 10 A. M.

First Electric Vehicle Session.

1—Address of Chairman—Walter H. Johnson; 2—Report of Secretary—A. Jackson Marshall; 3—Report of Treasurer—H. M. Edwards; 4—Report of Section Activities—Secretary Marshall; 5—Report of Committee on Membership—Joseph D. Israel; 6—Report of Committee on Standardization—E. R. Whitney; 7—Report of Committee on Motion-Picture Films—Carl H. Reed; 8—Report of Committee on Traffic and Good Roads—A. H. Manwaring; 9—Report of Committee on Insurance—Day Baker; 10—Election of Nominating Committee.

WEDNESDAY, 2:30 P. M.

Second Technical and Hydro-Electric Session.

1—Report of Committee on Underground Construction—E. B. Meyer; 2—Report of Committee on Overhead Line Construction and Inductive Interference—R. J. McClelland; 3—Report of Committee on Hydro and Transmission Progress—T. C. Martin.

WEDNESDAY, 2:30 P. M.

Third Commercial Session.

1—Report of Power Sales Bureau—C. J. Russell; 2—Paper: *Central Station Service in the Manufacture of Artificial Ice*—C. J. Carlsen; 3—Report of Committee on New Industrial Applications of Electricity—P. Torchio; 4—Report of Industrial Electric Heating Bureau—C. J. Hirshfeld.

WEDNESDAY, 2:30 P. M.

Second Electric Vehicle Session.

1—Report of Committee on Garages and Rates—George B. Foster; 2—Report of Committee on Legislation—P. D. Wagoner; 3—Report of Committee on Federal and Municipal Transportation—James H. McGraw; 4—Paper: *Industrial Truck Applications*—C. W. Squires; 5—Paper: *Electric Truck Problems and How to Minimize Them*—F. E. Whitney; 6—Paper: *The Relation of Tires to Electric Vehicle Efficiency*—S. N. Norton; 7—Paper: *Greater Garage Service*—Harry Salvat.

THURSDAY, MAY 25, 10 A. M.

Third Technical and Hydro-Electric Session.

1—Report of Committee on Accident Prevention—Martin J. Insull; 2—Report of Committee on Prime Movers—I. E. Moultrop; 3—Report of Committee on Electrical Apparatus—L. L. Elden.

THURSDAY, 10 A. M.

Third Accounting Session.

1—Paper: *Correspondence Course in Accounting*—A. L. Holme and J. R. Wildman; 2—Report of Committee on *Question Box*—Edwin A. Barrows; 3—Open Discussion and Experience Meeting; 4—Report of Committee on Nominations; 5—Election and Installation of Officers;—Adjournment.

THURSDAY, 10 A. M.

Fourth Commercial Session.

1—Report of Lighting Sales Bureau—John G. Learned; 2—Report of Committee on Commercial Aspects of Highway and Municipal Lighting—T. F. Kelly; 3—Report of Committee on Industrial and Yard Lighting—Oliver R. Hogue; 4—Lecture: *Lighting—A By-Product or a Buy Product* (Illustrated)—William A. Durgin.

THURSDAY, 10 A. M.

Third Electric Vehicle Session.

1—Report of Committee on Operating Records—W. P. Kennedy; 2—Report of Committee on Central-Station Co-operation—E. S. Mansfield; 3—Paper: *The Exchange Battery System*—P. D. Wagoner; 4—Paper: *Passenger Vehicle Problems and Activities*—E. P. Chalfant; 5—Paper: *Central-Station Promotion of Electric Vehicle Use*—W. P. Kennedy; 6—Report of Committee on Nominations; 7—Election and Installation of Officers;—Adjournment.

THURSDAY, 2:30 P. M.

Fourth Technical and Hydro-Electric Session.

1—Report of Committee on Street Lighting—S. B. Way; 2—Report of Committee on Power Supply for the Electrification of Steam Railroads—Peter Junkersfeld; 3—Paper: *Central-Station Electric Systems and Railroad Power*—F. Darlington.

THURSDAY, 2:30 P. M.

Fifth Commercial Session—Power Sales Bureau.

1—Paper: *Temporary Service for Municipal Sub-Service and Other Construction*—C. K. Nichols; 2—Paper: *The Resistance Heater as a Load Builder*—E. F. Collins; 3—Paper: *Electric Furnaces*—R. H. Tillman; 4—Paper: *Electric Welding*—S. R. Dresser; 5—Report of Committee on Competitive Power Sources—E. F. Tweedy.

THURSDAY, 2:30 P. M.

First Company Section Session.

1—Paper: *The Company Section and the Company*—M. S. Seelman, Jr.; 2—Paper: *Financing Company Sections*—A. L. Atmore; 3—Paper: *Company Section Educational Work*—Douglas S. Burnett; 4—Paper: *Company Section Entertainment and Recreation*—A. D. Bailey.

FRIDAY, MAY 26, 10 A. M.

Fourth General and Executive Session.

1—Awarding Doherty, Williams and Frasse prizes; 2—Report of Nominating Committee; 3—Report of Committee on President's Address; 4—Report of Committee on Memorials; 5—Report of Committee on Resolutions; 6—Election and Installation of Officers;—Adjournment.

FRIDAY, 10 A. M.

Sixth Commercial Session, Lighting Sales Bureau.

1—Report of Committee on Residence Lighting—Fred H. Scheel; 2—Report of Committee on Stores and Public Buildings—S. B. Burrows; 3—Report of Committee on Electrical Advertising—A. K. Young; 4—Election and Installation of Officers;—Adjournment.

FRIDAY, 10 A. M.

Second Company Section Session.

1—Paper: *Employees' Activities: Should They All Be Under the Auspices of the N. E. L. A. Company Section?*—J. D. Israel; 2—Formation and Methods of Conducting Company Sections—E. C. Stone; 3—Suggestions by Committee on Company Sections—F. J. Arnold;—Adjournment.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

COST OF SERVING RURAL CUSTOMERS AT KOKOMO.

Indiana Railways & Light Company Operates 13 Miles of Line, Serving 50 Customers.

By P. H. Palmer.

Although the supply of electricity to rural districts in Northern Indiana has been much considered and experimented with for several years, it cannot yet be looked upon as an established successful branch of the lighting and power business.

When we view an unsupplied field almost equal in population to that already within range of our service, we can hardly help but make an attempt to serve it, especially with our present fields becoming rapidly toward the point of saturation with the present common uses of electricity.

I take it for granted that each company has analyzed the urban residence lighting costs under the conditions pertaining to the operation of its particular system, and that the minds of the operators are pretty well made up as to whether or not their respective business at their present rate is a paying proposition. Therefore, in studying the cost of supplying the rural customer I shall deal only in the additional cost over and above that of supplying the urban residence customer.

Cost of Installation.

The Indiana Railways & Light Company of Kokomo, Ind., now has 13.11 miles of strictly rural line. By that I mean line feeding rural customers only. We also have considerable transmission line feeding small towns, but the rural supply was of secondary consideration in these cases, and location favorable to supplying rural business was not selected and that class of business was not catered to along these high-voltage lines, therefore we are not including them as rural supply lines.

The average cost per mile of our 13.11 miles of strictly rural line with transformers and service wires is $340, and the average number of customers per mile is 3.97, making an average cost per customer of $85.64, not including superintendence and intagible costs. Making a 15 per cent addition for these costs brings the investment per customer to $98.49. In several residence districts in towns we have found our average line, transformer and service wire costs to be about $48 per customer, including 25 per cent to cover superintendence and tangible costs. A lower figure was used for the intangible costs on the rural district on account of the financing mostly being taken care of by the farmer advancing $300 per mile for current to be supplied. This makes, in our case, an investment of $50.49 for the rural customer in excess of that required for the urban residence customer.

Assuming that capital cannot be brought into such projects for less than 8 per cent, and depreciation taken at 2 per cent, the additional cost for these two items is $5.05 per mile per customer. Pole renewals are not included in the above depreciation charge as the Indiana Public Service Commission classifies the renewal of poles and fixtures as maintenance cost. The additional cost per customer for maintenance, including pole renewals, is approximately $3.00 on account of the greater length of lines for more remote locations. For the latter reason the cost of meter reading and testing is about 50 cents per customer per year greater in the country, although meters are read only every three months.

About two one-kilowatt transformers are required on the average for every three rural customers. The core loss in the transformers at the average central-station cost, amounts to approximately 60 cents per customer per year in excess of the urban customer. This brings the total cost of serving a rural customer to $8.65 per year over and above that of supplying the town customer with the same class of service.

Assuming an arbitrary figure of 40 per cent of operating revenue as operating costs, would mean a necessary increase in business of $14.42 per year on the rural customer as compared with the urban customer.

Our average annual receipts per urban residence customer was $18.40 for the year 1915, while that of the farmer was $18.30 where it should have been $32.82 had the rural customer been on the same paying basis as the customer in town.

This means that the amount of sales to our rural customers will have to be increased $14.50 each per year in order for that class of business to pay a reasonable percentage on the investment.

It should be explained that the few miles of rural lines which we now have only touch the best territory, and should we undertake to cover our territory with service entirely different figures would be necessary. The investment per mile would be much greater and some of the other costs would be proportionately greater. We have not tried to estimate what the cost would be in that case as it is evident that extensions in communities paying less than those we now have should not be considered as prospects at this time.

We have put these few miles in as an experimental proposition with the hope of developing the same into a business that will pay not only on the present country installations, but give us the means of learning how to turn much larger rural areas into paying districts, and at the same time supply the farmer's wants.

Of course, when a paying basis is finally reached, it will have to be on a new figure which will necessarily take in the cost of development which will include the present loss in operation.

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Farm Uses of Electricity.

The problem of developing the rural business into a paying proposition looks rather difficult to us. First the farmer will have to pay more for his current than the town customer. He will have to guarantee a minimum to comply with the figures given above. In order that he will willingly do this he must be made to see the advantages of greater use of electricity. Some of these uses may be mentioned briefly as follows:

Electric irrigation for truck gardening, the sad part of which is that the central station gets only about 10 per cent of the annual cost of irrigation. Pumping water for general purposes opens the way for about the easiest sale of current outside of lighting and ironing. Feed grinding by electric power appeals to the farmer. Our minimum is $1.00 per horsepower per month, and it is difficult to get a farmer to pay $60 per year for the required 5 horsepower to operate a

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feed grinder, yet we do not feel that this can be reduced. We have hopes, however, that a one or two-horsepower feed grinder may appear on the market to relieve this situation.

A motor of one of these small sizes could serve as a general utility motor for grinding feed, pumping water, and domestic uses and would become very popular as the feed grinding could be accomplished with a smaller capacity in power.

Electric dairying affords a very hopeful opportunity and may bring in a very good revenue on the average. There will also be opportunities of developing electric cooking in the country as timber fuel becomes more scarce. The gas competition met with in cities is not often encountered in rural districts. The electric iron usually follows shortly after the connection for electric lighting and is introduced without difficulty.

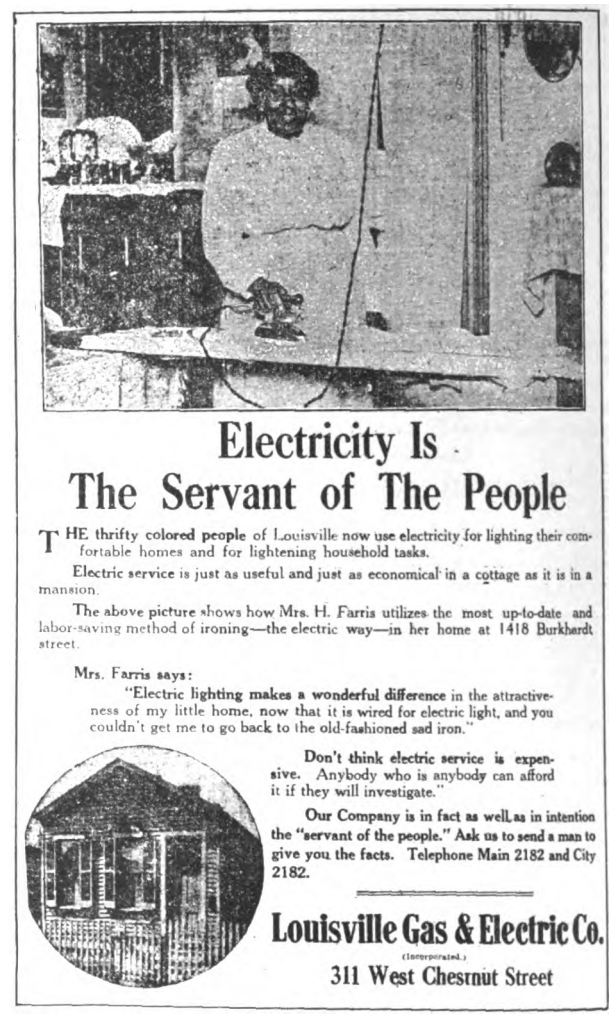
We have not had experience with heavy electric uses on the farm, such as tractors, threshing machines, etc., and it would be necessary to work out the cost to supply these on a different basis, using heavier lines and transformers, and arrangements for portable operation, distributing current to various locations on each farm.

We are not discouraged regarding the rural business. We expected it to take time, and we believe that it will eventually develop into a paying business.

Salt Lake Company Advertises Apartments Equipped With Electric Ranges.

The accompanying illustration is a reproduction of a full-page advertisement appearing in the Salt Lake City daily papers, advertising apartment buildings equipped with electric ranges. The Utah Power & Light Company has been conducting a range campaign for sometime past and has been very successful in interesting owners of apartment buildings. The advantages of electric cooking are set forth in the advertisement and it is announced that a demonstration of electric cooking will be given at a cooking school.

Attractive Full-Page Advertisement of Utah Company Calling Attention to Range Installations.



Unique Advertisement of Louisville Company Directed Exclusively to the Negro Population. Much Excitement Was Created in the Colored District by This Publicity.

Advertisement Directed to Poorer Classes in Louisville Brings Returns.

Proceeding on the basis that the greatest field for extension of electrical service is among the poorer classes of the city, the Louisville Gas & Electric Company is making use of individual testimonials relating to the subject. A recent display advertisement in the local papers carried a three-column picture of the interior of a colored woman's house, with the colored woman at the ironing board, using, of course, an electric iron. "Electricity is the servant of the people," the advertisement began, and continued with the statement that the thrifty colored people of Louisville are now making use of electricity in their homes. Referring to the subject of the picture, the company gives her a title not customarily given to colored people south of the Ohio River, saying:

"The above picture shows how Mrs. Farris utilizes the most up-to-date and labor-saving method of ironing—the electric way—in her home at 1418 Burkhardt Street. Mrs. Farris says:

"'Electric lighting makes a wonderful difference in the attractiveness of my little home (which is pictured), now that it is wired for electric light, and you couldn't get me to go back to the old-fashioned sad iron.'"

There are many thousands of people in Louisville in the same circumstances as Mrs. Farris, and there is no doubt at all that this particular advertisement will get attention.

This is the first attempt of the Louisville company to interest the large negro population by means of advertising.

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New England Companies Organize Wiring Campaigns.

The Salem (Mass.) Electric Lighting Company and the Malden Electric Company, both under the management of Charles H. Tenney & Company, Boston, Mass., have initiated house wiring campaigns. The Salem company turns over all contracts secured, to four local contracting firms, Lee & Osborne, F. L. Stanley, Marshall & Mithaud and Wilson & Emmerton. The company pays the contractor's bill as soon as the job is passed by the municipal inspector, and secures payment from the customer in 12 monthly installments, which are included in the monthly lighting bill.

The following are the unit prices at which the contracts are taken:

UNIT WIRING PRICES.

Service entrance	$9.00
Cellar outlet, including switch	5.00
Piazza, hall, parlor outlet and switch	6.75
Parlor outlet, electrolier	8.00
Dining room outlet, including switch	6.75
Dining room outlet, electrolier	8.00
Kitchen, pantry, china closet, back hall, second hall or other outlet, full socket	3.00
Bathroom, outlet switch	6.75
Floor receptacle outlets, first floor, with flush plug receptacle	4.50
Extra single-pole switch outlets	3.75
Three-way switches, set	9.00
Bryant heater control combination	4.50
Allowance for switches, except cellar	3.75

PRICES FOR FIXTURES.

Hall bronze tube and chain	$2.75
Porch, 6-inch ball	1.00
Parlor, 3-light shower fixture	6.50
Kitchen, pantry, long pendant tube	1.75
Bathroom, wall bracket, extends, 8-in	2.10
Dining room, 3-light chain shower	7.00
Bedroom, wall bracket	2.10

The company has mailed attractive circulars, with inclosures of illustrated fixture sheet and return postcard to each prospect. The plan enables each prospective customer to figure out for himself just what the wiring of his house will cost. In this way interest in electricity is stimulated.

The Malden Electric Company offers two group plans, one for $18 and one for $36, in either case payable 10 per cent down, and the balance in one year. The $18 offer covers service entrance, meter board, wiring to kitchen, drop-cord light, and flush receptacle for electric iron or other appliance.

The $36 offer includes wiring and fixtures complete for the first floor, including service entrance, meter board, four outlets wherever desired and flush receptacle for electrical appliance.

One or the other of these propositions is likely to form a basic for further inquiry, which the company will follow up by submitting a plan specially designed for the case.

When the job is passed the company pays the contractor's bill. Two contractors in each of the cities served—Malden, Medford, Melrose and Everett—share in the contracts. The business is carried on between company and customer, with no reference to the contractor's part in it.

Real-Estate Owners and Agents Solicited for House Wiring.

The Edison Company, of Boston, is making a special canvass of real-estate owners and agents who have to do with rented property. Two forms of letters are mailed to the owners and agents in each locality. The first letter points out the greater readiness with which electrically equipped houses are rented, and the increased profit, out of proportion to the investment, which results from installing electric lighting. Tenants are frequently glad to pay $2 a month more for a lighted home. This is $24 a year, or 20 per cent on an investment of $120.

The letter to dealers and agents points out that wired property sells much more readily than unwired, an investment of $100 oftentimes yielding twice that amount in the selling price.

The easy-payment plan applies to all property of this class. A return card is included with each letter.

A simple but forcible advertisement announcing its progress in house wiring is shown in the accompanying illustration placed in Boston newspapers by the Edison Company of that city. The policy of placing it in the "Real Estate" columns brings it to the attention of both house owners and real-estate dealers.

Advertisement of Boston Company Calling Attention to Progress Made in House-Wiring Campaign.

Minneapolis Company Secures 600 House-Wiring Contracts During Month.

The Minneapolis General Electric Company made a special effort to secure wiring of already-built houses during the period from March 15 to April 15, this being the month designated as "Wire-Your-Home Month" in a nation-wide campaign under the auspices of the Society for Electrical Development. The feature of the Minneapolis campaign was a flat price of $50 for the electric wiring and fixtures for a six-room house. Principal reliance was placed on newspaper advertising, with vigorous follow-up work by the company's salesmen, all of the wiring and fixtures contracts being turned over to the various electrical contractors in the city. During the period mentioned 595 already-built houses were equipped for electricity. Newspaper advertising produced 539 inquiries, at a cost of 83 cents per inquiry, advertising space used being that regularly employed by the company. The total amount of money expended by the public for wiring and fixtures was in excess of $40,000.

Six salesmen followed up the inquiries. The largest number of contracts closed by a single salesman during the one month was 127, although two others closed 125 contracts each. The campaign was planned and carried out under the direction of H. E. Young, sales manager of the Minneapolis General Electric Company.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

VARIED USES OF ELECTRIC HEAT IN INDUSTRIES.

Discussion at Boston Meeting Discloses Many Opportunities for Increasing Revenue From this Source.

In an address dealing with the uses of electric heat in industries, delivered by H. Fulwider, of the General Electric Company, in Boston on April 13, many opportunities were shown for increasing the central-station revenue from this source. About 200 electrical men of Greater Boston, including central-station operators, contractors and manufacturers' agents, attended the meeting which was held under auspices of the New England Section, N. E. L. A.

Guy K. Dustin, of the Gas & Electric Improvement Company, Boston, presided. E. W. Lloyd, president of the National Electric Light Association, described the advantages of membership in that inclusive organization. The electrical business is too unprepared to meet the conditions that lie ahead, and closely coördinated relations between the several factors of the industry are very desirable. Manufacturers, jobbers, contractors and central-station men should work together to meet the problems that confront the industry, he said.

The production of atmospheric nitrogen will call for vast quantities of electrical energy, said Mr. Lloyd. In the manufacture of steel with the use of electric furnaces the United States was long laggard, but has come to be the leading country in the world.

Mr. Fulwider, in his address, said that the early applications of electric heating were usually due to lack of other kinds of fuel, or because manufacturers found resort to electricity more convenient; 90 per cent of the business came from the manufacturers without solicitation, and the other 10 per cent usually resulted from the securing of power business in combination. High- efficiency incandescent lighting, and the approaching saturation of the power field, leads central stations to turn to electric heating in industrial processes as a fertile field.

Almost every manufacturer may be regarded as a prospect for some application of electric heat. The success of this type of heat is due to the improved quality of work resulting, increased production, or local conditions such as reduction in fire hazard, rather than in actual fuel cost.

There are three general classes of heating units: (1) air heating units, which transmit heat to work by radiation; (2) the "hotplate" unit, with a surface containing the unit, for mounting on tanks or machines; and (3) the emersion type, placed in water, oil, soda solution, etc. Mr. Fulwider described the construction and uses of units of the three types.

One automobile manufacturer uses a 20 by 21 by 7 feet oven, with 264-kilowatt input, in the process of enameling automobiles. Heat control is had by an automatic thermostat. It is found that the electric oven is several times faster than the gas oven formerly used, as the latter type, with muffled open flame and the necessary ventilation for combustion, loses much in efficiency. Enamel formerly requiring 4 to 5 hours to bake, now is baked by electricity in 45 minutes at 500 degrees, the gas oven formerly producing 300 degrees. A large western automobile manufacturer increased his production 50 per cent. The close and constant regulation of temperature is a valuable feature. Though in some cases the actual cost of the electricity used is more than for gas, increased production more than offsets.

Another type of industrial oven is of the revolving type, the floor being a round turntable and the sides divided by a vertical partition. The whole structure is rotated by a motor, and one half is baking while the other half is being unloaded. Such an oven, 6 by 5 by 8 feet, has a maximum input of 67 kilowatts. A temperature of 500 degrees Fahrenheit is maintained with 34 kilowatts. The baking of 1,000 pounds of metal requires 67 kilowatt-hours.

Drying ovens are frequently being changed from gas to electric equipment. It is usually practicable to adapt electric heating to existing ovens, sometimes improving the insulation of the walls. One such renovated oven, 60 by 51 by 30 inches, calling for 22 kilowatts for maintaining 400 to 450 degrees, consumes 96 kilowatt-hours for a day's task. When gas was used for fuel, the same process took 3,000 cubic feet a day. The relative cost, with electricity at one cent per kilowatt-hour and gas at 70 cents per 1,000 cubic feet, is $2.10 and 96 cents, respectively, showing a saving of $1.14 daily since electricity was introduced.

The Sherardizing machine, for rust-proofing metal parts, is equipped with electrically heated units, which produce a superior finish. Tests made for months under salt spray showed that the metals carried a better coating than had been secured with other fuels. Drums for the Sherardizing process, 40 by 24 by 24 inches, take a maximum of 50 kilowatts, with 15 kilowatts to maintain a temperature of 600 to 700 degrees. The smaller size, 17 by 10 by 10 inches, takes 15 kilowatts, with 5 kilowatts to maintain. The capacity of the largef drum is 1,800 pounds of work, and of the smaller, 150 pounds. Three hours are required to put through the work.

Babbitt-melting pots consist of a crucible surrounded by a jacket, with a base heater unit in the base. Linotype-machine pots are another attractive source of central-station business. A few printers have adopted electricity in place of gas on the Mergenthaler machines, with satisfactory results.

An electric furnace for shrinking jackets on large naval guns is another interesting application. This is in 6 or 8 sections, each heated to 1,000 degrees by 30 kilowatts, 15 kilowatts being required to maintain that heat. The core consists of a cast-iron cylinder, with fire-brick lining, in a pit, into which the jacket is lowered and left several hours.

Oil tempering baths are in general use by tool manufacturers. These consist of an iron crucible with the units mounted on the side. Oil is heated to 450 or 500 degrees, a temperature near the flash point, and hence dangerous when an open-flame gas jet is used. Baths developed for the manufacturers of safety razors were among the first of this type. Lead-melting pots, in knife manufacture, glue-pots in binderies, and kettles for melting wax and pitch are electrically heated appurtenances that offer an attractive source of business for central stations. Hotplate type of heaters are supplanting steam tables for keeping celluloid in a workable condition.

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Talks to Central-Station Power Salesmen

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

This is the fourth of a series of articles by Mr. Stevens, in which he discusses the salient features of power-sales work. This installment deals with the organization and equipment of a power bureau, the suggestions being based on the methods used with such pronounced success by the Edison Electric Illuminating Company of Brooklyn. The concluding installment of the present series will be published in an early issue.

In selling power, as with most undertakings, success lies largely with the directing forces and organization. It is most essential that the individual salesmen receive help and co-operation from their office, in order to place their efforts in channels that will result in the greatest degree of efficiency.

In small companies employing perhaps one, two or three power men an elaborate organization, of course, is not required. Here the power engineer must depend more upon his own resources to meet the various obstacles in his path, as the problems he encounters are simpler and not so diversified as those met with in the larger fields. It is not necessary for him to have extensive follow-up systems, testing apparatus and records of plants in the field of operation as he is able to acquaint himself personally with all such concerns within a reasonably short time.

Power Sales Work Must Be Systematized.

While this is true in the smaller companies, the larger central stations appreciate the necessity of systematizing this work and have gathered data and developed systems of records which are found indispensable to the efficient selling of power. Such a system has been developed by the Edison Electric Illuminating Company of Brooklyn, and has proven of great value from an efficiency standpoint.

A brief outline of the operation of this Bureau is given herein for the consideration of other companies, though, of course, certain changes may have to be made to meet each central station's local conditions.

The personnel of this particular Power Bureau is shown graphically in Fig. 1.

The manager of the Power Engineering Bureau is held responsible for the entire operation of the Bureau and reports directly to the general sales agent of the company.

The power engineers are the men who directly handle the power sales. Great care has been exercised in selecting these men as the positions they hold with reference to the public, coming in contact with the largest manufacturers and business interests of the city, are extremely important to the company.

The assistant power engineers conduct all necessary tests on plants and work out propositions which are later presented for the consideration of private-plant operators. The assistant power engineers do not come in direct contact with the prospective customers, but are technical men of such caliber as will become power engineers when their practical training and experience fits them for the position.

The Brooklyn Edison Company has found it advisable and advantageous to have all plant testing done by the power sales force instead of by other departments such as the engineering or operating departments, as the men making the test are more vitally interested in the sale of power, also are more intimately associated with the men actually making the sale, and thus better results are obtained.

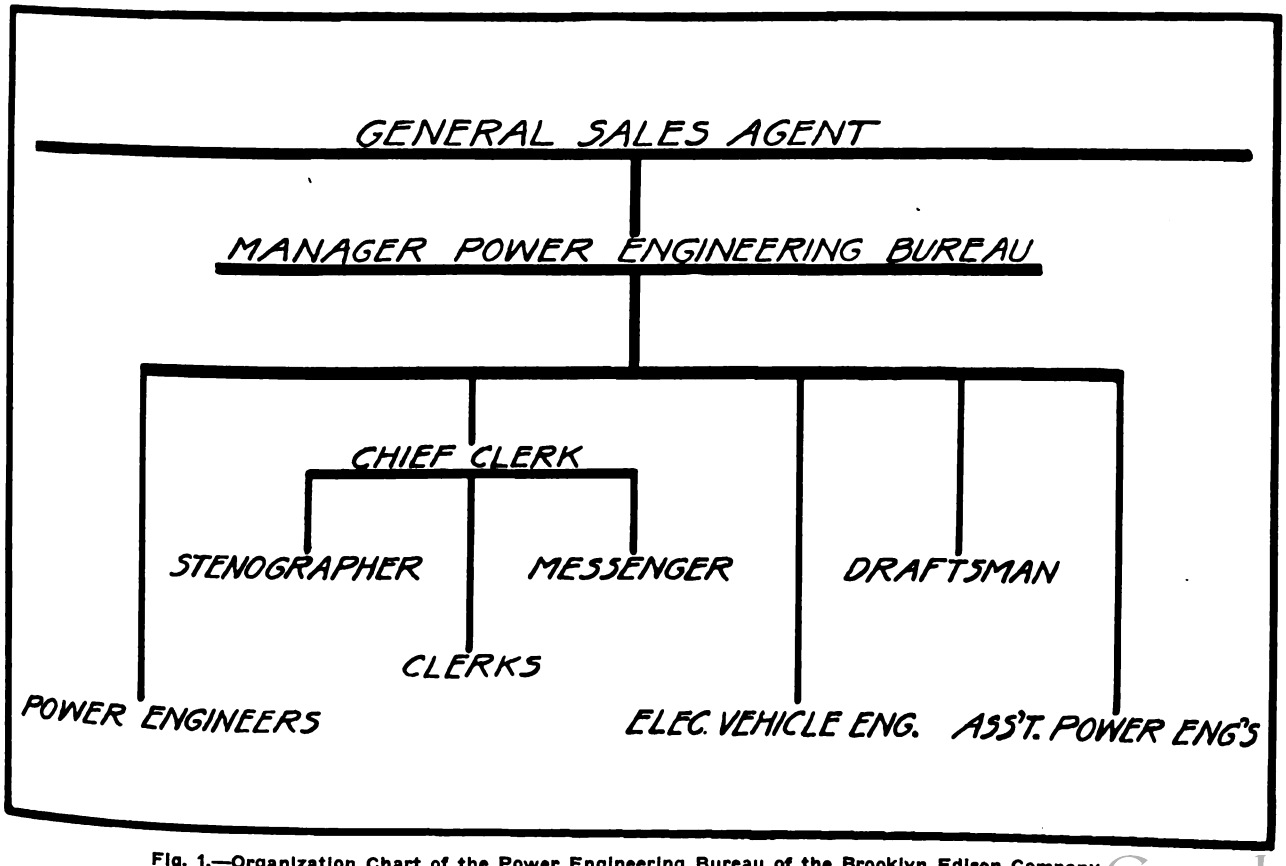

Fig. 1.—Organization Chart of the Power Engineering Bureau of the Brooklyn Edison Company.

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467-C90368

INDEX SERIAL No C-121

NAME Blank Bed Company,

ADDRESS 900 Mechanic Street

BUSINESS Metallic Beds

APPROX H P. 660 KIND OF DRIVE Electric

REMARKS

Fig. 2.—Index File—Plants Alphabetically Arranged.

468-C90368

INDUSTRY FILE SERIAL No. C-121

BUSINESS Metallic Beds

NAME Blank Bed Company,

ADDRESS 900 Mechanic Street

APPROX. H. P. 660 KIND OF DRIVE Electric

REMARKS

Fig. 4.—Industry File—Plants Arranged According to Industry.

Electric Vehicle Engineer Essential.

It is becoming more and more important that each power-sales force should have on its staff an electric-vehicle engineer with necessary assistants; one who is specialized and is thoroughly conversant with electric vehicles and vehicle storage batteries, as this branch of the work is growing very rapidly. In the Brooklyn Company this man has taken a course with one of the large vehicle manufacturers in order to thoroughly familiarize himself with the subject. It is necessary that this man keep in touch with the developments in vehicles, and should be the type of man who can, by clear arguments, completely dispel in the minds of those who are potential users of electric vehicles the erroneous ideas of having "peculiar conditions," which may forestall the application of such vehicles to their business.

Functions of Clerical Staff.

The clerical staff consists of the necessary clerks and stenographers to carry on the detail work of the Bureau. It has been found advisable to have an engineer as the chief of this staff, as it is quite necessary to have a man in the office at all times who can answer any inquiries a prospect or customer may make at the office regarding power; also he can better handle the manager's work in the latter's absence from the office.

The clerical staff maintains the follow-up system, files of correspondence, engineering data and engineering catalogs. It is the function of this staff to check all orders, compile various sales reports, and attend to the details of power-sales campaigns. Also, to keep the various files of the plant record, electric-garage record, available-factory-site and loft-building record and service inspection records. All of these are of great importance and each will be described later.

The Bureau equipment is complete in every detail. There is a reference library consisting of various engineering works on electric, steam, oil, gas and gas producer plants; books on heating, refrigeration and the many other phases of the power business.

The file system contains all correspondence relative to the power work, completed propositions and such miscellaneous data as may be needed for reference.

There is a testing laboratory equipped with engine indicators, steam-flow meters, draft gauges, tachometers, counters, various electrical instruments and other appa-

PLANT RECORD SERIAL No. C-121

NAME Blank Bed Company,

ADDRESS 900 Mechanic Street

BUSINESS Metallic Beds

NO. BOILERS 3 TOTAL H. P. 700 TYPE Fire Tube GAGE PRESURE 105

NO. ENGINES 3 TOTAL H. P. 575 TYPE Corliss AGE 6 COND. NON-COND. Non-Cond.

NO. DYNAMOS 2 TOTAL K. W. 350 A. C. D. C. D.C. VOLTS 250 PHASE

NO. MOTORS 20 TOTAL H. P. 660 TOTAL NO. LAMPS (INCANDESCENT) 1000 (ARC) 50

NO. ELEVATORS 1 TYPE Electric

ADDITIONAL APPARATUS 3 Deep Well Pumps and 2 Small Steam Hammers

HEATING SYSTEM Vacuum OTHER USE OF STEAM Drying Purposes

KIND OF COAL #1 Buckwheat TOTAL TONS PER YEAR 4500

HELP EMPLOYED 2 Engineers, 1 Electrician and 3 Firemen

APPROXIMATE COST OF POWER PER YEAR $23,000.

REMARKS See Mr. Brown, Factory Manager.

DATE 4/13/13 REPORTED BY A. B. C.

440-C55181

Fig. 3.—Plant-Record Card Containing Complete Data on Every Isolated Plant. The Reverse Side is Shown in Fig. 6.

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ratus that is required for making a complete and exhaustive test on a private plant.

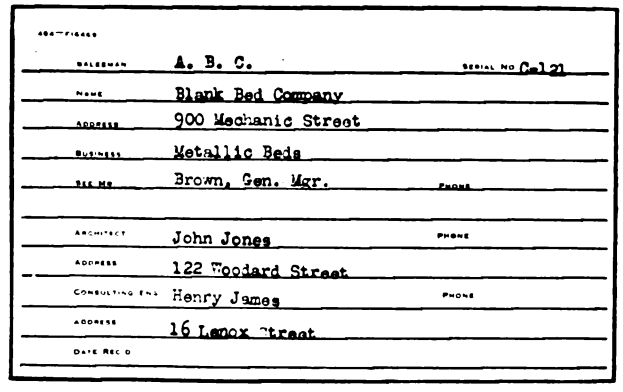
The follow-up system is maintained so that various matters can be attended to at their proper time and dormant propositions followed up periodically.

Plant Record File.

As has been previously stated, it is unnecessary in a community in which there are a few private plants to have card records of them, as the salesman in a short time may familiarize himself with all of them. However, in the larger cities such a record is so important that a complete description is given of the Brooklyn Edison plant-record file. This record was obtained by having a canvass taken of all establishments in the field of operation, where any kind of power was used to the amount of 25 horsepower or more. At the time this census was made it was considered advisable not to include the plants of smaller capacity as they were not likely to be permanent establishments. The men detailed for this work were given loose-leaf books with data sheets, which, when properly filled out, gave a complete description of each plant visited. This information was taken from the field sheets and transferred to the plant-record cards in the form shown in Fig. 3.

A map of the area covered by the company is divided into sections of size convenient for handling and each section alphabetically labeled. A gum sticker is placed on the map for each plant corresponding to its geographical location. Various colors are used for different amounts of horsepower and each sticker numbered so that it corresponds to a certain plant-record card.

The plant-record cards are filed by section and numerically. By referring to the map one is able to determine the number and size of plants in any section or along certain streets. Growth of business for the central station can thus be predetermined and by referring to the plant-record cards by number, the names of the firms may be ascertained. It has been found that this is an excellent way for planning sales campaigns and when extensions are made to the lines the various plants on the extension



SALESMAN	A. B. C.	SERIAL NO	C-1-21
NAME	Blank Bed Company		
ADDRESS	900 Mechanic Street		
BUSINESS	Metallic Beds		
SEE MR	Brown, Gen. Mgr.	PHONE	
ARCHITECT	John Jones	PHONE	
ADDRESS	122 Woodard Street		
CONSULTING ENG	Henry James	PHONE	
ADDRESS	16 Lenox Street		
DATE REC'D			

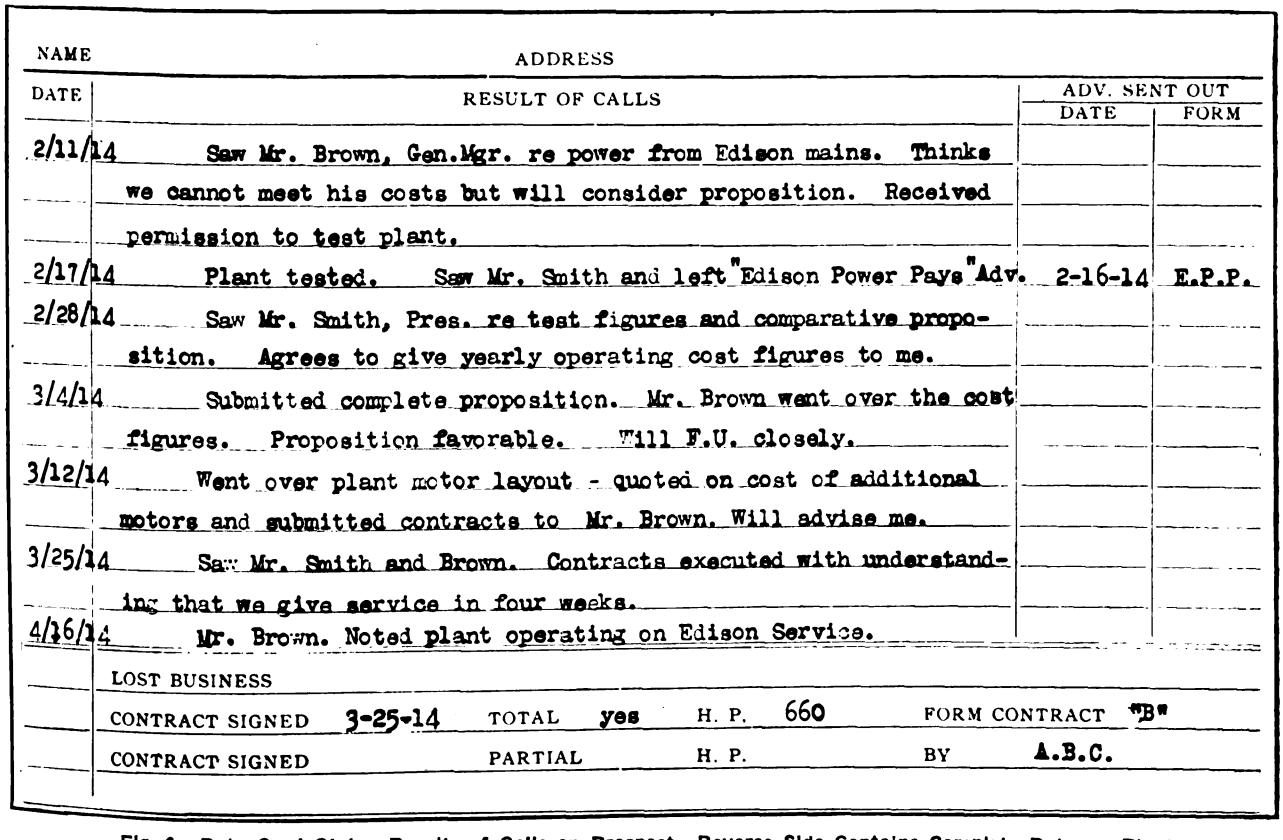
Fig. 5.—Salesman's Card of Prospects.

can be ascertained without leaving the office. An index file, alphabetically arranged, enables one to find any plant-record card and the plant's geographical location. Such a card is shown in Fig. 2.

There is also an industry file in which the cards are grouped by industry, as shown in Fig. 4. By referring to this file one can determine the number of establishments engaged in any particular industry. This file is of great value when sales campaigns are conducted in which particular attention is devoted to obtaining certain lines of business, such as woodworking, metal working, etc.

In conjunction with the plant record is the salesmen's follow-up file. This consists of cards of the form shown in Fig. 5, and each card represents a prospective customer. Data on this card consist of the prospect's name, address, name of party to be interviewed regarding power and an index number corresponding to the plant-record card.

Calls are followed up in this file by means of small metallic flags or markers of various colors which are attached to the cards, each color denoting the date for follow-up. The reports of the salesmen are entered on the backs of the plant-record cards and each prospect is followed until the business is secured or lost, after which the salesman's card is destroyed.



NAME ADDRESS

DATE	RESULT OF CALLS	ADV. SENT OUT DATE	ADV. SENT OUT FORM
2/11/14	Saw Mr. Brown, Gen.Mgr. re power from Edison mains. Thinks we cannot meet his costs but will consider proposition. Received permission to test plant.		
2/17/14	Plant tested. Saw Mr. Smith and left "Edison Power Pays" Adv.	2-16-14	E.P.P.
2/28/14	Saw Mr. Smith, Pres. re test figures and comparative proposition. Agrees to give yearly operating cost figures to me.		
3/4/14	Submitted complete proposition. Mr. Brown went over the cost figures. Proposition favorable. Will F.U. closely.		
3/12/14	Went over plant motor layout - quoted on cost of additional motors and submitted contracts to Mr. Brown. Will advise me.		
3/25/14	Saw Mr. Smith and Brown. Contracts executed with understanding that we give service in four weeks.		
4/16/14	Mr. Brown. Noted plant operating on Edison Service.		

LOST BUSINESS

CONTRACT SIGNED 3-25-14 TOTAL yes H. P. 660 FORM CONTRACT "B"

CONTRACT SIGNED PARTIAL H. P. BY A.B.C.

Fig. 6.—Data Card Giving Results of Calls on Prospect. Reverse Side Contains Complete Data on Plant.

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The manager of the bureau by referring to the salesmen's cards is able to tell upon what propositions each salesman is working, and by referring to the reverse side plant-record cards, shown in Fig. 6, the status of each matter in hand can be learned.

For soliciting business and obtaining power prospects all the usual sales methods are employed, such as regular canvasses, advertising in papers and form letters. Leads are also secured from various sources such as the district agents, the daily records of new buildings to be erected, and then proper co-operation with electrical contractors, electrical manufacturers and their representatives, consulting engineers and the other departments of the Brooklyn Edison Company. Two methods which are somewhat out of the ordinary and have produced very good results are here described.

Follow-Up of Building Permits.

By following the city records of building permits information is obtained of all contemplated building projects. When plans are filed for a new building with the city a power engineer immediately gets in touch with the owners and their architects and consulting engineers to induce them to use central-station service for all lighting and power requirements. When the power engineer makes his first call all information which can be obtained regarding the proposed building and the power to be used is obtained and upon his return to the office a plant-record card is filled out with this information. This card is then placed in a file for incomplete plant-record cards. Reports of the power engineer's subsequent calls are noted on the back of this card and the building is followed up until its completion when the card is entirely filled out, given a serial number and placed in the completed plant-record file. Also a numbered sticker is placed on the map which corresponds to its geographical location. If the building is not equipped for Edison service, a private plant being installed instead, a complete report is made to the manager of the bureau as to why the proposition was lost, so that with any future propositions of similar nature different sales methods may be employed, which may give better results.

By referring to the reports of the city record and guide, a periodical which reports all new building projects, the manager of the bureau is informed of the project months before the building is started and is able to direct and advise the power engineers how to get the business.

A description of additional records used will be given in another issue.

Middleboro (Mass.) Municipal Plant to Buy Electricity.

The Middleboro (Mass.) municipal lighting department has made a five-year contract with the Plymouth Electric Light Company for the bulk supply of energy at a rate based on amount of energy used, ranging from 1.75 cents per kilowatt-hour for 500,000 hours per year, down to 1.55 cents for 1,500,000 hours. The plant's output last year was 464,000 kilowatt-hours. The new contract becomes effective about July 1, a tie line being built meanwhile, five miles of which, in Middleboro, is constructed by that town, and seven miles, outside the town, by the Plymouth company.

The present generating equipment of the Middleboro department consists of two generators aggregating 350 kilowatts, operated by producer-gas engines, and two water turbines developing 70 kilowatts. The town will maintain the former, for future use if desired, and will operate the water-power equipment as auxiliary to the purchased supply. Cost of production with the engines has averaged about 2.28 cents per kilowatt-hour, and with the water wheels less than one cent.

The town proposes to extend its lines into the neighboring town of Lakeville, for residence service. A line about five miles long will be built to supply 25 or 30 customers who have applied for service. George A. Philbrook, general manager and superintendent, has the matter in charge.

COMMONWEALTH EDISON COMPANY HAS RAPID INCREASE IN NEW POWER BUSINESS.

Connected-Load Contracts for Past Three Months Nearly Triple Those for Same Period Last Year.

A remarkable showing in new power business has been made during the past few months by the Commonwealth Edison Company, Chicago, Ill. The contracts obtained for new load connections since January 1, 1916, total nearly three times as much as during the same period last year and bespeak the growing utility of central-station service.

Some of the more prominent contracts for power closed recently are: Western Electric Company's group of buildings on Clinton Street, 3,000 horsepower; Stewart-Warner Speedometer Company, factory, 2,000 horsepower; General Chemical Company, 1,000 horsepower, displacing two turbo-generators; Wisconsin Steel Company, 2,000 horsepower; Edgewater Beach and Morrison Hotels.

Central-Station Service to Be Used for Municipal Pumping at St. Paul.

The city of St. Paul, Minn., has closed a contract with the Northern States Power Company for furnishing electric power for two 300-horsepower motors to be installed in the municipal pumping plant. These motors will operate during off-peak hours. The city decided to purchase central-station power as opposed to installing steam-turbine units of its own. The contract is for a period of five years, and current is delivered at 2,300 volts. The city of Minneapolis for a number of years has purchased electric power for operating its water works from the Northern States Power Company organization. Other cities in the Northern States Power Company's territory which use the service for municipal pumping include Mankato, Faribault, Minot, St. Peter, St. James and Waseca.

Electricity Cheapest for Flour Mills.

Millers who are members of the Central Kentucky Millers' Association have been exchanging experiences as to cost and desirability of the various kinds of power. They are mostly divided between steam and oil engines, although the Somerset Milling Company uses electric drive at a cost of $4.75 for 10 hours' run, with an average daily production of 95 barrels. The efficiency of the electric drive is plainly indicated by comparative figures. Among the steam-driven plants the reports show $3.50 for coal to an average output of 37 barrels; $4.15 for 30 barrels; $3.25 for 30 barrels; $3 for 25 barrels. The figures for the oil engines were not as plentifully stated. One miller reported oil cost of $2 per 25 barrels.

To Construct Electric Portable Saw Mills.

The Union Iron Works, Bangor, Me., is about to build portable band saw mills equipped with electric motors, for the Portable Band Saw Mill Company, of New York.

The electrically operated mill of the portable type is said to be rapidly gaining in favor among lumbermen. The use of such mills in states like Maine, having abundant water power developing electricity at low cost, is particularly advantageous. The demand for mills of this type is fast increasing in the west and south, according to the president of the company, which has placed a large order with the Bangor concern.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

Rush of House-Wiring Business in Louisville.

Although Louisville (Ky.) electrical contractors, as previously noted by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, expected something of a rush in the way of house-wiring contracts before May 1, when the requirement of all-metal conduits goes into effect, they were not prepared for the rush that has developed. The top notch was reached during the third week in April, when one day saw 119 permits for house wiring issued by the city building inspector, practically all of them for original construction. It has been evident for some time that the contractors were not going to be able to get all the work done before May 1. At that time, it has been stated, the regulations will become effective automatically, and only jobs on which a bona fide beginning has been made on the present style construction will be approved for completion.

However, most of the local electrical contractors who are now taking orders for work have determined that they will carry out the holdover contracts on the same price basis. The difference will not be anything like as great in price as some people seem to think, and the contractors appreciate that the work they are going to do will give them the data they will need on which to base their later estimates.

Timely Hints to Electricians.

The Pennsylvania Department of Labor and Industry, Harrisburg, Pa., of which John Price Jackson is commissioner, has issued a folder entitled "Timely Hints to Electricians," and is ready to supply copies in any quantity.

From it the following useful hints that should prove of value to electricians anywhere are taken:

An electrician who is not familiar with or does not follow accepted standard practice in his repair and installation work is a constant menace to the safety of any establishment and its employees.

Shield your eyes from electric arcs or flashes. This kind of light frequently causes temporary blindness and in some cases ruins the eyesight. If you ever become so affected, consult the plant doctor or your own physican at once.

Small cuts, bruises or burns should receive treatment immediately and be protected from dirt or mechanical injury. Blood poisoning may set in and must be guarded against.

Keep your eyes on your hand when reaching for electric switches. Otherwise you may touch the "juice."

Before working on electric machines *lock* the service line switch *open* and place the key in your pocket. No person can then turn on the current with fatal results to yourself. This has often occurred.

Screwdrivers, pliers and all other handy tools should have insulated handles.

Immediately stop any abuse or misuse of electrical apparatus.

Never work on live circuits unless it is absolutely necessary. If you must work on such circuits, use all the safety devices and methods possible.

Treat all wires as "live" until you are absolutely sure they are "dead."

Unsafe or improperly working electrical apparatus should be immediately shut off and reported to the proper authorities.

In working overhead be careful to place tools so they cannot fall on persons underneath.

If working on ladders or scaffolds see that they are substantially built. If they are not, you may be the sufferer.

Use your safety belt whenever possible. It may be your "life preserver."

Never overload a circuit or use a fuse of too great capacity. Overheating of conductors may occur and the possibility of a fire is thus increased.

Study regulations for the proper installation of electrical apparatus. Never install wiring or other electrical apparatus which is not strictly in accordance with such rules. They have been formulated to prevent fires and accidents.

Do not have soldering torches burning unless you are present. Thoughtlessness in this matter on your part may cause considerable damage.

See that all combustible material is removed from places where a spark from electrical machinery or apparatus could ignite it.

Rat Short-Circuits Oil Switch.

The importance of keeping switches tightly closed where there is possibility of prowling vermin is emphasized by the illustration here shown.

This picture was taken after the switch had been opened

Interior of an Oil Switch After It Was Short-Circuited by a Rat. The Switch Mechanism Was Completely Ruined.

following the night prowlings of a large rat. The rat was completely burned up and the interior of the switch was completely ruined. The current caused by the short-circuit was so large that one of the main leads to the switch was melted.

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Alternating-Current Motors—II

By Justin Lebovici

The first installment of this article explained the fundamental principles upon which the construction and performance of alternating-current motors are based. The present installment describes and illustrates the induction motor, and explains what is meant by a rotating magnetic field. The article will be concluded next week.

Classification and General Description of Alternating-Current Motors.

Alternating-current motors may be divided into two chief classes.

(*A*) *Synchronous motors.*—The characteristics of synchronous motors are very closely related to those of the alternator. Their field of application as industrial motors is limited to larger units, due to their requiring a direct current for excitation. In what follows we shall limit ourseves to the motors of class B, their field of application being more general.

(*B*) *Asynchronous motors.*—This class of motors is distinguished by the fact that the speed at which they can perform useful work is not determined by the number of poles and the frequency of the system, as in the case of synchronous motors.

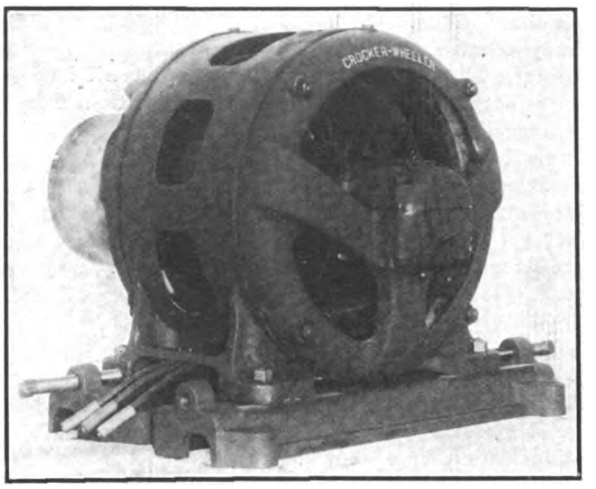

Fig. 10.—Squirrel-Cage Induction Motor With Rails.

The asynchronous motors may be divided into two divisions: (1) induction motors and (2) commutator motors.

Induction motors and commutator motors are of both the single-phase and the polyphase types, but while the polyphase commutator motor is the exception, in single-phase work the commutator is a common feature of the medium and larger sizes. Common to both types is the low reluctance of the magnetic circuit.

Induction Motors.

Distinctive of the induction motor is the fact that the windings of only one member of the machine are connected to the line, usually the stationary member or stator, while the windings of the rotating member or rotor are either all short-circuited in themselves or arranged in groups which are short-circuited directly or through resistance. This gives a basis for subdivision of induction motors into (a) squirrel-cage motors; (b) slip-ring motors.

The rotors of these motors receive current through induction, the same as the secondary of a transformer; hence, the name primary is given to the member connected directly to the line, and the name secondary is given to the short-circuited member. In practice the stationary member is the primary and the rotating member the secondary.

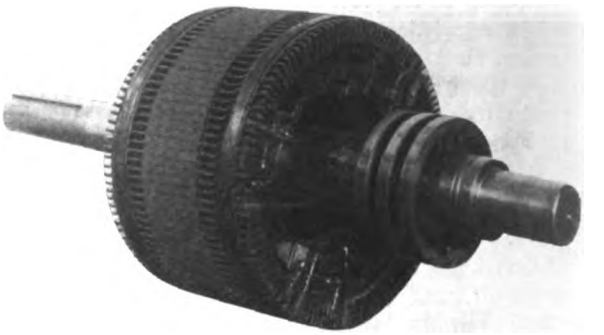

Fig. 12.—Rotor of Slip-Ring Induction Motor.

Fig. 10 shows the general view of a squirrel-cage induction motor. Fig. 11 is a displayed view of a motor of the same type; Fig. 12 represents a slip-ring type of induction rotor.

In Fig. 11 we can distinguish the following stationary parts: the stator housing with its core and windings, usually referred to in practice as the stator, the bearing brackets and the bear-

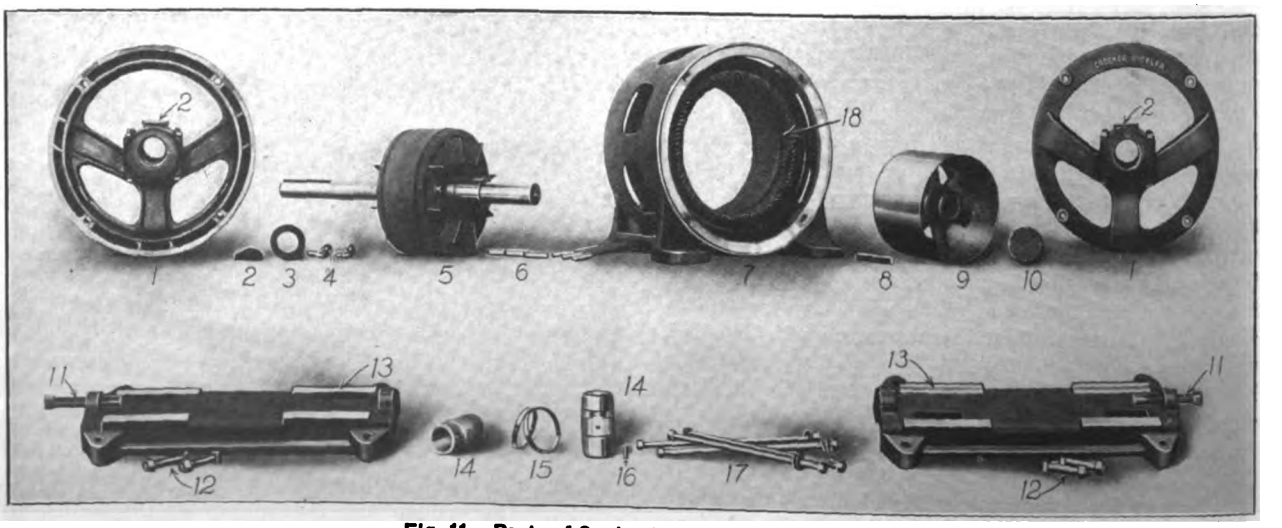

Fig. 11.—Parts of Squirrel-Cage Induction Motor.

1. Shields; 2. Oil-Hole Cover; 3. Inclosing Washer; 4. Oil Gauges; 5. Rotor; 6. Terminal Sleeves; 7. Stator; 8. Pulley Key; 9. Pulley; 10. Dust Cap; 11. Adjusting Screws; 12. Bolts for Stator Feet; 13. Rails; 14. Journal Boxes; 15. Oil Rings; 16. Journal-Box Set Screw; 17. Stator Studs; 18. Stator Coils.

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ings. The stator housing is a cast-iron frame in which the laminations and windings are placed. The photograph of an assembled stator core and housing is shown in Fig. 13. The stator core is made up of disks punched from sheet steel, as illustrated in Fig. 14. These punchings are the laminations just referred to and are assembled in groups and placed in the housing as shown in Fig. 13. The windings are placed in the slots and insulated therefrom, as can be seen from Fig. 15.

A squirrel-cage rotor is shown in Fig. 16. The rotor core is made up of laminations clamped between end rings and secured to the shaft or spider. The rotor windings consist of insulated copper bars placed in partially closed slots. The ends of these bars are short-circuited through end rings of copper, brass or alloy.

The slip-ring rotor is similar in construction to the squirrel-cage rotor except that the rotor slots carry coils connected in groups in much the same manner as the stator windings. Leads are brought from the windings to slip rings. Brushes ride on these slip rings and from them the curent is taken to the controlling apparatus. Fans are provided on the rotor to aid in the ventilation of the motor.

Fig. 13.—Stator of Induction Motor Without Windings.

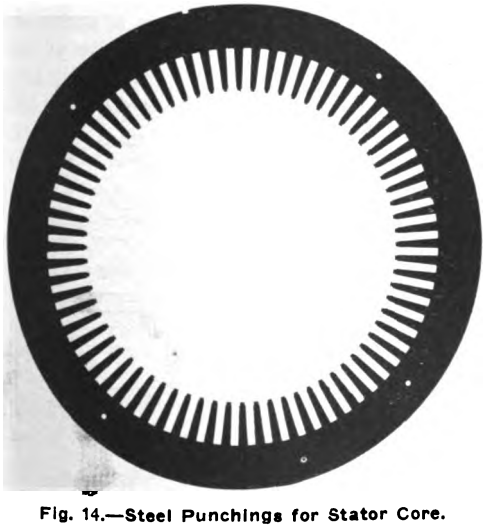

Fig. 14.—Steel Punchings for Stator Core.

Galileo Ferraris and Nikola Tesla were the first to show that it is possible to build alternating-current motors without using direct-current excitation. These motors are extremely simple in construction and can be economically built for either small or large outputs. The primary, when excited with polyphase alternating currents, produces (1) a revolving magnetic field, and when excited with a single-phase current produces (2) a single alternating magnetic field. The revolving field is constant (or nearly constant) in value and changes its position in space with a uniform (or non-uniform) speed. The alternating magnetic field does not change its direction in space but periodically changes its value from a maximum value in one direction to the same value in the opposite direction.

The Revolving Magnetic Field.

In Fig. 17, NS represents a permanent magnet supported in bearing B_1 and driven by means of a belt on the pulley A_1. EE represents a copper disk, free to move in the bearing B_2 and carrying on its free end a pulley A_2. The lines of magnetic flux M close themselves through the copper disk. Driving the permanent magnet by means of belt and pulley A_1, we cause the copper disk to be cut by the flux and eddy currents are induced in the disk EE according to Lenz's law which tend to stop the movement of the magnet. If the torque on the belt A_1 is enough to overcome this opposing force, the disk EE will be forced to follow the movement of the magnet, and we may now use the pulley A_2 for driving a belt. We have transmitted energy from the pulley A_1 to the pulley A_2 through an air gap without the use of a mechanical coupling. If in place of the revolving permanent magnet we should use a revoving magnetic

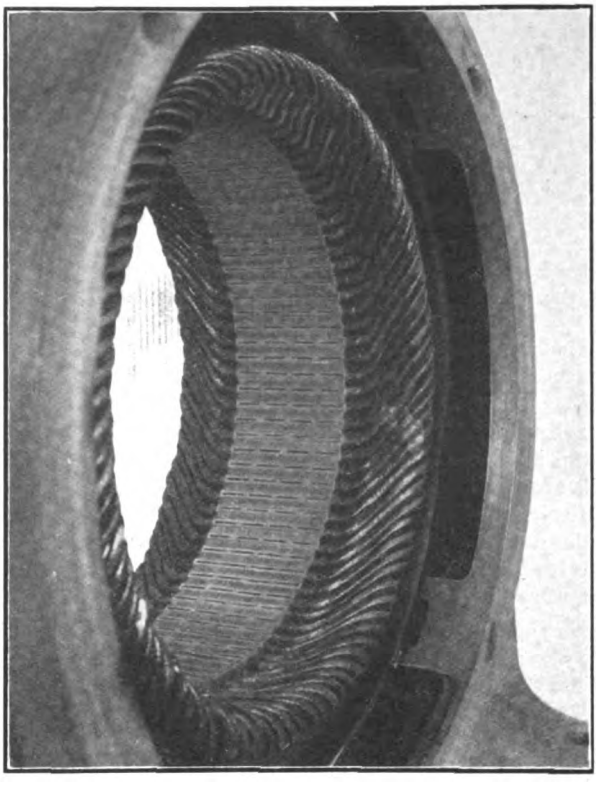

Fig. 15.—Stator Windings.

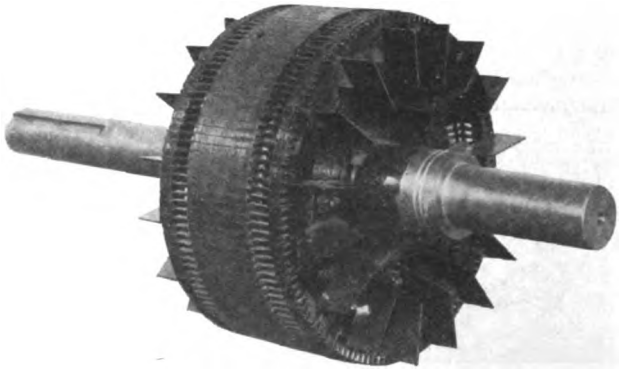

Fig. 16.—Rotor of Squirrel-Cage Induction Motor.

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field we would have in the above arrangement an alternating-current induction motor in its simplest form.

In order to show how a revolving field can be obtained by means of two or more windings on the stator, let us supply to the stator core shown in Figs. 19 to 23, two currents displaced by 90°, or a quarter period.

The instantaneous values of the currents supplied to the two windings I, I and II, II, displaced in space by 90°, are shown in Fig. 18. Figs. 19 to 23 may be imagined to be sections through the stator core. The part of the stator surface from which the magnetic field emerges we call a north pole.

At instant 19 in Fig. 18 the current in coil I (phase I) is a

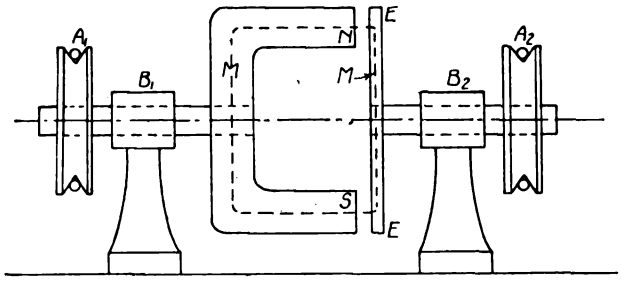

Fig. 17.—Generation of Electromotive Force by Induction.

maximum and in coil II (phase II) zero. We will indicate a current entering the plane of the paper by a circle and cross ⊕, a current coming towards the reader by a circle and dot ⊙. The distribution of current at the instant 19 in the two coils is shown in Fig. 19. The lines of magnetization produced by the coils are shown by dotted lines and the core surface will present two poles N and S as shown. A permanent magnet n s placed in the stator bore will assume the position shown in Fig. 19.

At the instant marked 20 in Fig. 18 the distribution of current and magnetism has changed and is as represented in Fig. 20. The current in phase I has decreased while the current in phase II has increased until they both have the same value and are both positive. We notice that the poles N S have moved 45 mechanical degrees while we moved through the same angle in Fig. 18. The permanent magnet n s will now assume the position shown in Fig. 20.

At the instant 21 the current in phase I has decreased to zero while the current in phase II has reached its maximum value. The poles N S and the permanent magnet n s have reached the position shown in Fig. 21. The poles N and S have the same strength in the three positions shown in Figs. 19, 20 and 21, but they have moved through an angle of 90° during a quarter period of time. In position 20 the current in I is less than it was in position 19, but the current in II has increased to the same value and the geometrical sum of the magnetic fields I and II has the same magnitude as the magnetic fields of I or II above in positions 19 or 21.

At the instant 22 the current in phase II has decreased to part its value in position 21, while the current in phase I has in-

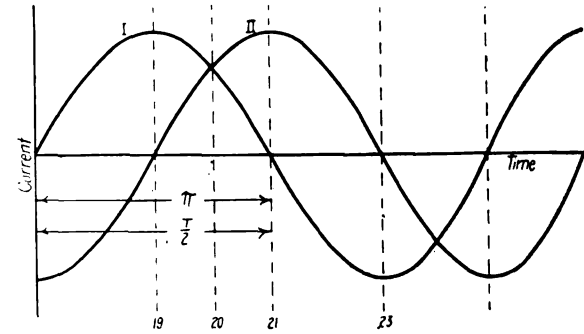

Fig. 18.—Instantaneous Values of the Currents.

creased to the same amount but in an opposite direction, and at the same time in a direction opposite to the one shown in Fig. 20 and instant 20. The position of the poles N S and of the permanent magnet n s are shown in Fig. 22.

The positions of poles N S and permanent magnet at the instant 23 are shown in Fig. 23.

We see that during half a period the poles N and S and the magnet n s have moved around 180°. During each cycle, then, the poles N S move around two poles or, in the case of a two-pole motor, through one revolution. In a two-pole motor the magnetic field of constant strength makes f revolutions per second if f represent the number of cycles per second. The field revolves in a two-pole motor 60 f times every minute.

It is at once apparent that the permanent magnet n s will follow the magnetic field, but if in place of a permanent magnet we substitute a copper cylinder or a squirrel-cage or a wound rotor, these will also follow the motion of the field for the same reason for which the disk EE in Fig. 17 started in motion; i. e., due to the currents induced in the rotor metal.

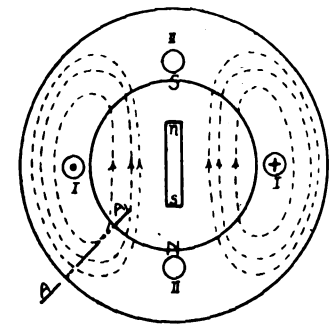

Fig 19

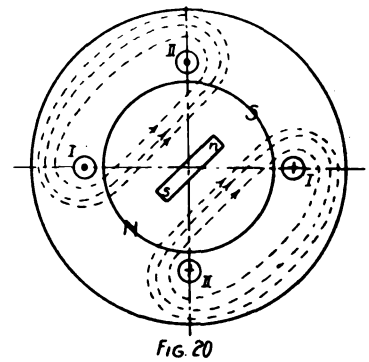

Fig. 20

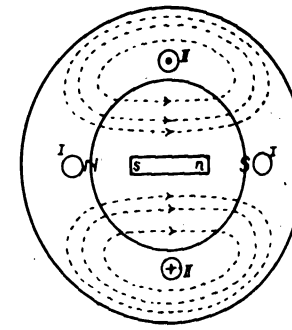

Fig 21

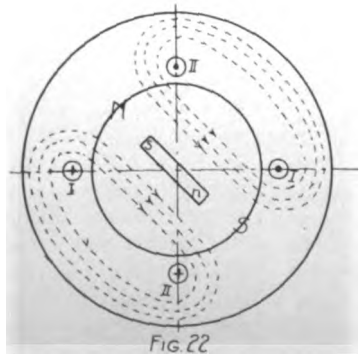

Fig. 22

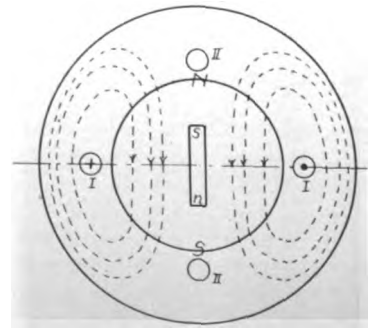

Fig 23

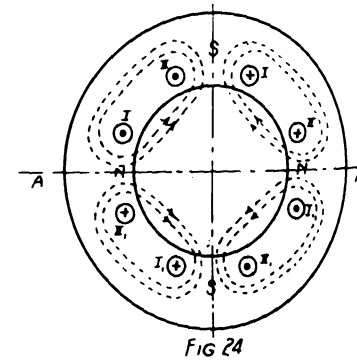

Fig 24

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We have shown how a revolving magnetic field can be produced by means of a two-phase current supplied to a two-phase stator of an induction motor.

Instead of a two-phase arrangement we could have chosen a three-phase system and the result would have been the same.

The current in coil II in Fig. 19 produces a simple alternating magnetic field in a horizontal line (or the X axis), while the current in the coil I produces a similar magnetic field in a vertical line (or Y axis). Assuming the electromotive forces applied to the two coils to be of the same value and frequency, but displaced in time a quarter period or 90 electrical degrees, then for a sinusoidal wave of electromotive force the instantaneous value of the magnetomotive force of the coil II is $H \cos 2\pi ft = H \cos \omega t$; and in the coil I, $H \sin \omega t$, if H be the maximum value of the magnetomotive force. As long as the iron is not saturated, the flux-density B can be taken as proportional to the magnetomotive force and we obtain for the magnetic inductions in the x and y axis the following values, shown graphically in Fig. 25.

$$\left.\begin{aligned} x &= OA = B \cos \omega t \\ y &= OD = B \sin \omega t \end{aligned}\right\} \quad (30)$$

The resultant of the two components is at every instant

$$\left.\begin{aligned} OC &= \sqrt{OA^2 + OD^2} = \\ B\sqrt{\cos^2 \omega t + \sin^2 \omega t} &= B \end{aligned}\right\} \quad (31)$$

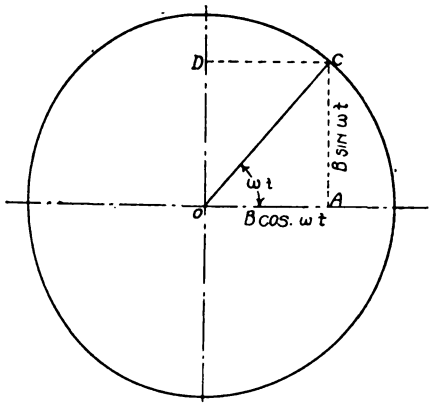

Fig. 25.

The resultant B is for every instant constant in value but revolves with a uniform velocity $\omega = 2\pi f$, hence the resultant magnetic field is constant and is revolving with a uniform velocity. Such a magnetic field is called a circular revolving field.

If the magnetomotive forces are not equal in value or the angle they make with each other differs from 90 electrical degrees, we will not obtain a circular revolving field and torque exerted by the field will not be uniform. Hence the importance of perfect symmetry in polyphase induction motors.

To produce a circular revolving field we need, generally speaking, n simple alternating magnetic fields of equal maximum value (amplitude) displaced in time phase by $2\pi/n$ degrees and spaced with reference to each other by the same angle. Fig. 18 gives us the value of the current at every instant of time and is a time diagram.

Figs. 19 to 23 show us the position of the resultant magnetic field in space at every instant and can be considered as space diagrams.

Imagine that the stator ring shown in Fig. 19 is cut open along the dotted line AA_1, then bent to a half circle as shown in the upper half of circle of Fig. 24 and another similar half added below. We obtain a four-pole stator. During the time corresponding to one cycle the magnetic field moves around the rotor axis a distance equal to two poles or in Fig. 25 a distance of 180°. The time corresponding to two cycles is necessary for a complete revolution. During one second, then, in the four-pole motor the field revolves $f/2$ times and during one minute the magnetic field revolves n_1 times, where

$$n_1 = 60f/2 = 30f \quad (32)$$

For the bipolar arrangement shown in Figs. 19 to 23 we had

$$n_1 = 60f/1 \quad (33)$$

But 1 in formula (33) and 2 in (32) represent the number of pairs of poles, and we can generally state that the speed of the revolving field in revolutions per minute

$$n_1 = 60f/p \quad (34)$$

where p equals half the number of poles of the motor.

Barring friction in the bearing, windage and other losses, the rotor of an induction motor running free would follow the revolving field the same as the permanent magnet in Figs. 19 to 23 and would run at the speed n_1. n_1 is called the synchronous speed of the motor.

Assume an eight-pole induction motor connected to a 60-cycle circuit. Then $f=60$, $p=4$, and the speed of the revolving field in revolutions per minute, according to (34), is

$$n_1 = 60 \times 60/4 = 900.$$

The Alternating Magnetic Field.

If the winding II in Fig. 19 should be left open and an alternating current supplied to the winding I, the same becomes the seat of magnetomotive forces and will produce a flux along the vertical axis. This flux will vary in magnitude and for low saturations will be at every instant proportional to the magnetomotive force, which may be assumed to vary according to a sine

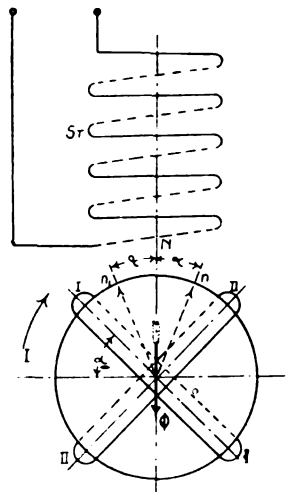

Fig. 26.

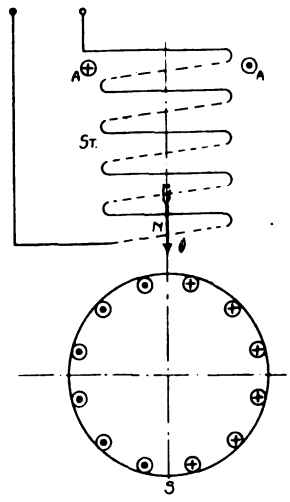

Fig. 27.

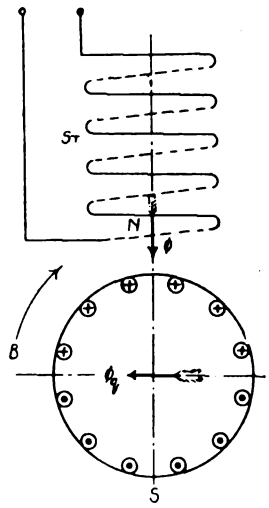

Fig. 28.

wave. We diagrammatically represent such a stator by a spiral St as shown in Fig. 26. The rotor may be represented by a circle. Assume one coil, I wound on the rotor, the same making an angle α with the horizontal. The flux ϕ produced by the stator coil St is in a vertical direction and induces a current in the coil I which according to Lenz's law produces a magnetic field of such a direction at every instant as to oppose the change in the field causing the current. The flux produced by this current is perpendicular to the plane of the coil and forms the same angle α with the vertical line. According to the law of Biot and Savart expressed in formula (26), a torque exists between the flux ϕ and the current in I which is proportional to the current in I, the flux ϕ and the sine of the angle α. Provided the torque is large enough, the rotor will turn until the plane of the coil I is perpendicular to the flux ϕ (or in other words until it is interlinked with the maximum amount of flux); at this instant the torque becomes zero. The direction in which the rotor would move under the influence of the current in the armature coil I and the field ϕ can easily be determined by noting that the coil I forms a north pole at n which is repelled by the north pole N on the stator field while ϕ is increasing. The rotor would move in the direction of the arrow I. If ϕ were decreasing in value, the current I would be in the opposite direction, and the force also would be reversed.

In a squirrel-cage rotor with many short-circuited coils we

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will find for every coil I a second coil II whose normal to the plane of the coil forms with the vertical the same angle α, but to the left instead of to the right (as shown in Fig. 26). The coil II gives rise to the pole n_1 which is repulsed by the pole N in the opposite direction as n. The combined torque of coil I and coil II is then zero. The complete rotor, being made up of combinations like I and II, cannot produce any torque with the field flux ϕ.

The flux of the coils I and II, and in consequence the entire rotor windings, combine to oppose the main flux ϕ and behave towards the stator like the short-circuited secondary of a transformer.

It is an experimental fact that if the winding II in Fig. 19 is opened while the rotor (not shown in Fig. 19) is running, the rotor continues to run at approximately the same speed as before, the assumption being that the motor is not loaded. It is evident then that it is possible to produce a torque by means of a single-phase current supplied to the stator; but this is conditioned by a revolving rotor which is short-circuited along more than one axis. In order to produce a revolving field in a single-phase induction motor, the same has to be brought up to speed, and we shall investigate now the effect of the mechanical motion of the secondary in giving rise to a rotating field.

When the rotor is rotating at a certain speed in a single alternating field there are electromotive forces induced in the short-circuited turns by induction and by rotation.

Using in Fig. 27 the same notations as in Fig. 26, we note that due to the pulsation of the flux ϕ electromotive forces and currents are induced in the rotor winding, the direction of which can best be determined when we remember that these currents produce in turn fluxes which oppose the changes due to the stator currents. The direction of the currents shown in our diagram refer to only one instant, the current being alternating in character.

If the current in the stator coil for the instant we consider, has the direction shown in our conventional manner by AA in Fig. 27, and is increasing, the direction of the rotor currents for this instant is as indicated in the same figure.

If the rotor be moving across the field ϕ in the direction indicated by the arrow B in Fig. 28, there will be generated in each conductor an electromotive force proportional to the field and to the speed of rotation. The direction of the induced currents for a certain instant can be determined by remembering the following rule: For clockwise direction of rotation the electromotive force, induced in the armature by its cutting the magnetic flux, is directed away from the reader for the conductors under the north pole and towards the reader for the conductors under the south pole. If there be no lag the currets are grouped symmetrically around the horizontal and for the instant shown in Fig. 28 the flux ϕ_q, produced by these currents is from right to left. These electromotive forces have their maximum value when the flux ϕ is maximum. Due to the self-induction of the armature winding the flux ϕ_q lags behind the electromotive forces producing it. The fluxes ϕ and ϕ_q are displaced in space about 90°, and produce an elliptical field. It has been shown that an alternating flux cannot produce torque on a stationary squirrel cage, hence at starting the torque of the single-phase induction motor is zero. This single-phase induction motor has inherently no starting torque whatever, but will accelerate, if given an initial start, to nearly synchronous speed, provided the load is not too great.

The torque exerted by an elliptical field is not constant, because the instantaneous values of the rotating field to which the torque is due are not constant.

The rotor currents indicated in Fig. 24 (the energy currents) are displaced by nearly 90° in time from the flux ϕ; the quadrature flux ϕ_q is also displaced by nearly 90° from the flux ϕ. In consequence the rotor currents in the Y-axis are nearly in time phase with the flux ϕ_q and displaced therefrom in space by nearly a quarter period; these are most favorable conditions for producing torque.

A common method of starting a single-phase induction motor is the so-called split-phase method. The stator is wound similarly to a two-phase motor, but the impedance of the two windings, displaced from each other by 90 electrical degrees, is not the same. Due to the different impedances of the two windings, currents displaced in time phase will flow in the two circuits when connected in parallel to the line and the motor will start up as an imperfect two-phase motor. One of the windings (the so-called starting or teaser winding) is designed to be left in circuit only a very short time, a centrifugal switch being usually employed to open this circuit as soon as the motor has attained nearly full speed.

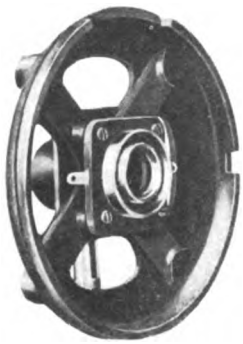

Fig. 29.

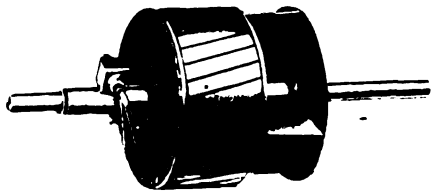

Fig. 30.

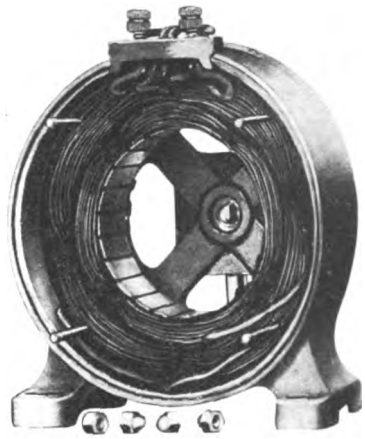

Fig. 31.

A motor of this type is shown in Figs. 29, 30 and 31. It is a one-eighth-horsepower, single-phase, split-phase winding. Fig. 30 shows the rotor core with the centrifugal switch. Fig. 29 shows the bracket with the slip rings through which the circuit of the starting winding is closed and opened. The fan shown on the rotor is characteristic of methods of ventilation of all modern motors.

Other methods of starting single-phase motors will be considered later on.

(To be continued.)

Water Powers of Europe.

Statistics of the Imperial Russian Technical Society show the available water power in European Russia, including Finland, the Urals and Caucasia, to be roughly 30,000,000 horsepower, of which hardly 250,000 horsepower is utilized. The potential water power of Germany is about 1,000,000 horsepower; that of Switzerland 2,500,000 horsepower, and that of Sweden more than 6,000,000 horsepower. Of the latter about 3,500,000 horsepower is not yet utilized. In Switzerland 300,000 horsepower is utilized.

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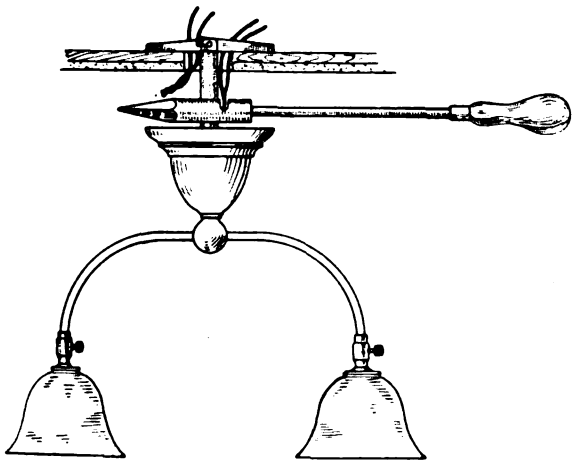
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Soldering in Close Places.

An easy way to solder joints in close and confined spaces is to take an ordinary soldering iron and file a groove in one side of it and tin it so that you can lay the joint into the groove. By doing this you will find that you can get



Grooved Soldering Iron for Work in Close Places.

into almost any corner and solder a joint in about half the time it requires to do it with a torch. The sketch shows how it is done in the case of fixture outlets.

Walter Morris.

Screws for Switch Outlets.

When flush switch or receptacle boxes are set too deep in the wall, as sometimes occurs when walls are stripped and back-plastered, the screws which come with the switch or receptacle are usually too short. Wood screws (No. 6 or 7) of the proper length can be screwed into the box-ear holes and hold the switch just as rigidly as the other screws would.

Benjamin Swanson.

Fishing Between Partitions.

In knob-and-tube-wiring in old houses it is often necessary to drop a fish line or mouse between partitions for a switch outlet, or some other purpose. In this case a weight must be put at the end of the string. Since a suitable weight is not always at hand, I have found that a piece of wire wound round itself serves satisfactorily as a weight. It is easily replaced should it become lost, as it frequently does.

Wire Weight.

S. B. Trunkat.

To Drill Glass.

It is sometimes necessary to drill a hole in glass intended for covering an instrument, etc. It is possible to drill glass very readily with a common drill and the use of a mixture of turpentine and camphor. When the point of the drill has come through, it should be taken out and the hole worked through with the point of a three-cornered file, having the edges ground sharp. Use the corners of the file to scrape the glass, rather than as a reamer. Care should be taken not to crack the glass or flake off parts of it in finishing the hole after the point of the drill has come through. Use the mixture freely, during the drilling and scraping. During the drilling the glass should be put on several layers of newspaper to prevent cracking the glass from uneven distribution of the pressure.

The above mixture will also be found useful in drilling cast iron. Tempered steel can be drilled by making a drill very hard and using this mixture.

F. A. Grohsmeyer.

Cutting Plaster for Outlets.

The following is a quick and neat way of cutting away plaster to make a hole for switch, bracket or ceiling boxes. Hold the open end of the box against the plaster on the exact spot where the outlet should be, then hammer on the back of the box, near the edge, so as to make the wall of the box cut the plaster. It is best to start near a corner of the box and work around. Most wiremen are afraid to use this scheme, fearing it will loosen a lot of plaster and make an irregular hole. With a little care, however, nearly all the plaster can be made to fall into the box.

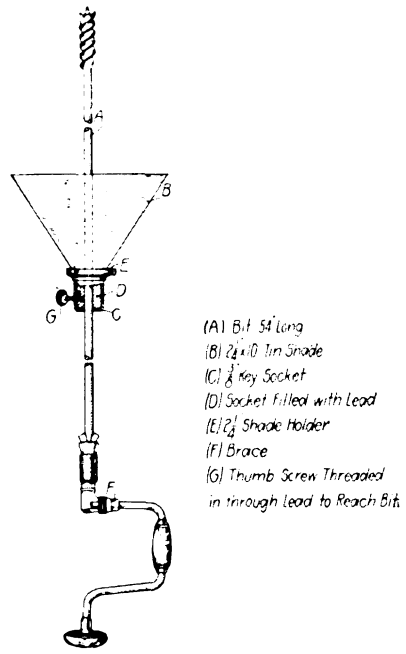
Charles Rubner.

Bit and Dirt Catcher for Boring Plastered Ceilings.

In wiring old houses I find that a bit about 4.5 feet long is very convenient. This is made by welding a rod onto the end of a regular bit and putting a shank on the other end of the rod.

Boring holes in plastered ceilings for fixture outlets has nearly always required two men—a wireman and helper—one to do the boring and the other to hold paper to catch the dirt. For this purpose I have found the following little scheme very convenient:

A three-eighths-inch key socket shell is filled with lead, ex-



Bit and Adjustable Dirt Catcher.

cept for a hole down through center the size of the rod or bit stem. An old 10-inch tin shade with 2.25-inch holder is attached to the socket; this is slipped over shank end of bit and fastened to bit rod at any desired point by a thumb screw, which is threaded into the lead, passing through the socket shell where the key originally went. A shade which is threaded to screw onto shade-holder ring is preferable, but separate shade and holder may be used, provided shade-holder is not ventilated, since an open holder would allow dirt to pass through.

Harry V. Light.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

The Wood-Waste Problem.

To the Editor:

Regarding the article on page 463 of your March 11 issue on the subject of the wood-waste problem, I suppose our experiences in Milwaukee in connection with this subject are the same as those of power engineers throughout the country; that is, that most of our woodworking plants offer many obstacles to the utilization of purchased electric power. We have figured on a number of these plants but at the present time we are supplying the entire power requirements of none of them of any consequence. The conditions we have met are these: Most of them operate a dry kiln in which they dry a large part of their lumber. This usually utilizes exhaust steam throughout the year in a very considerable quantity. They all have a number of small uses for live and exhaust steam in the way of glue pots and cookers, heating boxes, and paint-drying rooms. The factory buildings have to be kept at a higher temperature than the ordinary shop or factory, so a large amount of exhaust steam is used for heating the buildings during the heating season, which in this climate includes about eight months of the year.

The above steam requirements make it necessary for these plants to operate boilers throughout the entire year requiring the attention of one or two firemen, depending upon whether the plant operates one or two shifts. This establishes a labor charge which cannot be eliminated by the use of purchased electric power and a charge which amounts to at least half of the cost of the firing force were a power plant operated.

Where they have a power plant the chief engineer usually acts as mechanical superintendent for the equipment throughout the plant. With purchased service it is necessary to have at least one handy man to take care of this work. With a non-condensing steam power plant, careful engineers are usually able to carry a large part of their steam requirements on exhaust steam from the engine. They cannot, of course, utilize all of their exhaust steam throughout the year because if they have sufficient exhaust steam in the winter season to take care of the heating in addition to the other requirements they will have a great deal going to waste in the summer months. On the other hand if their exhaust steam does not meet their entire requirements in the winter months they can at small additional expense use live steam.

In all of the plants in this vicinity there is a great deal of refuse, a large part of which has no greater value for any other purpose than for fuel. This refuse is in the form of shavings and sawdust, blocks and edgings. It is produced continuously throughout the year and must either be disposed of as produced or large storage capacity provided. There is here a fairly ready market for blocks and edgings for starting fires and for fuel. If it is sawed in short lengths and delivered it will bring more than its value as fuel. There seems to be no market of consequence for the shavings and sawdust and the only satisfactory disposition made of them thus far has been to burn them in the boilers.

The relative amount of refuse, of course, varies in different plants. In some cases they have enough to supply almost all of their fuel requirements, while in others they have to purchase a great deal of coal. The shavings and sawdust are usually delivered by exhausters to a chamber just back of the boiler-room firing floor or direct to the boilers. Their full fuel value is thereby utilized and the refuse is effectually and regularly disposed of.

We have felt in a number of cases that the refuse should be almost adequate to supply the steam requirements of the plant and that power could be purchased to advantage and the steam generated in a simple boiler plant by burning the refuse. When, however, a general balance sheet and a comparison of costs were made it has usually been found that this does not work out to advantage.

We have tried to investigate various schemes for disposing of shavings and sawdust, such as using it in the manufacture of wood alcohol, the manufacture of linoleum, collecting it at one central point and burning it in a power plant; but none of these schemes seem feasible at this time. We thought the wood-alcohol manufacture might open up a new field for the use of sawdust and shavings, but we are informed by the Wisconsin State Laboratory in charge of investigations along this line that it will not be an economical proposition for many years to come because in that production the first factories would be started at the large saw mills in the northern woods where there are millions of board feet of green sawdust going to waste every year. The linoleum manufacturer requires certain classes of sawdust of a uniform color and composition and this could not be obtained from the woodworking plants in the city.

Within the past year we made a survey of 25 of the largest woodworking plants in Milwaukee and vicinity. We found that they use about 150,000,000 board feet of lumber per year of various kinds; that 25 per cent of this, or 37,500,000 board feet becomes refuse and that one-third of the refuse is sawdust and shavings and two-thirds blocks and edgings.

Like all other industrial plants, each woodworking plant is a case for individual treatment and what may meet the conditions in one will not work out in another; in general, however, we do not consider woodworking plants a likely field for central-station power. They offer, however, a splendid field for the motor-salesman and we believe the time will soon arrive when there will be no more mechanically driven woodworking plants in the country.

These remarks probably throw no new light on this subject. We are anxiously awaiting some new developments which will enable us to find an opening in the woodworking industries.

F. A. Coffin,
Commercial Engineer,
The Milwaukee Electric Railway & Light Company.
Milwaukee, Wis.

Ground Test on Conduit Installations.

To the Editor;

Regarding the method of making a ground test on conduit or armored-cable installations described by M. J. Moriarty in a recent issue (page 555), I wish to call attention to the fact that, while the method is very sensitive in finding grounds, it is too sensitive to determine whether or not a conduit or cable is properly grounded. So poor a ground may be made as to be totally unfit for protective purposes and still give a very loud and distinct click in the receiver when tested. A faint click does not necessarily indicate a poor ground. The most effective method is to test the grounding with the full voltage of the system grounded.

H. E. Weightman.
Chicago, Ill.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to not over 300 words. Payment will be made for all answers published.

Questions.

No. 341.—Controller for Bascule Bridge.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

No. 342.—Trouble Finders.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

Answers.

No. 336.—Visual and Audible Signal.—I should like to know whether it is possible (and if so, how) to wire a simple but positive signal system which will indicate at the same instant at the sending and receiving points by means of lighting red lamps and ringing large gongs for perhaps half a minute. That is, the man at the sending end must know positively by the lighting of his lamp and ringing of his gong that the combined signal was properly actuated at the receiving end without a special answer-back signal.—G. S. C., Joplin, Mo.

The accompanying diagrams will give the querist the details of a circuit such as he desires. The self-restoring, three-point keys are simply assembled, or may be procured from any supply house. The relays should be of approximately 20 ohms resistance, and preferably of the knife-edge armature type. A relay of this type operating on a circuit of from 21 to 24 volts is very positive in operation, with a current consumption of only from 0.015 to 0.020 ampere. This allows of its use on a circuit up to 1,000 ohms resistance one way. The bells should be wound for 24-volt operation, and the lamps designed for the same voltage.

If it is desired to use the circuit for telephone communication as well, any standard local-battery telephone connected across the circuit in series with a condenser of 2 microfarads capacity will give the desired result. In Figs. 1 and 2, letters *A*, *B* and *L* indicate corresponding terminals.

In a circuit designed by the writer, and placed in service in Buffalo, N. Y., some time ago, it was found advisable to take a tap wire from the stationary contacts of the bells to one side of the line, through a condenser of 1-microfarad capacity, and an extra contact in the telephone hook switch, this being the contact to which wire from the terminal *B* Fig. 2, is connected. This gives a positive answer-back signal from the distant station, since the receiver is removed from its hook while signaling, as a rule. It will be noticed that this tap wire must be connected to the opposite side of the line at each station, and also that polarity of main battery must be reversed at each station.

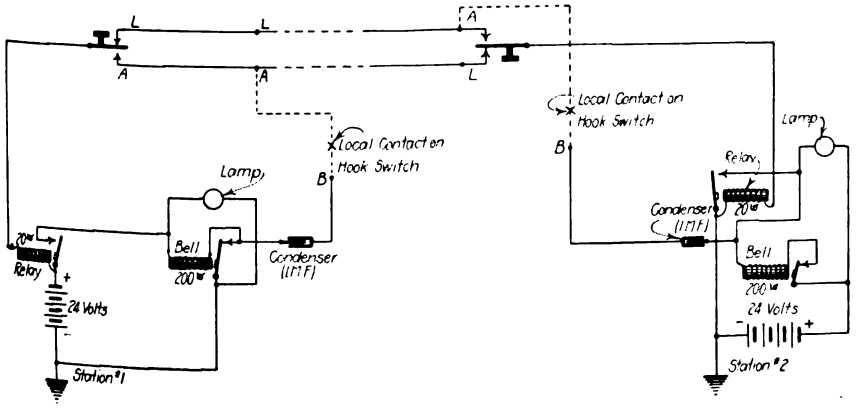
If it is intended to use the signal circuit only, bell-ringing transformers giving 20 to 25 volts on their secondaries may be used to supply the signaling current, and the tap wires from the bells may be omitted. All the equipment used is standard and may be procured from any reliable supply house.—A. C. F. L., Port Huron, Mich.

No. 339.—Telephones on Power Lines.—What precautions should be taken in installing telephones whose line is on the same poles with 11,000-volt power lines? What special precautions should be taken for safety? Would it be practical and would the service be satisfactory if a grounded circuit were used instead of a metallic circuit for the telephone line?—R. F. C., Minersville, Cal.

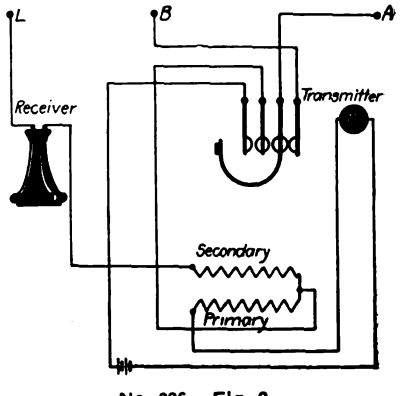
When a telephone line is installed on the same pole as a circuit carrying heavy current at low or high voltage it must be protected. The service must be protected from the current in the neighboring circuit where the voltage is low, while when the voltage is high the question of life risk as well as service also enters. The telephone lines for use of the public do not usually run on the same poles as the power lines. Such telephone lines are for the use of the employees of the power company, and their use by others is usually forbidden by the power company.

In power transmission work the same poles are often used for the power and telephone circuits because the route for the one is the logical one for the other, in this way obtaining economy of first cost, for maintenance and permitting the saving of valuable time during operating troubles. For circuits above about 60,000 volts a separate pole line is usually used for the telephone line, partly on account of the greater safety but also because of the effect of the high voltage upon speech over the telephone line. Separate pole lines should be not nearer than about 60 feet from the high-tension lines.

Where telephone lines parallel power lines there is always the possibility of interference due to the electromagnetic and electrostatic fields set up by the power line, and these



No. 336.—Fig. 1.—Visual and Audible Signal.



No. 336.—Fig. 2.

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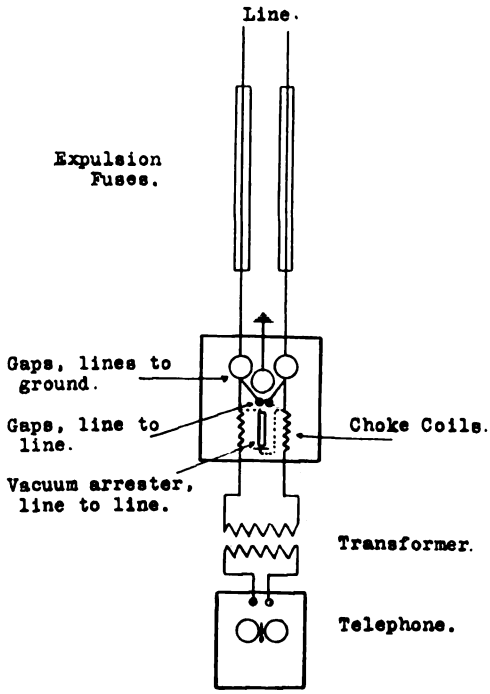
effects upon the talking properties of the telephone line must be guarded against, otherwise the bells may ring, receivers burn out, shocks be received and similar symptoms be encountered when short-circuits, grounds, sudden load changes, etc., occur on the high-voltage line. Climatic changes, especially when the insulation of the lines is not in the best condition, also enter, often making speech impossible of interpretation.

The quality of service of the telephone line may be safeguarded to a large extent by judicious spacing of the wires of the two circuits with respect to each other, transposing the lines, and maintaining the insulation of both circuits in first-class condition. When telephone lines are installed on the same poles as power circuits or even in close proximity to them, it is customary to transpose the telephone lines every 1,000 feet or so. Transpositions should not be made oftener than necessary, for making them costs money while too frequent transposition will often cause more harm than good. The power lines are often transposed also, but this is being done less now than it was at one time. In some cases where considerable trouble was encountered due to high voltage and heavy current surges, neutralizing transformers are used. The most notable instance of this is on the New York, New Haven & Hartford single-phase



No. 339.—Protection of Telephone on Power Line.

track, where the use of the track and earth caused considerable embarrassment for some time.

A telephone line with one side grounded almost always suffers more than one that is metallic throughout. It requires higher insulation on the ungrounded side, and is very much more susceptible to atmospheric conditions—moisture, etc. Where a telephone line parallels a power line, whether on the same pole or in very close proximity, the circuit should by all means be metallic throughout.

Not only must the speech characteristics be protected where a telephone line parallels a power line, but it is also necessary to protect the persons using the line from shock, and prevent the likelihood of fires starting. As a rule telephone companies do not allow circuits paralleling power lines on the same pole to be connected to their exchanges, although they may be if the proper precautions are taken.

Power transmission companies usually supply insulated wooden platforms for use of their employees who must use the telephones along their power lines. The wood is dry varnished wood supported on insulators. In addition to this many of them, particularly on really high-voltage circuits, 60,000 volts and above, insulate the telephone from the telephone circuit by means of a transformer specially built for this purpose. Lightning arresters are installed, as are also choke coils and fuses. The sketch shows the general arrangement of a protected telephone installation, applicable for voltages from 11,000 to 110,000 volts. These sets are supplied by the large manufacturers of electrical apparatus.—K. R., Chicago, Ill.

Telephone lines on high-tension power poles can be as safely and quietly operated as elsewhere, if the line is installed below the power line, say 10 or 12 feet or more, and transposed at frequent but equal distances. Then above the telephone circuit, or between it and the high-tension circuit, run an old iron wire, about No. 14 or larger, parallel with both telephone and power lines and ground it twice between each transposition of the telephone pairs.

Where entering building install type Y-109, form B telephone-line insulating transformers with lightning arrester and fuses. The transpositions should not be greater distances than one-fourth mile apart.—J. B. K., Torrance, Cal.

No. 343.—Theater Emergency Lights.—Rule 38a of the National Electrical Code provides that "where supply to a theater cannot be obtained from two separate sources, the feed for emergency lights must be taken from a point on the street side of main service fuses." Has this provision been found ample for the purpose? Would it not be desirable to insist on an entirely independent source, such as a storage battery?—J. H. R., Pittsburgh, Pa.

The Cleveland city code provides that in addition to the usual emergency lighting, there shall also be a storage-battery auxiliary lighting system. This battery must be of sufficient capacity and lamps so arranged as to light the house for 15 minutes. The amount of light demanded is such that the house may be easily emptied without confusion. This requirement has been of very great service in several cases which have come to the writer's personal attention.

In one instance, after motion-picture exhibitor had objected very strenuously to the installation of this equipment, and after it was necessary to threaten him with closing his theater, he finally installed it. The next week, the power supply failed for 15 to 20 minutes, and the exhibitor was thankful that he had installed this additional equipment, for the reason that he was able to light his theater and so hold the house in control.—E. W. P. S., Cleveland, O.

No. 345.—Demagnetizing Iron Castings.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

The best means for demagnetizing iron and steel castings is annealing, by heating the castings up to the point of a dark red which can just be seen in daylight. This would demagnetize entirely. The parts, of course, must not be handled afterwards again by the lifting magnet. This in all probability is done only when the castings come from the foundry in great quantities, afterwards they will doubtless be handled individually, and lifted by hand or by small cranes. As a foundry is already on the ground, this proposition would very likely be the most economical, a little furnace being easily installed for the annealing. This will be much cheaper and more effective than demagnetizing by alternating current, in which case also provision must be made for gradually diminishing the strength of the initial current to zero before breaking.—H. A., Pittsburgh, Pa.

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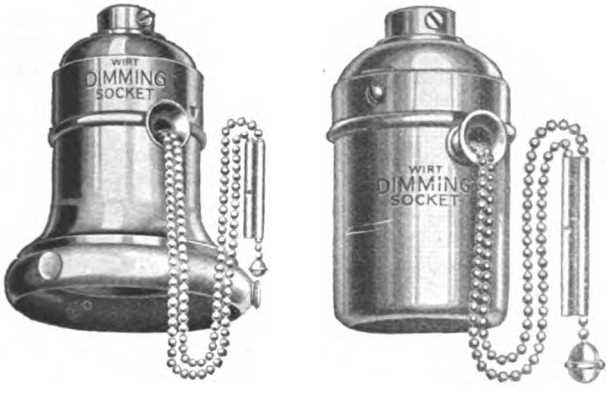
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Wirt Dimming Sockets.

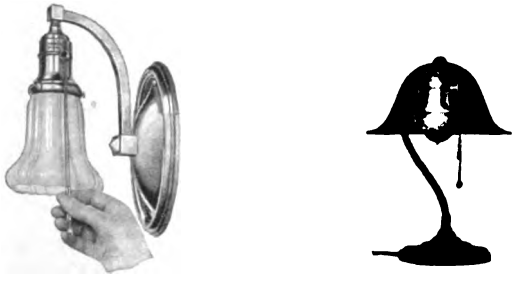
Through the development of dimming sockets an additional impetus is being given to electric lighting, particularly in residence service. Ceiling fixtures, wall brackets and portable lamps can now be supplied with sockets which enable the consumer to obtain every advantage of electric lighting together with ability to regulate the amount of light by a small dimming arrangement. Thus, such dimming sockets enable the light to be turned up or down as readily as with a gas lamp and, therefore, meet the only advantage which gas lighting has heretofore possessed over electric lighting.

The first compact and self-contained dimming socket was



Two Types of Dimming Sockets, the First Including a Shade Holder.

described in the Electrical Review and Western Electrician of September 5, 1914. This socket was the development of the well known Dimalite device. Since that time the Wirt Company, Armat and Lena Streets, Philadelphia, Pa., has further developed its line of dimming sockets and now has a number of improved types available. These are shown in the accompanying illustrations. Each of them gives five changes of light,



Use of Dimming Sockets for Bracket and Portable Lamps.

namely, full, half, dim, night light, and out. They are controlled by a convenient double chain, of which one portion has the ordinary ball end and the other has a tubular part through which the former passes. One of these chains is used for increasing the light step by step and the other is used for turning it down. Included in the socket is a very compact and durable resistance, which is introduced in series with the lamp when the light is turned down, thus effecting a saving in the current of from 30 to 80 per cent, depending upon the degree of dimming. These sockets, of course, can be used for any type of Edison base lamp and are designed to be attached permanently to the fixtures with thread and set screw, the same way as ordinary sockets are attached.

One of these sockets (No. 31) is supplied with 2.25-inch holder and is intended for use on lighting fixtures in hallways, bathrooms, bedrooms, nursery, etc. Another socket (No. 32) is designed especially for use in portable, table, piano, and floor lamps, special brackets, etc. Both these sockets may be used on any fixture where direct control of light is desired. Their use dispenses with the need for the ordinary pull-chain or key socket with an additional dimming device. In addition to convenience and economy these sockets lend themselves to very artistic effects when installed on ornamental fixtures.

Ward Leonard Adaptor Resistance Units.

Occasion frequently arises for inserting in series with a circuit a certain amount of resistance. A very convenient means for doing this has been developed by the Ward Leonard Electric Company, Bronxville, N. Y., through its new Adaptor resistance units. These consist of enameled resistances mounted with an Edison base screw plug at one end and an Edison socket at the other end. Thus this unit provides a very convenient means of connecting the resistance in series with the circuit, since it can be interposed between the connecting cord and any portable device. These resistance units can be furnished for practically any resistance and current-carrying capacity desired. They are used extensively to enable universal type

Adaptor Resistance Unit for Series Connection to Circuit.

motors to be used either on alternating-current or direct-current circuits so as to give identically the same speed, which means that a resistance should be used on the direct-current circuit. These resistances have also been used in connection with low-voltage apparatus when connected to circuits of higher voltage.

The resistance unit consists of a porcelain tube having resistance wire with low temperature co-efficient wound on it; the joint between the resistance wire and terminal lead is made while the parts are bright and clean and under high pressure, thus insuring a perfect connection through life. The entire resistance winding, as well as this joint, is imbedded in a coating of vitreous enamel which thoroughly protects it from electrical, chemical and mechanical disintegration.

Mazda Spot or Lens Light.

The prophesied passing of the hand-fed arc-lamp device used for stage purposes and portable illumination appears to have been at last realized. Last year the Sprague Works of the General Electric Company, New York City, placed on the market an Olivette type of device used as a flood lamp for illuminating large surfaces which rapidly

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Sprague Mazda Spot Light.

supplanted the hand-fed arc type of device used for the same purpose and now this company is in the field with a lens lamp or as it is sometimes termed spot lamp, which undoubtedly will be welcomed by the trade as a successor to the hand-fed arc device.

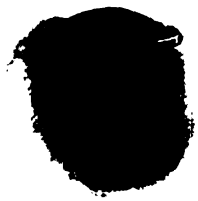
This device, using the Mazda gas-filled lamp as its illuminant, is designed to take the place of the hand-fed arc lamp at present used for projecting purposes in theaters, assembly halls and motion-picture houses generally. It can be used for any purpose for which the present arc device is now employed, namely, as a flood light from the balcony or gallery, or as a spot light from the same location.

The hood of the device is substantially constructed and of neat appearance. A special feature has been made of the design of this ventilating hood to produce a device that will meet the requirements of the National Board of Underwriters. No part of the exposed surface of this hood attains greater temperature than 200 degrees Fahrenheit while in continuous operation. The hood is built with an inner and outer body, thus permitting a clear circulation of air to pass around the lamp at all times.

The hood is mounted on a telescopic stand which permits it to be raised or lowered at will, while a swing-joint attachment permits operation of the light in any direction.

New Double-Contact Push Button.

A new type of push button has recently been placed upon the market by the Connecticut Telephone & Electric Company, Meriden, Conn. This button is fitted with long self-cleaning contact springs which have a double wipe. This is the only push button upon the market with a double rubbing contact. The contacts are protected by a heavy metal guard, and lugs on the side of binding-post screws keep the wire connections in position, therefore no soldering is necessary.



Double-Contact Button.

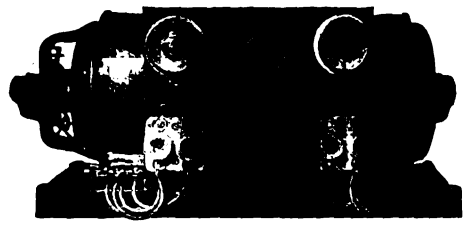
The push button has a large oval center which has a solid stop. The entire button is solidly built and is practically indestructible. This button is arranged to be mounted singly or in groups and designed to fit a five-eighths-inch hole. It can be furnished with black, white or pearl center, as desired.

Motor-Generator Equipment for Charging Small Storage Batteries.

Every garage operator and automobile owner has experienced the need of a convenient means for charging small storage batteries, such as are used today on practically all up-to-date gasoline cars for starting, lighting and ignition service. Launch owners also have experienced the same need.

For economically charging these small storage batteries, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is marketing an equipment shown in the illustration. This simple, compact motor-generator can be connected to the most commonly found lighting circuits, namely 110 or 220-volt, 60-cycle, alternating current or 115 or 230-volt direct current. The motor-generator takes its power from the line and generates direct current at a voltage slightly higher than that of the battery.

The panel and the charging set are supplied completely wired ready for operation, which is extremely simple. The motor is first connected to the supply circuit and then started by means of a snap switch. The battery is connected to the generator terminals and the charge rate adjusted by means of the field rheostat to the value shown on the battery name plate. The charging is continued according to the method recommended by the battery manufacturer. As the generator is shunt wound, its voltage increases as the ampere load decreases. That is, as the battery approaches a charged condition the potential of the generator automatically rises to the higher value required for finishing the charge. This voltage characteristic is a great



Battery-Charging Motor-Generator.

advantage where lead batteries are to be charged, because it permits the operator to give the battery an equalizing or long-period low-rate charge which prolongs the battery life.

The Westinghouse charging equipment includes a motor-generator and a charging panel with the necessary controlling rheostat, ammeter, switches and fuses. Snap switches and fuses control both the motor and generator, conforming to all the requirements of the National Electrical Code. The outfit is simple and compact; it is easily installed and operated.

Improved Alternating-Current Cooper Hewitt Lamps.

During the last few months a marked improvement has been made by the Cooper Hewitt Electric Company, Hoboken, N. J., in its type F or alternating-current mercury-vapor lamps. Formerly it was impossible to design these lamps so as to have a power-factor much over 50 per cent. Through a redesign and improved construction of the lamp auxiliaries, the power-factor of these units has now been raised to about 87 per cent. These lamps have also been found to operate very satisfactorily on 25-cycle circuits; they are very steady in operation and provide a non-fluctuating light at this low frequency. These Cooper Hewitt lamps are made in two lengths, 20.75 and 50-inch tubes. They are made for various frequencies from 25 to 133 cycles.

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Brassart Lighting Fixtures.

The problems of the fixture designer and manufacturer are becoming more complicated every day on account of the continued demand for artistic and original designs which may be produced at moderate cost. One of the fixture firms that is making conspicuous headway in this direction is the Brassart Fixture Company, 13-15 Laight Street, New York, N. Y. This company is making a very complete line of electric, combination and gas fixtures, to which new designs are being added from time to time. To give an adequate idea of these fixtures is impossible in the limited space available. Therefore, only a few typical designs picked at random are illustrated herewith.

Fig. 1 is a semi-indirect fixture with very attractive glassware of the Adam period of design. This glass is an excellent diffuser and makes the embossed design stand out in very pleasing relief. The length of this fixture is 36 inches, its spread 18 inches and the diameter of the bowl is 16 inches. The metal parts are of polished brass or special finish.

Figs. 2 and 3 are two designs of the Greek period, which were modeled and patented by the firm. The shades of the pendent lamps are artistically etched. The candle-type fixture has silk shades and is in harmony with the popular vogue of the day. These fixtures have met an immediate demand and have proven an excellent sales proposition. The length and spread of the fixture shown in Fig. 2 are 36 and 18 inches, respectively, while those of the fixture shown in Fig. 3 are 42 and 17 inches. These fixtures may be had for different numbers of lamps.

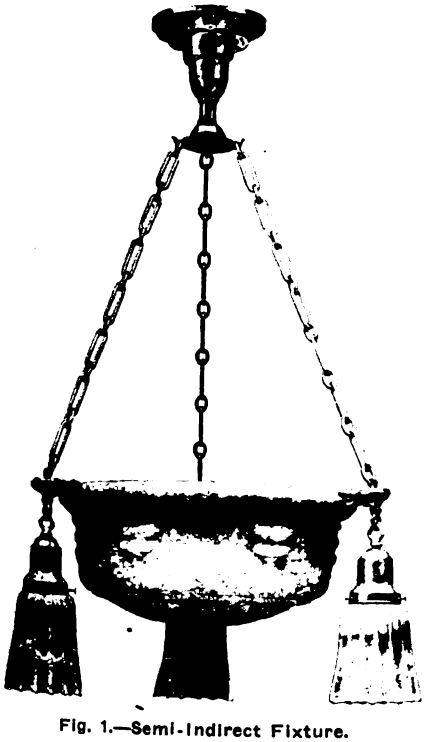

Fig. 1.—Semi-Indirect Fixture.

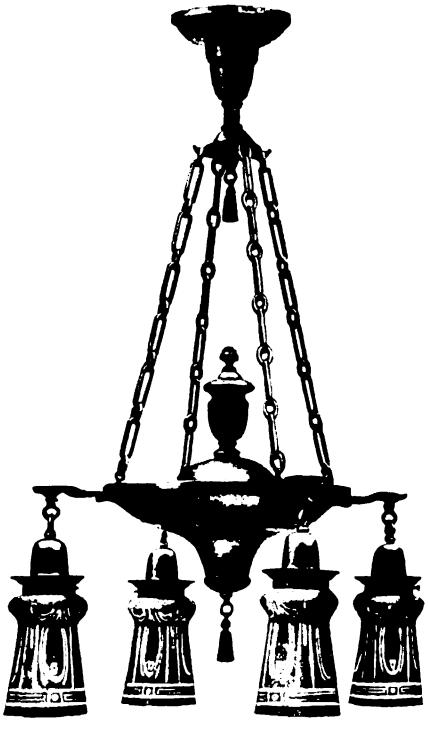

Fig. 2.—Four-Light Fixture of Greek Period.

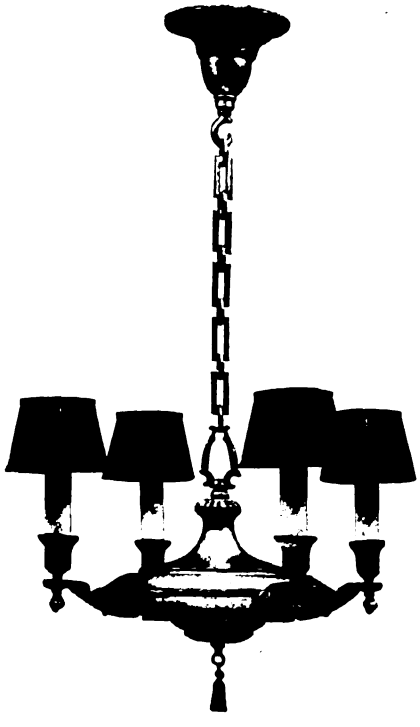

Fig. 3.—Four-Light Candle Fixtures.

The Ko-Shovel Stoking Machine for Boiler Furnaces.

Power-plant engineers have for many years recognized the great value of mechanical stoking, the principal advantages of which are greatly improved economy in fuel consumption and reduced labor costs. A considerable number of mechanical stokers are now on the market but, as a rule, their installation has been rather costly and involved other difficulties which have retarded their use in the smaller plants, at least.

A new design of stoker has recently been developed which, on account of its great simplicity of construction, overcomes the difficulty of high installation cost and has the further advantage that it can be applied to any existing boiler front without difficulty. This device, known as the "Ko-Shovel," can be installed either in the upper portion of the fire-door opening or immediately above the door in the boiler front. The horizontal chute and plunger arrangement which connects with the interior of the furnace requires a vertical depth of only five inches and, if installed in the fire-door opening, requires merely the replacement of the fire door by a new and shallower door. The general method of installation can be seen from the view in Fig. 1, on Page 778.

The coal is spouted from overhead bins or shoveled by hand into single or double hoppers which have sufficient capacity to run the boiler for about one hour. At the base of this hopper is a compact coal crusher which breaks up the larger lumps to a size suitable for firing. From the crushing rolls, which also act as agitators, the coal passes to a rotating valve in the bottom of the crushing compartment. This valve supplies small charges of coal to a chamber directly above the reciprocating piston. This piston is attached to a crosshead or a carriage which is mounted on ball-bearing rollers. Connected to the carriage are powerful tension springs which, through a special cam arrangement, are alternately placed under tension and then suddenly released, driving the piston with its charge of coal forward at frequent and definite intervals. As the piston moves forward with considerable velocity it projects the charge of coal in front of it and over a water-cooled deflecting plate that causes it to spread evenly over the entire grate surface, thus corresponding to an ideal automatic fireman. The general arrangement and operation of the stoker can be seen from the sectional view.

In general principle the Ko-Shovel stoker approaches very closely to the practice of feeding powdered fuel, which has been found to give under proper conditions the most perfect form of furnace combustion. Therefore coal is burned in the combustion zone before it actually touches the fuel on the grate. The charge of coal is about one-half pound and this is fed at intervals averaging about four seconds. The rate of feed is varied either automatically

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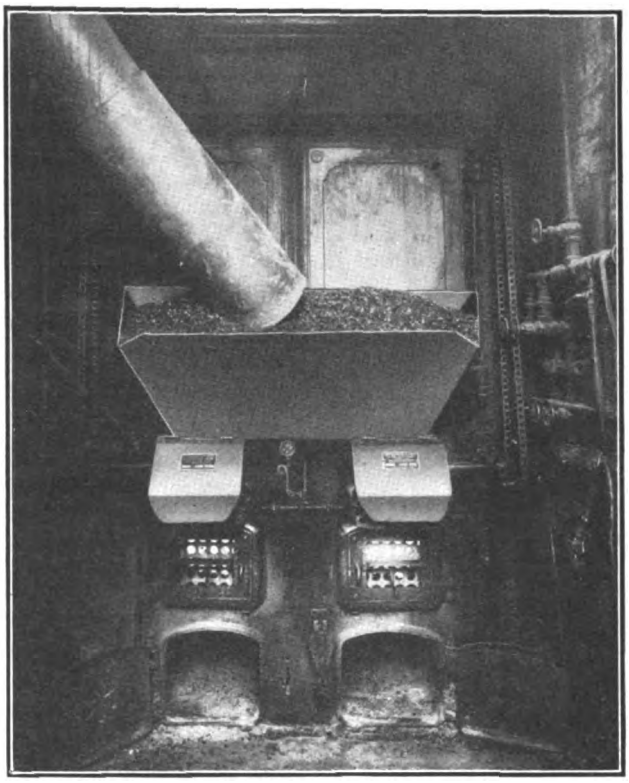


Fig. 1.—Ko-Shovel Stoker Applied to Return Tubular Boiler.

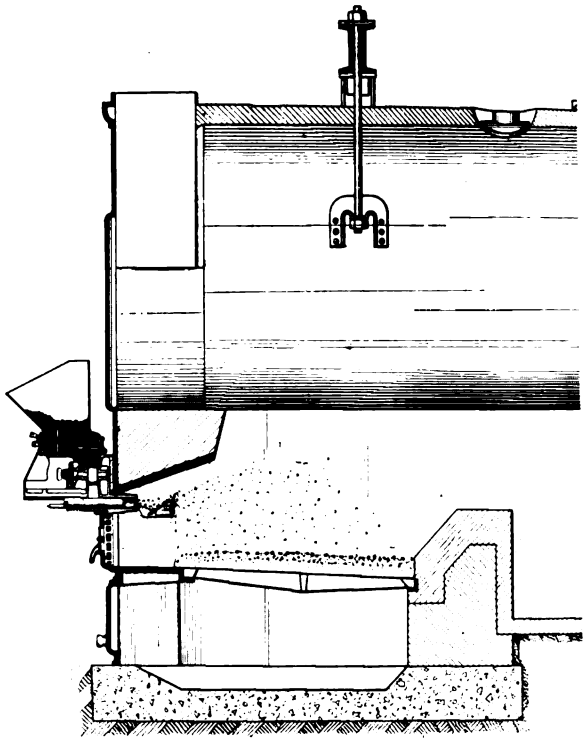


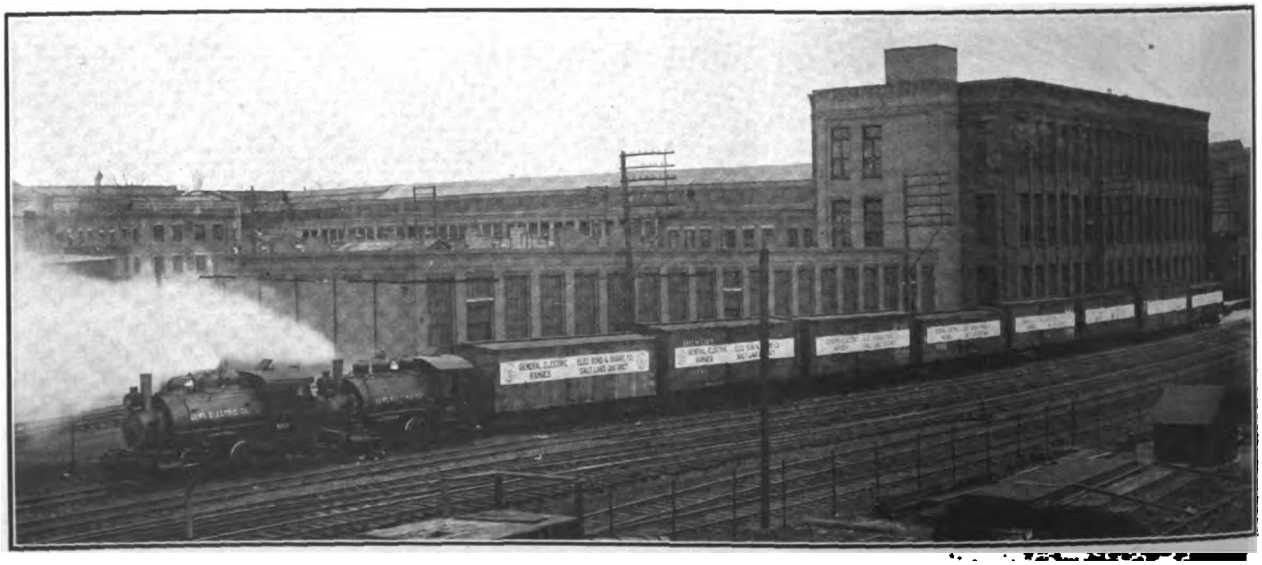
Fig. 2.—Section Through Boiler Furnace and Ko-Shovel, Showing Operation of Latter.

or by hand in accordance with the demand for steam. The equipment is of simple design and very ruggedly built. Its weight complete is about 400 pounds. For attaching the entire stoker mechanism, including the hopper, to the boiler front requires only four five-eighths-inch bolts.

One of the marked advantages claimed for this stoker is that its operation can be intrusted to the ordinary fireman. It does not interfere with hand firing and, in fact, can be used along with hand firing, if the necessity for this should ever arise. It lessens the work of the fireman because, if no overhead bins are used, he needs merely to fill the hoppers about every one-half to one hour. The hand cleaning of the fires can be taken care of through the fire door as usual. Any grade of coal from 1.5-inch bar screenings to No. 5 washed or unwashed coal can be used.

These stoking machines can be used on return tubular as well as water tube boilers. Their use insures proper feeding of the coal in steady and small quantities which have been conclusively shown to give maximum economy and smokeless operation. Since the fire door is not opened, except for occasional cleaning of the fires, no cold air is admitted to chill the furnace. These stokers can be operated by means of a steam engine or electric motor.

The Ko-Shovel is manufactured by the Goetz Company and sold exclusively through George A. Kohout & Company, Monadnock Block, Chicago, Ill.



Eight Cars of Electric Ranges.

It has been estimated that at least $1,000,000 worth of electric ranges will be sold during 1916. The increased activities of the electric-range manufacturers is an indication that this desirable goal will be attained. The largest single order ever placed for electric ranges was recently filled by the Pittsfield, Mass., works of the General Electric Company for shipment to the Salt Lake district. The shipment contained 90 apartment-type ranges, 105 type S-3 ranges for domestic use, and 416 ranges of assorted types. This is a total of 611 ranges, with a listed value of approximately $53,000 and filling eight cars when packed for shipment. The demand for electric ranges in the Salt Lake district indicates the rapid growth of electric cooking in that section. Indeed, this movement to completely electrify the kitchen is becoming common throughout the country where special low cooking rates are being established, placing electricity on an equal footing with gas and coal, so far as cost is concerned.

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INDUSTRY ACTIVITIES

Harvey Hubbell, Incorporated, Bridgeport, Conn., has prepared a mailing folder illustrating the service of Hubbell T-slot receptacles and attachment plugs.

The Electric Agencies Company announce its removal on May 1 to 419 East Third Street, Los Angeles, Cal., where the company will maintain offices and warehouse.

Beardslee Chandelier Manufacturing Company, Chicago, Ill., has established a branch office in San Francisco, Cal., under the direction of E. C. Weber and L. N. Scammon, both very well known to the Pacific Coast trade.

The Hughes Electric Heating Company, Chicago, Ill., added 5,000 square feet of floor space to their factory last week. The company recently was awarded the contract for the bake-oven equipment of the new Edgewater Beach Hotel, Chicago.

The E. C. Cowie Electrical Company, of Kansas City, Mo., is making plans to open a branch house in Wichita, Kans., about June 1. The company manufactures a self-starter for automobiles and specializes in storage-battery and charging equipment.

The Adams-Bagnall Electric Company, Cleveland, O., has issued a folder which gives views of some of its single and three-phase transformers, low and high-voltage distributing and power transformers and constant-current regulating transformers for street-lighting work.

The Independent Electric Company, El Paso, Tex., jobber and dealer in electrical supplies and electrical contractor and engineer, occupied prominent space in a publication called *Commerce of El Paso*, which gave a comprehensive survey of the advantages of that city as a commercial center.

Dielectric Manufacturing Company, St. Louis, Mo., has issued a handy 48-page booklet entitled "Data on Dependable Insulation." It contains valuable metric conversion factors and other data, characteristic curves of various insulating materials, and brief descriptions of the properties of the company's numerous insulating mica products, varnishes, paints and other compounds.

The Domestic Engineering Company, of Dayton, O., recently incorporated to take over the manufacture of the "Delco" farm-lighting system, shipped its first machine a few days ago. A number of the outfits had previously been manufactured for experimental purposes, but the first machine for actual use was completed only a short time ago. The plant is now ready, however, to proceed to business on a large scale, and orders already on hand are reported to be so numerous as to make a considerable degree of activity a certainty.

The Roller-Smith Company, 203 Broadway, New York City, announces that it has added to its list of agents the Barber-James-Dwinnell Electric & Manufacturing Company, 600 East Fifteenth Street, Kansas City, Mo., who will handle the former company's instruments, meters and circuit-breakers in the territory comprising the states of Kansas, Oklahoma, Nebraska, Iowa and part of the state of Missouri. The Roller-Smith Company now has branch offices in the Monadnock Block, Chicago, Ill., and the Williamson Building, Cleveland, O. Its complete list of agents, other than the ones referred to above, is as follows: Conant Electric Company, Equitable Building, Baltimore, Md.; W. W. Geisse, First National-Soo Line Building, Minneapolis, Minn.; H. D. Lackore, 544 Henry Building, Seattle, Wash.; H. I. Shire, 1310 Majestic Building, Detroit, Mich.; Tompkins-Stoddard Company, 77 Franklin Street, Boston, Mass.

The Electric Fuse Guard Company, Newark, N. J., has acquired property at 60 Shipman Street, and will establish a plant for the manufacture of fuse guards and other electrical specialties.

General Electric Company transformer specialists from various parts of the country held a conference at Pittsfield, Mass., April 11-13, this being the first meeting since 1914. Daily sessions were held, M. O. Troy, sales manager of the Pittsfield works, presiding over these and a banquet held the last evening of the conference.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Leaflet 3838, on No. 557-A railway motors; Leaflet 3852, on type E B alternating-current switchboards, arranged for hand operation of oil circuit-breakers; Leaflet 3886, on Westinghouse-American Blower generating sets for direct current.

The Borden Company, Warren, O., manufacturers of pipe and thread-cutting tools, has prepared reprints of an article on "The Evolution of Hand Pipe-Cutting Tools," by W. A. Phillis, which appeared in the *Plumbers Trade Journal* March 1, 1916. The evolution is described from the year 1800 to the present date and points are brought out showing why users of pipe and electric conduit should use efficient cutting tools. The reprints are being distributed free by the company.

Betts & Betts, 256 West Fifty-fifth Street, New York City, are building a 20-foot, self-winding "Electric Klok" for the new Circle Theater in Indianapolis, Ind. The installation is being made by the Sanborn Electric Company, of that city, which also has the complete electrical contract. In addition to the "Klok," which will have electric hands, numerals and minute marks, there will be an attractive electric sign, which will be equipped with a Betts & Betts special flasher and several hundred color caps. This will be one of the most elaborate electrical displays in that part of the country. Other "Klok" installations being made this month are in Syracuse, N. Y. Providence, R. I.; Boston, Mass., and Lancaster, Pa.

Deuth & Company, Incorporated.—In order to widen the scope of its incandescent lamp business, Deuth & Company has found it necessary to completely reorganize and secure additional capital. The company has reorganized as Deuth & Company, Incorporated, with Eugene J. Deuth, formerly president of the old company, president, and W. Dunbar McElhinny secretary and treasurer. The other directors of the new company are George H. Dirkes and Charles LeBarbier. Deuth & Company, Incorporated, has gone into the manufacture and import of incandescent lamps on a very large scale and in addition to its own business has secured the output of two of the largest lamp factories in the country. The main offices and salesrooms occupy the entire eleventh floor of the Fifth National Bank Building, 131 East Twenty-third Street, New York City, and the company is establishing agencies throughout the United States. For the convenience of its New York City trade, it maintains two large warehouses in that city, in which it maintains a minimum stock of 200,000 lamps. It also has a number of supply stations in other cities in which it carries large stocks. At the last meeting of the Board of Directors, it was decided that the new company should carry on a large amount of experimental work in the lamp field. A corps of experts have been assembled and this work is going forward with gratifying results. The sales force is under the supervision of F. R. May, assisted by Thomas Magiff. At the present time the company has about 20 salesmen in New York City and surrounding territory.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

CONDUIT BOXES.—The Adapti Manufacturing Company, 919-25 West Street, Cleveland, O.

Pressed steel and cast-iron conduit boxes.

For use with rigid conduit, catalog Nos. 7110-12, 7220-22, 7234-35, 7245, 7260-62, 7270-72, 7330-32, 7440-42, 70290-92, 72350-52, 72370-72, 72380-82, 73343-45, 73353, 73390-92, 73443, 73445, 73454, 73535, 73545, 73553-54, 74490-92, 743334-35, 743344-45, 743355, 743434, 743444-45, 743455, 743535, 743555, 744445, 744455, 744545, 744555.

Listed March 10, 1916.

EGG TESTER.—Lo-Glo Electric Incubator Company, Incorporated, 76 Greenwich Street, New York, N. Y.

Egg tester consisting of an incandescent lamp in a sheet-metal casing having an oval opening over which the egg is placed, and having a reinforced portable cord and attachment plug for connection to ordinary lighting circuit. Lo-Glo; 60 watts, maximum volts, 250.

Listed March 9, 1916.

FIXTURE FITTINGS.—National Specialty Manufacturing Company, Lehigh Avenue, American and Third Streets, Philadelphia, Pa.

Gray-iron bodies, eccentrics, tripods and crow feet, catalog Nos. 0165-69, 0196, 0199, 0200, 0210, 0219-20, 0225, 0285-95, 0287½, 0293½, 0297-00, 0298½, 0303-06, 0304½, 0304¾, 0309-14, 0311½.

Malleable-iron crow feet, finishers, saddles and hickeys, catalog Nos. 0271-79, 0276½, 0280A-G, 0350-53, 0432-35, 0511-24.

Listed February 5, 1916.

GROUND CLAMPS. — The Cap Swivel-Let Company, Warren, R. I.

Grounding lock nuts consisting of copper-plated malleable iron or cast brass lock nuts for rigid iron conduit, each nut formed with a soldering lug for receiving a ground wire. Johnson. For ½, ¾ and 1-inch rigid iron conduit.

Listed March 9, 1916.

INSULATING SUPPORTS. — The Thomas Wrigley Company, 416 South Dearborn Street, Chicago, Ill.

Consisting of two pairs of stamped steel hooks, joined by connecting strap, for use in mounting porcelain cleat on steel girder. Ahlander girder clamp. Styles A and B.

Listed March 9, 1916.

PANELBOARDS.—Chicago Switchboard Manufacturing Company, 428 South Clinton Street, Chicago, Ill.

Panelboards shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with requirements of the National Board of Fire Underwriters have labels attached.

Listed March 7, 1916.

SWITCHES, Automatic.—Automatic Switch Company, 4-6 White Street, New York, N. Y.

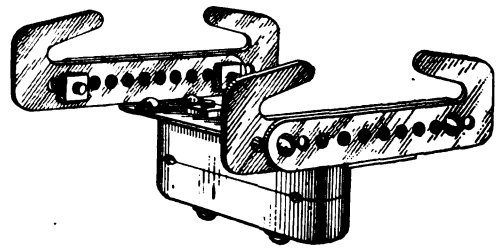
Magnetic switches, remote-control switches of special design mounted on slate bases and arranged to be operated by push-button switches, thermostats, pressure-regulating switches and similar controlling devices at remote points. Darrin, 20, 75 amperes, 250 volts, alternating or direct current. Type DMS.

Listed March 9, 1916.

SWITCHES, Enclosed.—The Johns-Pratt Company, Hartford, Conn. The H. W. Johns-Manville Company, New York, N. Y., sole agents.

"Noark Universal," 30 amperes, 250 volts.

Two, three or four-pole switches with specual cutout bases for plug or cartridge fuses, also two-pole, 30-ampere, 125-volt switches with special cutout bases for link fuses. Inclosed in metal case and designed for manual operation without opening cases, for service entrance or other uses. These switches may consist of suitably chosen parts, and may be fitted with accessories for meter testing, etc.



Insulator Support.—The Thomas Wrigley Company.

The appliances which comprise this so-called system may be made up from the following unit parts:

Noark Universal System. Base block units, catalog Nos. 10121, 10102, 10116.

Connectors, unfused, for cartridge, plug and link fuses.

Branch tap straps, catalog Nos. 10270-72.

Sealable cabinets, catalog Nos. 10200-10201.

Meter adapters, catalog Nos. 10400-14.

Load side device supports, catalog No. 10225.

Troughs for cabinets, catalog Nos. 10310-15.

External switch handles, catalog Nos. 10235-38.

Direct switch handles, catalog Nos. 10251-42.

Current transformer testing device. A special form of switch gear for use in testing current transformer meters. With or without fuses or enclosing cabinets.

Also special meter test plugs and cords.

Listed February 17 and 18, 1916.

SWITCHES, Fixtures.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Single-pole, 3 amperes, 250 volts, 6 amperes, 125 volts; catalog Nos. 7306, 7307, 7309, 7311.

Listed March 2, 1916.

SWITCHES, Knife.—Albert & J. M. Anderson Manufacturing Company, Boston, Mass.

Anderson, types A, all capacities, 250 volts.

Listed March 8, 1916.

SWITCHES, Surface Snap.—Trumbull Electric Manufacturing Company, Plainville, Conn.

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 404, 405.

Listed March 2, 1916.

WIRES, Miscellaneous.—D. & W. Fuse Company, Providence, R. I.

Deltabeston motion-picture-machine cable.

Standard conductors, Nos. 14 to No. 1 B. & S. gauge with a felted asbestos insulation covered by an outer braid of asbestos, impregnated with a moisture-proofing compound.

Standard for use in wiring moving picture machines, projectors, rheostats and similar devices where heat-resisting properties are required.

Listed March 8, 1916.

WIRES, Miscellaneous.—D. & W. Fuse Company, Providence, R. I.

Deltabeston switchboard wire.

Solid conductors of all standard sizes, insulated by a felted asbestos covering treated with a brown insulating filler and covered by an outer braid of black or white asbestos.

Standard for use on back of switchboards in circuits not exceeding 600 volts.

Listed March 9, 1916.

WIRES, Rubber-Covered. — Kerite Insulated Wire & Cable Company, 30 Church Street, New York, N. Y.

Marking: Green and black threads parallel in braid; or in lead encased or steel armored conductors without braids or wires having colored braids; green, white and black threads parallel with wire between insulation and outside finish.

Listed February 17, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. ARTHUR W. BERRESFORD, vice-president and general manager of the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., who was selected as the Wisconsin representative of the American Institute of Electrical Engineers on the Industrial Preparedness Committee of the Naval Consulting Board, was born in Brooklyn, N. Y., in 1872. He was graduated from the Brooklyn Polytechnic Institute in 1892 and from Cornell University in 1893, receiving the degree of mechanical engineer in electricity from the latter institution. Following his graduation Mr. Berresford engaged in general work for several public service companies, then became a designer in the employ of the Riker Electric Company and in 1896 was placed in charge of the testing and designing work of the Ward Leonard Electric Company. Two years later, in company with other interests, he purchased the holdings of the Iron Clad Rheostat

A. W. Berresford.

Company and formed the Iron Clad Resistance Company, becoming vice-president and manager of that company. In 1900 the Cutler-Hammer Manufacturing Company purchased the Iron Clad company and Mr. Berresford entered the engineering department of the former company, becoming superintendent in 1901, secretary in 1902, general manager in 1905, and assuming his present position in 1907. Mr. Berresford is a fellow of the American Institute of Electrical Engineers and was a member of its board of managers 1909-12, and vice-president from 1912 to 1914. He is also a member of the National Electric Light Association, the American Society of Mechanical Engineers, the Society of Naval Architects and Marine Engineers, Franklin Institute, Society for the Promotion of Engineering Education, Electrical Manufacturers' Club and other organizations.

MR. F. E. M'KENNA, local manager of the Oregon Power Company at Coquille, Ore., has been elected secretary and treasurer of the Ko Keel Klub.

MR. NOAH KENNARD has been appointed manager of the municipal electric-lighting plant at Morehead, Ky., succeeding MR. E. E. MAGGARD, who resigned to enter business for himself.

MR. W. H. THOMSON, JR., general manager of the Des Moines (Iowa) Electric Company, will become general manager of the Kansas City (Mo.) Light & Power Company. The change will become effective on or before June 1.

MR. J. W. WORTHINGTON, who has been vice-president of the Alabama Power Company, has resigned. He has been elected president of the Muscle Shoals Hydro-Electric Power Company, a subsidiary of the Alabama Traction, Light & Power Company.

MR. CHARLES R. UNDERHILL, chief electrical engineer of the Acme Wire Company, New Haven, Conn., lectured on the subject of "Electromagnets" at Leland Stanford University, Palo Alto, Cal., April 17, and at the University of California, Berkeley, Cal., April 18.

MR. WILLIAM WEISSENBERGER, JR., who is retiring, after sixteen years' service as architect for the New York Edison Company, was tendered a testimonial dinner Monday evening, April 17, at the Biltmore by the officials and his friends in the company. Mr. Weissenberger is retiring to enter business for himself.

MR. JAMES CLARK, JR., president of the James Clark, Jr., Electric Company, Louisville, Ky., has modestly called our attention to an error which appeared in our last issue relative to his being appointed a colonel on Governor Stanley's staff. Mr. Clark advises that this appointment was made to MR. JAMES S. CLARK, of Louisville.

MR. CLYDE A. FLINT recently has entered the employ of Rathbone, Sard & Company, of Albany, N. Y., and Aurora, Ill., and will sell in the territory east of the Mississippi River the line of electric ranges which that company has put on the market. Mr. Flint was connected with the Simplex Electric Heating Company for five years and with Duparquet, Huot & Moneuse until recently. He enjoys a wide acquaintanceship in the electrical trade.

DR. WILLIS R. WHITNEY, director of the research laboratories of the General Electric Company, Schenectady, N. Y., has been awarded the Willard Gibbs medal, founded by William A. Converse, of Chicago. The presentation will be made May 19, in connection with the meeting of the Chicago Section of the American Chemical Society, when Dr. Whitney will make an address on "Incidents of Applied Research."

MR. W. H. WOOD has been appointed superintendent of power plants of the Baltimore & Ohio Railroad, with headquarters at Baltimore, Md., succeeding MR. T. F. FOLTZ, resigned. Mr. Wood formerly had charge of the boiler plants of the American Writing Paper Company, of Holyoke, Mass. He was born in 1875, and graduated from the University of Arts and Sciences in 1898, following which he was connected with the Standard Steel Company, Burnham, Pa. From 1889 to 1914 he was associated with A. C. Wood, a consulting engineer.

MR. JOHN J. MILEY, formerly purchasing agent of the Minneapolis (Minn.) General Electric Company, is now with the Mississippi River Power Company, Keokuk, Iowa.

MR. H. O. SWOBODA, consulting electrical and mechanical engineer, Pittsburgh, Pa., has been retained by the borough of New Brighton, Pa., for the purpose of planning a new street-lighting system for that borough.

MR. BION J. ARNOLD, the well known consulting engineer, and chairman of the Board of Supervising Engineers, Chicago Traction, has been selected by Secretary of Navy Daniels to be a member of the Naval Consulting Board. He will be the representative of the American Aeronautical Society. Besides his manifold activities in consulting engineering and his services on the new special traction investigating commission in Chicago, Mr. Arnold has taken deep interest in

B. J. Arnold.

questions of national defense. A hobby of his has been aeronautics, to which he has devoted much time, thought and resources. Mr. Arnold has always been a most active and progressive man throughout his engineering career of about 25 years. He is a past president of the American Institute of Electrical Engineers and the Western Society of Engineers.

MR. C. G. CHILDERS, formerly manager of the new-business department of the Gadsden, Alabama City & Attalia Street Railway Company, has resigned to become special representative of the general and operating managers of the Alabama Power Company, Birmingham.

OBITUARY.

MR. WILLIAM A. HOPKINS, president of the Erner & Hopkins Company, Columbus, O., one of the largest electrical jobbers and contractors in Ohio, died in Columbus, April 22, aged 42 years, from the effects of a tumor. A native of Henderson, Ky., he came to Columbus in 1898, and was employed by the local street railway company, a few years later helping to organize the concern which bears his name. Mr. Hopkins was very popular in the electric trade. He was unmarried.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

MARS HILL, ME.—The Westfield Electric Company has been authorized to own and operate an electric plant to supply this locality. The capital is $10,000, and the president is R. J. Colbath, Mars Hill, Maine.

SEBEC, ME.—The Milo Electric Light & Power Company has been authorized by the Public Utilities Commission to enter this town and supply electricity for light, heat and power. A 6,600-volt, two-phase transmission line will be constructed.

MANCHESTER, N. H.—Improvements and construction work, estimated to cost $788,000, undertaken by the Manchester Traction, Light & Power Company during last year, are rapidly being completed. The building operations for a new steam plant at Kelley's Falls have been finished, and the electrical machinery is expected to be installed so that plant will be ready for service in June. The new substation at the same place will be ready at that time. A high-tension transmission line from the Kelley's Falls plant to the one at Garvin's Falls has been erected. The new substation at the latter plant is ready for occupancy, but some new switchboard equipment will be installed during the summer. Electrical equipment for the Brooks Street substation in this city has not yet been fully installed, but it is expected it will be completed in July.

MALDEN, MASS.—The City Council has passed an order appropriating $500 for the employment of an electrical expert to investigate the city lighting system.

WALTHAM, MASS.—City officials and the Edison Electric Illuminating Company of Boston, which serves this community, are considering improvements in the city lighting system

WYBEN, MASS.—The Westfield (Mass.) Gas & Electric Light Works is making plans to extend its transmission lines to furnish electric service here. Power will also be furnished to the plant of the Westfield Clay Products Company near here.

NEW LONDON, CONN.—The exterior work on the new power house being erected by the Shore Line Electric Railway in Williams Street has been completed. A pole line from the power house to the Cohanzie road has also been completed.

BINGHAMTON, N. Y.—The Binghamton Light, Heat & Power Company has received permission from the Public Service Commission to issue bonds and preferred stock to the amount of $1,000,000. Part of the proceeds will be used for plant enlargements and betterments. A new 3,500-kilowatt turbogenerator with necessary auxiliaries, estimated to cost $77,000, will be installed.

BROOKLYN, N. Y.—The Brooklyn Rapid Transit Company has placed an order with the Westinghouse Electric & Manufacturing Company for a 30,000-kilowatt turbogenerator for its Williamsburg station. The unit will run at 1,500 revolutions per minute and use steam at 200 pounds pressure and 115 degrees superheat, exhausting into a 28.5-inch vacuum produced by a 40,000-square-foot Westinghouse surface condenser.

FULTON, N. Y.—The Public Service Commission, Second District, has granted permission to the Fulton Light, Heat & Power Company, to issue $49,000 worth of six-per-cent preferred stock for improvements and extensions to its plant. It is the company's intention to expend most of the money thus obtained on the distribution system, although considerable money will be spent on improving the power plant.

POTSDAM, N. Y.—The St. Lawrence Transmission Company, which recently was combined with the Northern Power Company, will complete this season the construction of a transmission line from Raymondville to Massena, connecting with a line built last year from Hanawa to Raymondville. The lines connect developments at Higley and Hanawa with those at Massena and Cedar Rapids, on the St. Lawrence. The length of line to be constructed is 25 miles. Steel towers and aluminum cable will be used.

SCHENECTADY, N. Y.—The Schenectady Illuminating Company has begun the construction of standards for the ornamental incandescent lighting system to be placed in the avenues between Eastern Avenue and Central Park. Concrete standards similar to those on the boulevards are being built.

WHITESTONE, N. Y. (Flushing Postoffice).—The Whitestone Improvement Association has asked the Department of Electricity for the installation of a number of lamps on Ninth Street.

BAYONNE, N. J.—The Board of City Commissioners has instructed City Engineer Clarkson to secure estimates of cost for the installation of an underground conduit system throughout the city.

MORRISTOWN, N. J. — The Morris County Traction Company will install new equipment, including transformers, at its Dover power station.

JERSEY CITY, N. J.—The Grove Street Merchants' Association is negotiating with the City Commissioners for the installation of a new street-lighting system along Grove Street.

HALIFAX, PA.—Application will be made May 1 for a charter for incorporation of the Halifax Electric Light, Heat & Power Company, which intends to supply service here. H. L. Lark is the solicitor.

POTTSVILLE, PA.—The Eastern Pennsylvania Light, Heat & Power Company, with headquarters in Pottsville, has purchased the electric-lighting plants of the boroughs of Auburn and Pine Grove and is preparing to supply energy to those towns from its central power house at Palo Alto.

VARDEN, PA.—Application has been made for a charter for the Varden & Lake Ariel Electric Light, Heat & Power Company by A. F. Kizer, W. W. Kizer and others. The company plans to furnish electric service in the vicinity of Varden and Lake Ariel.

WILMINGTON, DEL.—The Lykens Valley Light & Power Company has been incorporated here with a capital of $600,000 to acquire and operate public-service corporations by H. E. Latter, N. P. Coffin and others.

RALEIGH, N. C.—Preliminary work for the installation of the white way on Martin and Fayetteville Streets has commenced. The Carolina Power & Light Company and the telephone companies are placing their wires underground in the white-way district.

SALUDA, N. C.—The Saluda Public Service Corporation has been incorporated with a capital of $25,000 by T. D. Fulmer and E. W. Able to build and operate an electric-lighting plant here.

MANNING, S. C.—Fire in boiler room of the Manning Electric Light Plant did considerable damage to the plant.

DEFUNIAK SPRINGS, FLA.—An election will be held May 2 to vote on the question of issuing $45,000 municipal improvement bonds, of which it is proposed to use $5,000 for enlarging the electric-lighting system.

MIAMI, FLA.—The Miami Traction Company is planning to make line extensions. B. B. Tatum is president of the company.

PENSACOLA, FLA.—Bids will be advertised for lighting the streets of Pensacola for the ensuing year. The new lighting contract is expected to be made effective June 1.

NORTH CENTRAL STATES.

CINCINNATI, O.—C. W. Handman, business manager of the Board of Education, is calling for bids on the work of remodeling the Whittier school, including the electrical work. Plans and specifications are in the hands of the Board. Bids will be opened at noon on May 22.

CINCINNATI, O.—The Union Boulevard Lighting Committees, consisting of a number of local civic and business organizations interested in promoting a general plan of ornamental street lighting, have secured the co-operation of the city authorities and of the Union Gas & Electric Company, the company making an offer to install a comprehensive system for $150,000 more than the present street-lighting system in the business district costs, over a six-year period. Reports on the proposal are encouraging. The electric company will install and furnish lighting for the system if the proposition is accepted.

COLUMBUS, O.—First announcement has been made by the Columbus Railway, Light & Power Company of its intention to build a new $375,000 power plant. The site is property already owned near the Scioto River, and permission of council is asked to strengthen the levee as a part of the city's general flood-prevention plans. The company has asked for speedy approval, stating that it wishes to begin work at once to care for its rapidly increasing business. It is understood that one of the company's several power houses, the original Edison plant, is to be abandoned.

DAYTON, O.—The Cincinnati, Hamilton & Dayton Railway Company is making plans for a new electric power plant in connection with the rehabilitation of its roundhouse in the East End.

HAMILTON, O.—The city is considering plans to modernize and extend its fire-alarm system, which is at present inadequate. A complete new system may be installed, or a proposal from the Gamewell Fire Alarm Company to remodel the present system, at a cost of $2,500, may be accepted.

SIDNEY, O.—Plans are being considered for the installation of a municipal electric-lighting plant here.

SPRINGFIELD, O.—The city's engineering department has prepared drawings and specifications setting forth the style of lamps which has been decided upon for the ornamental street-lighting system and these will be sent to various lamp manufacturers to bid upon. The contract will be awarded early in May, it is announced.

ULRICHVILLE, O.—A committee has been appointed to secure estimates for a municipal electric-lighting plant.

YOUNGSTOWN, O.—The Youngstown & Niles Railway Company has asked the Public Utilities Commission for authority to issue $100,000 capital stock to secure funds with which to build a line from Youngstown to Warren.

ELKHART, IND.—J. B. Davidson, president of the Board of Works, following a conference with officials of the Indiana & Michigan Electric Company, has announced that work on the installing of a new lighting system on Main Street will begin in 30 days.

RICHMOND, IND.—Alfred Bavis, president of the Board of Works, has announced that favorable action will be taken on the petition for an ornamental lighting system on Main Street, and that bids will be called for soon. The improvement is estimated to cost $11,000.

WINCHESTER, IND.—The Citizen's Heat, Light & Power Company has signed a 15-year contract for lighting the city streets. Plans for a boulevard lighting system are being considered, and such a system probably will be installed.

BELLEVILLE, ILL.—The City Council has approved a plan for the raising of funds for a municipal electric-lighting plant to cost $350,000. The plan adopted was that of combining a special assessment and public certificate plan, the former to furnish $120,000 for the distribution system, and the latter to furnish $230,000 for the remainder of the plant. The certificates are to be sold with the municipal mortgage as plant security.

CARROLLTON, ILL.—Bonds have been authorized for the establishment of an electric-lighting system.

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CHICAGO HEIGHTS, ILL.—The Chicago Heights Street Railway Company, C. H. Wacker, president, has asked for authority to extend its lines on certain streets.

PEORIA, ILL.—An ornamental lighting system, five lamps to a block, will be installed on Perry Avenue.

SOUTH PEORIA, ILL.—The Central Illinois Light Company, of Peoria, is considering plans for extending its lines to this place. A street-lighting system probably will be installed.

WATERMAN, ILL.—The Illinois Northern Utilities Company is preparing to furnish electric service here. The energy will be supplied from the company's plant at Paw Paw.

DEPERE, WIS.—The DePere Electric Light & Power Company is planning to remodel its plant to change the current output from direct to alternating. Plans have been prepared by H. A. Smith, consulting engineer, Madison, Wis., calling for an expenditure of $20,000. L. L. Tessler is superintendent of the plant.

MADISON, WIS.—J. E. Jones, president of the Wisconsin Interurban System which contemplates the construction of an interurban railway between Madison and Janesville, has made the announcement that his field force of surveyors were already at work on the proposed route.

MERTON, WIS.—The construction of a transmission line by the Milwaukee Light, Heat & Traction Company from Pewaukee to Merton and Lake Five is now under way, and service will be furnished in a few months.

SUPERIOR, WIS.—As a result of requests received from various sections of the city it is probable that the entire street-lighting system in the residence districts will be changed and new corner incandescent lights installed.

WAUKESHA, WIS.—The Waukesha Pure Food Company, O. E. Glidden, manager, will build a power plant in connection with a factory to be erected here.

ARGYLE, MINN.—The Council has appointed a committee, of which C. J. Robertson is a member, to secure estimates for building a water and electric-lighting plant.

BRAINERD, MINN.—The Brainerd Gas & Electric Company has been incorporated with $100,000 capital stock by St. Cloud capitalists, with Brainerd as its principal place of business and St. Cloud as its principal branch office. The incorporators are: A. G. Whitney, president; R. L. Gale, vice-president; A. J. Bemis, secretary, and P. H. Collignon, treasurer. Construction work will soon be under way. H. G. Williams will superintend the construction.

CARVER, MINN.—Plans are being considered for a white-way system here.

GILBERT, MINN.—J. M. Carlson, N. J. Colvin and L. Rubenstein, members of the Water and Light Commission of Gilbert, are on a trip to the eastern cities to inspect white-way systems and to make preparations for installing a lighting system in this city.

HIBBING, MINN.—Residents of Second Avenue and Center Street have petitioned the Water and Light Commission to install a new lighting system on those streets.

LITTLE FALLS, MINN—Construction work on an transmission line which will eventually supply energy for power and lighting to Long Prairie, Wadena, Verndale, Staples and intermediate towns will be begun by the Little Falls Water Power Company this spring. The line will be in the form of a loop, going from Little Falls west to Long Prairie, thence north to Wadena and southeast to Staples and Little Falls. At Long Prairie an electric pumping station and street-lighting system will be installed. Two of the towns which are to be supplied have already granted franchises.

MINNEAPOLIS, MINN.—President Brewer, of American Public Utilities Company, has announced that the Wisconsin-Minnesota Light & Power Company, a subsidiary, has closed a contract for the sale to the Northern States Power Company of 40,000 horsepower of electric energy from the plant now being constructed on the Chippewa River, and that a high-tension transmission line to carry this current to Minneapolis for distribution by the Minneapolis General Electric Company will be built at a cost of $700,000.

GUTTENBERG, IOWA.—The City Council has accepted the contract offered by Schmidt Brothers & Company, who own the electric-lighting plant at Elkader, for supplying electrical energy for power and light. The city will be bonded for $10,000 to install a distribution system.

DATES AHEAD.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

National District Heating Association. Annual convention, New York City, May 16-19. Secretary, D. L. Gaskill, Electric Building, Greenville, O.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

MARATHON, IOWA.—At a recent election the town of Marathon voted bonds in the sum of $12,000 to finance the establishment of an electric-lighting system and closed a contract with the Peterson Power & Milling Company for supplying electrical energy.

ROCK RAPIDS, IOWA.—The City Council has sold a $15,000 issue of water and electric-light bonds. Work will be started soon on remodeling and enlarging the electric light plant and also extending the water plant. The building is to be enlarged, new boilers, engine and dynamo installed and the plant brought up to date. A heating plant will also be installed.

SLATER, MO.—The city has voted $35,000 in bonds to provide for extensions to the water mains and improvements in the municipal electric-lighting plant. The city has made a contract with the Alton-Slater Water Company to furnish electrical energy for pumping 400,000 gallons of water daily for a period of 20 years. A 13,200-volt transmission line will be erected to this city from the new plant of the Alton-Slater Company eight miles east of here. L. E. Shepherd is superintendent of the Slater Light and Water Works and A. L. Nichols is superintendent of the Alton-Slater Water Company.

SPRINGFIELD, MO.—The city recently made a contract for five years with the Springfield Gas & Electric Company for the maintenance of 294 street lamps. The Council has authorized the erection of 61 additional lamps, eight being arcs and the rest 200-candlepower incandescents.

OTTAWA, KANS.—The City Commission has approved specifications for tests for new machinery which will govern the purchase of a new 350-kilowatt unit (or possiby two) for the city power plant, as prepared by George C. Shaad of Lawrence, Kans. Bids will be received up to May 15. The new equipment will consist of a new unit complete, with surface condenser and auxiliaries, spray cooling equipment and a complete new switchboard. David Flinchpaugh is commissioner of utilities, and W. O. Myers is superintendent of the plant.

KEARNEY, NEB.—The Kearney Water & Electric Power Company has been granted permission by the State Railway Commission to issue $200,000 in bonds.

OMAHA, NEB.—City Commissioner Jardine has announced tentative plans for the new street-lighting system to be installed here. The proposition, outlined by Mr. Jardine, contemplates a three-year contract with the Omaha Electric Light & Power Company, which will make an installation of over 1,000 new lamps.

TRENTON, NEB.—Bonds have been authorized for the erection of a municipal electric-lighting plant.

CLARK, S. D.—The City Council is considering plans for the installation of an electric-lighting plant in conjunction with the present municipal gas and waterworks plants.

DEADWOOD, S. D.—Announcement has been made by the Consolidated Power & Light Company that it had purchased the holdings of Sturgis (S. D.) Light & Power Company. The Consolidated now supplies electricity for lighting purposes to Lead, Deadwood, Spearfish, Belle Fourche and Whitewood.

JAVA, S. D.—Bonds have been voted for the erection of a municipal electric-lighting system here.

FOREST CITY, N. D.—The installation of an electric-lighting system costing about $10,000 is being considered by A. B. Field, I. W. Poole and others.

NEW ROCKFORD, N. D.—On May 7 citizens here will vote on the proposition of establishing a municipal electric-lighting plant.

TOWNER, N. D.—C. B. Rasness and J. E. Galehouse, of Carrington, are seeking a franchise giving them the right to install and operate an electric-lighting plant here.

SOUTH CENTRAL STATES.

CYNTHIANA, KY.—President Reed, of the Kentucky Utilities Company, City Agent Durbin and Commissioner of Public Works Wohlwender, are conferring on the matter of a renewed contract for street lighting. Lately the city officials were reported considering a municipal plant.

KUTTAWA, KY.—The Cumberland Electric Company has been incorporated with a capital of $3,500 by B. W. Doom, M. J. Beard and others to furnish electric service here.

LAGRANGE, KY.—J. W. Stoval, J. W. Lusby and others have organized a company which has taken over the present electric-lighting plant and which will make some improvements and continue to operate it. Since the franchise was sold for a lighting plant here to the Adams Utility Company, of Sulphur, it is understood that the purchaser has disposed of these rights to a company which proposes to establish a lighting and water plant.

LEBANON, KY.—The Lebanon Light, Ice & Power Company, is making improvements in its distribution system, including new poles, which are used by both the telephone and lighting companies.

PAINTSVILLE, KY.—Damage was done recently to the local lighting plant by an electric storm.

SARDIS, KY.—Albert Hill, of Maysville, Ky., has installed an electric-lighting plant in the Sardis opera house, which will be used for lighting the building. It is of sufficient capacity to provide service for the community.

STITHTON, KY.—The Stithton Lighting Company has sold its plant to L. J. Metcalfe and C. H. Aubrey.

DYERSBURG, TENN.—The city is planning to make extensive improvements to the municipal electric lighting plant.

FRIENDSHIP, TENN.—W. H. Fisher, manager of the local electric-lighting plant, announces that additional generating equipment will be installed and the extensions made to the distribution system. The city will install a street-lighting system.

BIRMINGHAM, ALA.—The steam plant of the Alabama Power Company will be located on the Warrior River, about two miles from the Drifton branch of the Southern Railway, according to an announcement made by James E. Mitchell, president of the company. He also announced that work will begin at once on the new transmission system and that a new power unit will be installed at Lock 12 on the Coosa River.

ITTA BENA, MISS.—The city has purchased the local electric-lighting plant from J. L. Haley for $14,250.

ARKADELPHIA, ARK.—It is reported that the Arkadelphia Light & Power Company has purchased the electric-lighting plant at DeQueen and will make extensive improvements there.

CHANDLER, OKLA.—The Chandler Electric Company, of which R. C. Johnston is president and G. D. Henderson is manager, has been granted a new franchise covering a period of 20 years. The company will make extensive repairs and install new generating equipment, furnishing 24-hour service.

COMMERCE, OKLA.—The Empire District Electric Company, Joplin, Mo., which holds franchises in many towns of the Miami mining district, will pay the expenses of an election to be held here on the question of granting the company an electric-lighting franchise.

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DURANT, OKLA.—Stockholders of the [illegible] Ice & Light Company have sold their interests to William A. Baehr and associates, of Chicago, Ill. Mr. Baehr is president of the newly organized concern; D. S. McDonald, Durant, vice-president; A. H. Brown, Chicago, treasurer, and W. J. O'Brien, secretary. The controlling interests, it is understood, will purchase several similar properties in Southern Oklahoma.

KUSA, OKLA.—A charter has been granted to the Kusa Ice, Light & Power Company, capitalized at $25,000. The incorporators are: D. F. Servey, Iola, Kans.; R. C. Clark, Kansas City, Mo., and J. G. Goshorn, Henryetta, Okla.

NEW WILSON, OKLA.—The city will issue $25,000 in bonds for installation of an electric-lighting plant and water works.

RINGLING, OKLA.—Power secured by utilizing the Washita River in Southern Oklahoma may operate the Oklahoma, New Mexico & Pacific Railroad, otherwise known as the Ringling road, if plans now on foot are consummated. It is proposed also to build transmission lines to Waurika and points in the Healdton oil fields north of Ringling. The proposed power site probably would be in the Arbuckle Mountains.

BALLINGER, TEX.—The Council is contemplating the purchase of the local electric-lighting plant.

COMANCHE, TEX.—The Texas Power & Light Company, of Dallas, has purchased the Comanche Light & Power Company's plant and will erect a high-tension transmission line for connection with the former company's generating station in Brownwood, Tex.

FLOYDADA, TEX.—The City Council has granted a 50-year franchise to the Texas Utility & Power Company for an electric power plant, same to be 24-hour service and not less than $8,000 to be expended in wiring the town. Construction is to begin within 90 days.

GONZALES, TEX.—Field notes for the San Antonio, Gonzales & Houston Interurban Railroad have been completed. Messrs. Kennedy and Godman are promoters of the road.

STOCKDALE, TEX.—G. A. Burrie has purchased a system of poles, already installed in Stockdale, with a view to installing an electric-lighting plant here in the near future.

WACO, TEX.—The capacity of the power plant of the Texas Power & Light Company, located in this city, will soon be doubled. A contract has been awarded for the installation of four additional boilers. This plant supplies light and power for Waco and all small towns in Central Texas, and the interurban road between Waco and Dallas. The additional facilities will be sufficient to operate the proposed extension of the interurban to Temple and Austin.

WESTERN STATES.

BUTTE, MONT.—According to official reports from the Montana Power Company, the work of completing the hydroelectric development at Holter is being rushed and actual completion is expected by August, 1917. The proposed plant will have a capacity of 40,000 horsepower. It is reported the Montana Power Company has plans under way for the construction of another large power plant in Montana to supply the increasing demand for energy made by the various railroad and mining companies in the state.

PHILIPSBURG, MONT. — The Bowen Brothers Electric Light & Power Company has incorporated with a capital of $40,000 by Fred Bowen, Jr., Walter Carter and others. The company furnishes electric service here and recently closed a two-year contract for city street lighting.

ALAMOGORDO, N. M.—The city has taken over the plant and distributing systems of the Alamogordo Light & Power Company for $25,000.

LAS CRUCES, N. M.—The board of directors of the Water Users' Association has investigated the Leasbury hydroelectric power proposition and estimates that the cost of construction, installation of machinery and power line to Las Cruces will be $60,000.

LAS VEGAS, N. M.—The Rio Grande Light, Heat & Power Company has filed with the state engineer the estimated cost of the proposed hydroelectric development at the mouth of White Rock Canyon. The ultimate installation is to be 25,000 horsepower, but the immediate installation is to be only 10,500 horsepower, necessitating a dam 60 feet lower than was at first figured. The cost of the dam is figured at $772,690. Intakes and penstocks are to cost $127,310; powerhouse, $66,000; machinery, $322,800; transmission lines, $271,000; substations, $180,000, together with incidentals, interest, etc., requiring an ultimate outlay of $2,221,157. The initial expenditure is to be $1,639,614.

ALBION, IDAHO.—Materials have been ordered by the City Council for the installation of an electric-lighting system. The heating of the Albion Normal School with electricity is under contemplation by the school board.

LEWISTON, IDAHO. — The Lewiston-Clarkston Transit Company, according to recent reports, will immediately begin the expenditure of approximately $25,000 in extending lines of the local street-car system.

LEWISTON, IDAHO.—A recommendation for the construction of a large hydroelectric plant to be constructed with the assistance of several nearby municipalities has been made by Major J. E. Hoobler. It is reported the City Council and the local commercial organizations favor construction of the plant.

EVERETT, WASH.—Robert Howes, consulting engineer, American Bank Building, Seattle, has been commissioned by the City Council of Everett to gather data on power possibilities in the Sultan Basin, looking forward to the development of a municipal power project.

LIND, WASH.—Superintendent J. D. Lewis, of the Washington Water Power Company, Spokane, reports his company will extend electric service to the experimental farm near Lind, and possibly to adjoining farms. Construction, it is reported, will begin sometime in May. The experimental farm will be equipped with electric lights, two electric ranges, churns, cream separators, and other equipment, all of which will be operated by electricity.

MONTESANO, WASH.—It has been definitely established that the Northwestern Electric & Water Works has purchased the holdings of the Elma (Wash.) Light & Power Company, and that the two plants will be operated in conjunction. Manager R. J. Andrus, of the Northwestern company, reports the purchase will result in reduction of rates to Elma patrons of about 12 per cent, and will give Elma facilities for obtaining power for manufacturing purposes. He also reports extensions to rural residents between Elma and Montesano will be made and the town of Satsop will be given electric service. According to present plans, the Elma plant will be managed by Mr. Andrus, and the Montesano plant by D. L. Plantz.

NORTH YAKIMA, WASH.—The Pacific Power & Light Company has petitioned the Board of County Commissioners, Yakima County, for permission to erect transmission lines and make extensions to its lines in the vicinity of Sunnyside.

SEATTLE, WASH—City Engineer A. H. Dimock, Councilman R. H. Thomson, and J. D. Ross, Superintendent of Lighting, will immediately inspect the Sauk-Suiattle Power project where the city of Seattle contemplates the development of additional current for use of the municipal lighting department. According to reports, the Department of Agriculture, Washington, D. C., has requested the city to come to some decision as regards the development of the project, which has been selected by the American Nitrogen Company, who purposes the contruction of a nitrogen plant and the ultimate investment of $30,000,000 in the development of the site.

SPOKANE, WASH. — Negotiations will probably be closed soon for the purchase of the electric power plant of the Similkameen Power Company by Eugene Enloe, of Spokane, representing the Okanogen Valley Power Company, according to a report from Oroville. The Okanogan Valley Power Company has a plant on the Methow River that provides service for Pateros, Brewster, Bridgeport, Okanogen and Riverside. The Similkameen Power Company was organized 12 years ago by the late J. M. Haggerty and possesses valuable undeveloped waterpower sites.

WENATCHEE, WASH.—A contract has been negotiated between the city and the Wenatchee Valley Gas & Electric Company whereby the latter will furnish current for lights for public buildings, parks and city streets for a term of five years beginning May 1. The Wenatchee company heretofore held a contract for this service.

GRANTS PASS, ORE.—William H. Swalwell, manager of the Everett Paper Mill Company at Everett, Wash., and a stockholder in the Black Eagle group of mining claims in the Kirby District, reports a hydroelectric plant for supplying energy for light and power will be installed at the mines.

PORTLAND, ORE.—Details for providing Portland with a municipal lighting system, sufficient to light all the streets and public buildings of the city, are being worked out by engineers of the Municipal Water Bureau under the direction of Commissioner W. H. Daly of the Department of Public Utilities.

RIDDLE, ORE.—The construction of a 250-horsepower power plant in this city is being promoted by A. E. Brais to supply this city with electrical energy for light and power.

BERKELEY, CAL.—Property owners have asked the Council to form a lighting district east of Shattuck Avenue and north of the University of California campus.

LAKEPORT, CAL.—F. L. Wright, general manager of the California Telephone & Light Company, has been looking over the Lake County plant with a view to its reconstruction.

LOS ANGELES, CAL.—The Board of Supervisors has granted the request for additional lights in the Hawthorne Lighting District.

LOS BANOS, CAL.—A movement is on foot here which will probably result in the installation of a new electrolier lighting system.

OAKLAND, CAL.—A movement has been started looking toward the installation of a new lighting system on Lincoln Highway.

REDDING, CAL.—At a recent election it was decided to have the city construct an electric-lighting system.

SANTA ANA, CAL.—The City Trustees are considering ways and means for better street lighting.

SAN FRANCISCO, CAL.—The Great Western Power Company and the Pacific Gas & Electric Company have arranged for the joint use of poles on Clement Street from Arguello Boulevard to Twenty-fifth Avenue, thus obviating the hearing by the Board of Works of a protest from the Richmond district of the number of poles on that street. The Great Western Power Company is to erect poles 60 feet high, large enough to carry the wires of several companies, and will transfer to them the wires of the Pacific Gas & Electric Company, which will then remove its small poles.

SANTA ROSA, CAL.—Plans for an ornamental street-lighting system will shortly be presented to the City Council.

SOUTH SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has been awarded a contract for the installation of a new lighting system in this city.

VENTURA, CAL.—Application has been made by the Ventura County Power Company for a franchise to extend its electric transmission lines in certain parts of the county. Bids will be received up to May 10.

NOME, ALASKA.—Bonds were voted at a recent election for the installation of a municipal lighting plant.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	April 24	April 17
American Tel. & Tel. (New York)	127½	128
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	235	236
Electric Storage Battery common (Philadelphia)	.....	.....
Electric Storage Battery preferred (Philadelphia)	.....	165
General Electric (New York)	162¼	130
Kings County Electric (New York) (ex-dividend)	128½	85
Massachusetts Electric common (Boston)	6¾	35
Massachusetts Electric preferred (Boston)	34½	.....
National Carbon common (Chicago)	.....	.....
National Carbon preferred (Chicago)	133	134½
New England Telephone (Boston)	28	28
Philadelphia Electric (Philadelphia)	78	78
Postal Telegraph & Cables common (New York)	67½	68
Postal Telegraph & Cables preferred (New York)	89¾	90
Western Union (New York)	57¾	58½
Westinghouse common (New York)	70	70
Westinghouse preferred (New York)	.....	.....

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Financial Notes

Alabama Power Company, operating subsidiary of Alabama Traction, Light & Power Company, has called for payment August 1 at 101, through the United States Mortgage & Trust Company, New York City, the $2,000,000 first-mortgage six-per-cent bonds due February 1, 1918. For the retirement of these bonds a part of the funds secured by the recent sale of $4,000,000 first and refunding five-per-cent bonds will be used.

Mahoning & Shenango Railway & Light Company, operating subsidiary of Republic Railway & Light Company, has filed in the counties in Ohio and Pennsylvania in which its properties are located, a mortgage securing $10,000,000 refunding and improvement bonds. The mortgage, which covers all property of the company, is given to the Guaranty Trust Company, of New York, as trustee, and the bonds are to be retired in equal blocks annually during the next 100 years.

Dividends.

	Term	Rate	Payable
Bangor Ry. & Elec.	Q	0. 5%	May 1
Pow., com	Q	1 %	May 1
Conn. Ry & Lt., pf	Q	1 %	May 15
Conn. Ry. & Lt., pf	Q	1 %	Aug. 15
Conn. Ry. & Lt., pf	Q	1 %	Nov. 15
Houghton Co. Elec., pf	S	3 %	May 1
Houghton Co. Elec., com.	S	2.5 %	May 1
Kaministquia Pw	Q	1.5 %	May 15
Montreal Lt., Ht. & Pw.	Q	2.5 %	May 15
Montreal Tramways	Q	2.5 %	May 1
North American	Q	1.25%	July 1
Pacific Pw. & Lt., pf	Q	1.75%	May 1
Texas Pw. & Lt., pf	Q	1.75%	May 1

Reports of Earnings.

NEW YORK EDISON.

The Public Service Commission has issued a report covering the operations of the New York Edison Company for the year ended December 31, 1915, which compares as follows:

	1915	1914
Operating revenues	$22,546,068	$23,538,342
Operating expenses	9,649,679	9,932,976
Net operating revenue	12,896,390	13,605,366
Taxes	1,469,369	1,361,624
Uncollectible bills	88,152	101,767
Rentals	1,521,615	1,502,306
Reserves	2,861,999	3,483,056
Net profits	6,955,255	7,156,614
Interest	556,521	915,734
Dividends	4,451,855	3,720,204
Surplus after dividends	1,946,789	2,520,676
Other additions	143,400	*44,037
Previous surplus	32,091,343	29,614,704
Profit and loss surplus	34,181,622	32,091,343

*Deduction.

KINGS COUNTY ELECTRIC LIGHT & POWER.

The combined statement of the Kings County Electric Light & Power Company and Edison Electric Illuminating Company of Brooklyn for the quarter ended March 31, 1916, compares as follows:

	1916	1915
Gross	$2,136,019	$1,754,248
Net after taxes and depreciation	690,849	643,668
Other income	15,714	11,715
Total income	706,563	655,383
Surplus after charges	498,690	438,595

GENERAL ELECTRIC COMPANY.

The General Electric Company has issued its annual report for the year ended December 31, 1915. The income account compares as follows:

	1915	1914
Sales billed	$85,522,070	$90,467,692
Costs, incl, op. maint. depr. chgs.	76,898,183	$1,496,728
Profit	8,623,887	8,970,963
Int. and sundry rev.	2,129,266	1,570,431
Inc. fr. sec.	1,554,843	1,313,989
Total inc.	12,307,996	11,855,383
Debent. int.	570,086	567,556
Net profit	11,737,910	11,287,827
Dividends	8,129,919	8,142,867
Surplus	3,607,992	3,145,060
Balance	3,607,992	3,145,060
Prev. surp.	20,084,879	16,939,819
P. & L. surp.	23,692,871	20,084,879

The net profit was equal to 11.56 per cent earned on $101,510,600 capital stock, against 11.12 per cent earned on $101,485,700 stock in 1914.

In his remarks to stockholders, Chairman C. H. Coffin said in part: Value of orders received by the company for electrical apparatus and devices in the past year was $98,385,891, an increase of $14,637,370, or 17 per cent over those of 1914. This increase was largely due to the general revival of business in the latter part of the year. These figures are exclusive of orders for special war munitions, which amounted to $33,980,000 during 1915. These have been so restricted as to interfere as little as possible with the regular product of the company. The percentage of profit from these orders will probably be less than that of the average of the company's output. The amount of sales billed was $85,522,070, a decrease of $4,945,621, or 6 per cent.

Number of employes engaged in the factories and offices, and in those of subsidiary companies at the end of 1915, was about 60,000.

The company has followed its customary practice in writing off against income account its total expenditures in 1915 for patents, applications for and licenses under patents, and other outlays relating thereto, amounting to $838,455. The patent account is carried at $1, as in previous years. Stocks, bonds, and other securities are carried at a valuation of $32,916,593, of which $19,687,965 represents securities of subsidiary companies, and $13,228,628 those of public utility and other companies. Current accounts and notes receivable are carried at $19,619,215.

Sales of several small factories substantially offset the manufacturing floor space added in 1915; and plant expenditures amounting to $4,485,068 were chiefly for improvements in existing construction and equipment, and the purchase of special tools and machinery which are subject to a high rate of depreciation. Because of the nature of these expenditures, and on account of the liquidation of the book value of the factories sold, the reduction in the plant account for the year was $5,985,068.

The company has no note payable, nor is there any paper outstanding bearing its endorsement.

At a meeting of directors, on February 11, George E. Emmons, who has held important positions in this company and its predecessor since 1886, was elected vice-president.

Proposals

ELECTRICAL WORK.—Sealed proposals will be received until noon of May 22, by George W. Fricke, clerk of the Board of Education, Reading, O., on the electrical and other work involved in the completion of the Reading school. Garber & Woodward, Cincinnati, O., are the architects.

ELECTRICAL WORK.—Sealed bids will be received until May 4, at Room 406, City Hall, Chicago, Ill., for furnishing all labor and material and for installing all electrical work required in the 16 one-story office buildings, shelters, and sand-court buildings at various school sites, according to plans on file in the office of the Department of Public Works. W. R. Moorhouse, Commissioner of Public Works.

POWER PLANT.—Sealed proposals will be received by the Board of Administration, in its office in the Capitol Building, Springfield, Ill., May 16, for power plant, piping and accessories to be installed in the new power house at the Alton State Hospital, near Upper Alton, Ill. Plans may be obtained upon application to Martin C. Schwab, consulting engineer, 1514, Mallers Building, Chicago, Ill. Frank D. Whipp, Fiscal Supervisor of the Board of Administration, Springfield, Ill.

New Incorporations

LOGANSPORT, IND.—Rutenber Electric Company has increased its capital from $85,000 to $200,000.

MILWAUKEE, WIS.—The Bureau of Electric Sign Engineering. Capital, $10,000. Incorporators: J. B. Lindl, Joseph Lindl and W. O. Meilahn.

CANFIELD, O.—Canfield Gas & Electric Company. Capital, $100,000. Incorporators: W. J. Smith, John Rowan, A. Wiesner, C. C. Neff and C. R. Wetmore.

SAN FRANCISCO, CAL.—The Electric Sales Service. Capital, $100,000. Incorporators: W. W. Briggs, H. E. Kennedy, H. A. Mulvay, W. S. Leffler and W. S. Braun.

BRONX, N. Y.—Interstate Switchboard & Supply Company. Capitol, $11,000. Incorporators: A. E. Reinhardt, 1341 Franklin Avenue, Bronx; G. N. Reinhardt, Bronx, and C. Millikow, New York City.

NEW YORK, N. Y.—Marko Storage Battery Depot of New York. Capital, $5,000. Incorporators: P. M. Marko, 142 Norwood Ave., M. H. Tuttle, and J. Kresse, Brooklyn.

BUFFALO, N. Y.—The Battery & Starter Company. Capital $10,000. Manufacture electric accessories for automobiles, batteries, etc. Incorporators: E. F. Miller, W. R. Devine and J. B. Rodgers, all of Buffalo.

POTSDAM, N Y.—St. Lawrence Transmission Company. Capital, $525,000. Formed by the consolidation of the St. Lawrence Transmission Company and the Northern Power Company, to generate and deal in electricity. Incorporators: G. R. Gibbons, Pittsburgh; F. A. Stoughton and Paul B. Murphy, Potsdam.

Electrical Patents Issued April 18, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,179,389. Circuit-Controlling Device. J. T. Austin, assignor to Austin Organ Co., Hartford, Conn. For electromagnetic organ.

1,179,395. Insulating Support for Storage-Battery Tanks. H. M. Beck, Evanston, Ill. Stands in cup of insulating fluid which it protects with petticoat.

1,179,407. Electrical Truck. F. J. Decker, assignor to Shafer-Decker Co., Rochester, N. Y. Motor mounting and gearing.

1,179,414. Process of Thickening Oils. C. Ellis, Montclair, N. J. Fatty oil subjected to ultra-violet rays in absence of oxygen.

1,179,428. Screen. E. Hayes, Park City, Utah. For sifting; electromagnetically vibrated.

1,179,478. Electric-Braking System. P. S. Turner, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Motor disconnected from supply and connected to braking circuit on backward movement of vehicle.

1,179,486. Water-Level Recorder. J. M. Wight, Lakewood, O. Float-controlled device for boilers.

1,179,495. Transforming Battery. A. Burkhardt, New York, N. Y. Interconnection of cells having zinc and aluminum electrodes.

1,179,498. Combined Terminal Box and Switch Support. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. Switch parts carried by separable box sections and locked open when box sections are not locked together.

1,179,502. Battery and Lamp Tester. W. F. Cass, Escanaba, Mich., assignor of one-half to L. N. Schemmel, Escanaba, Mich. Unitary device for application to terminals of batteries, etc.

1,179,512. Time-Controlled Electric Switch. L. T. Fenning, Jackson, O. Clockwork mechanism.

1,179,515. Alternating-Current Rectifier. L. E. France, Cleveland, O. Magnetic vibratory device for charging batteries.

1,179,517. Telegraph Instrument. E. L. Gilleland, Grand Forks, N. D. Details of sounder.

1,179,522. Process of Extracting Metals From Their Ores. W. E. Greenawalt, Denver, Col. Electrolytic treatment.

1,179,530. Direct-Acting-Solenoid Resistance Regulator for Train-Lighting Systems. P. Kennedy, Brooklyn, N. Y. Contact structure and operation.

1,179,537. Electrically Controlled Valve. L. A. Mapel, assignor to Mapel Mfg. Co., St. Louis, Mo. Closing mechanism released by float-controlled solenoid.

1,179,540. Electric Valve-Controlling Mechanism. L. A. Mapel, assignor to Mapel Mfg. Co. Modification of above.

1,179,624. Overload Indicator. C. F. Gilliatt, assignor to The Excess Indicator Co., Pittsburgh, Pa. Details of electromagnetically operated contact device.

1,179,637. Circuit Controller. C. J. Kruse, assignor to Cutler Hammer Mfg. Co., Milwaukee, Wis. Polyphase motor controller responsive to circuit conditions.

1,179,642. Telephone Attachment. J. F. Makowski, assignor to Telephone Appliance Co., San Francisco, Cal. Receiver support for clamping to desk instrument.

1,179,648. Meter Seal. C. C. Personette, St. Louis, Mo. Details of device secured by frangible stud.

1,179,700. Take-Up Device for Telephone

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Cords. W. P. Cornell, Charleston, S. C. Spiral spring extending along and secured to cord.

1,179,722. Lightning Arrester. W. J. Heinritz, Norristown, Pa. Electromagnet in series with horn gap in ground connection draws horns apart. (See cut.)

1,179,728. Separable Attachment Plug. G. P. Knapp, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. For connecting chafing dishes and the like; has provision for ground wire.

1,179,741. Automatic Telephone System. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement and construction of selective switches.

1,179,761. Watch. J. Rosemont and F. Amati, Trenton, N. J. Has battery lamp to illuminate dial controlled from stem.

1,179,769. Street-Indicating Mechanism. T. W. Small, assignor to Acme Indicator Co., Cleveland, O. Drum device operated by spring motor and controlled by magnetic clutches.

1,179,770. Street-Indicating Apparatus. T. W. Small, assignor to Acme Indicator Co. Strip intermittently fed by solenoid.

1,179,779. Starting and Lighting System. H. W. Uhl, Freeport, N. Y. Dynamo for operating from automobile engine has armature and field rotatable with braking means for one regulated according to speed of engine.

1,179,783. Bond-Wire Protector. E. W. Vogel, assignor to Chicago Railway Signal & Supply Co., Carpentersville, Ill. Hook encloses wire and is secured to splice bar by plug.

1,179,805. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Jersey City, N. J. Voltage regulation of battery and dynamo car-lighting system.

1,179,878. Trolley Retriever. F. A. Wasson, Milwaukee, Wis. Details of pressure fluid-operated trolley-swinging motor.

1,179,891. Electric Switch. T. Bozzetti, assignor to Maricanola & Testa, Turin, Italy. Pendant switch actuated by pressure or pull.

1,179,896. Telephone-Receiver Support. C. S. Cate, Easthampton, Mass. Details of vertical-turning spring-actuated arm.

1,179,903. Electric Battery. F. S. B. De Mello, Rio de Janeiro, Brazil. Depolarizer comprising artificial proto-sulfid of copper in a container.

1,179,906. Electric Signaling. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Receiver for wireless telegraphy.

1,179,927. Device for Producing Oxids of Nitrogen. J. S. Island, Ontario, Canada. Arrangement of rotary and hollow electrodes producing electric flame for treatment of oxy-nitrogen gas.

1,179,929. Device for Breaking Circuit Between Generator or Magneto and Storage Battery. S. F. Johnson, Indianapolis, Ind. Ball governor lifts brush off commutator.

1,179,933. Electric-Circuit-Controlling Mechanism. S. Q. Kline, Jr., Washington, D. C. Float-operated mechanism.

1,179,936. Electrostatic Apparatus for Separating and Cleaning Grits, Grain, or the Like. J. Kraus, Brunswick, Germany. Electrodes form attractive and repelling poles and stripping off devices co-operate with stationary dielectric covering attractive pole.

1,179,937. Method of and Apparatus for Separating and Cleaning Materials in an Electrostatic Field. J. Kraus, Brunswick, Germany. Alternate fields and neutral zones travel along dielectric septum and particles attracted to field zones are removed.

1,179,957. Switch Mechanism for Controlling Circuits or High-Current Value. G. E. Palmer, assignor to Palmer Electric & Mfg. Co., Boston, Mass. Electromagnetically controlled switch in working circuit controlled by circuit supplied by auxiliary source of potential.

1,179,970. Side Connection for Electrical Cables. J. C. Stearns, Worcester, Mass. Special plug connector for armored or insulated conductors.

1,179,986. Electrical Cooking Utensil. A. A. Warner, assignor to Landers, Frary & Clark, New Britain, Conn. Mounting of heater element with special provision for its expansion and insulation. (See cut.)

1,179,987. Signal System for Railway Crossings. E. M. Weaver, Ozone Park, N. Y. Time electromagnetic mechanism for operating bell.

1,180,025. Process of Making Thickened Oil Product. C. Ellis, Montclair, N. J. Fatty oils subjected to ultra-violet rays in non-oxidizing atmosphere.

1,180,039. Electric-Generator Regulator. H. Hill and J. B. Dyer, Anderson, Ind. Generator field resistance has cam-operated short-circuiting contactor controlled by differential current and potential coils.

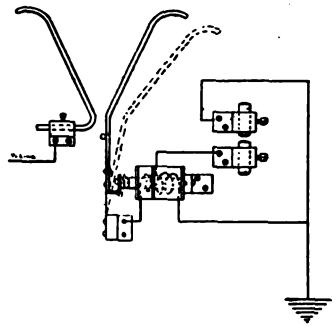
1,180,044. System of Electrical Distribution. M. H. Johnson, Utica, N. Y. Interlocking switches for controlling automobile-lighting circuits.

1,180,047 and 1,180,048. Electric Riveting Apparatus. F. P. Kobert, assignor to International Electric Riveter Co., Boston, Mass. First patent: Machine has plunger for forming current and swinging electrode arms for passing heating current through rivet. Second patent: Modification.

1,180,055. Rail Joint. S. Leschziner, Newark, N. J. Device for electrically connecting rail ends.

1,180,066. Process of Making Filaments. R. E. Myers assignor to Westinghouse Lamp Co., E. Pittsburgh, Pa. Making fine ductile filaments from refractory conducting material.

1,180,075. Production and Detection of Electric Oscillations. P. Pichon, assignor to Gesellschaft fur Drahtlose Telegraphie, M.



No. 1,179,722.—Lightning Arrester.

B. H., Berlin, Germany. Testing apparatus for producing and detecting oscillations of frequency in wireless telegraphy and telephony.

1,180,090. Electrolytic Device for Use in Electric Meters and Other Apparatus. W. B. Thorpe, Wandsworth Common, London, England. Comprises cell having two separate regions containing electrolyte with gas-trapping connection between.

1,180,096. Apparatus for Electric Welding. H. R. Woodrow and T. E. Murray, New York, N. Y. Relates to the clamping mechanism of a butt welder.

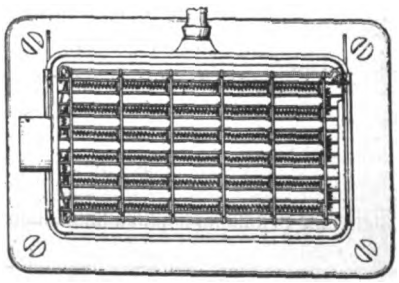
1,180,103. Apparatus for Controlling Electrical Circuits. R. E. Baker, assignor to A. G. McKee, Cleveland, O. Details of contacts operated by pointer of indicator.

1,180,138. Illuminated Sign. R. S. Giese, Pittsburgh, Pa. Structure of globe for porches, etc.

1,180,139. Combined Cylinder and Shade Support. R. S. Giese, Pittsburgh, Pa. Lamp enclosing cylinder for attachment to fixture supports upwardly opening bowl at its lower end.

1,180,144. Electric Warp Stop-Motion. J. Hancq, Jamestown, N. Y. Controlling contacts operated by heddle frame.

1,180,147. Combination Telephone. R. D. Hatch, Memphis, Tenn. Arrangement of re-



No. 1,179,986.—Electrical Cooking Utensil.

ceiver horn and transmitter in a hood for the face of the user.

1,180,158. Automatic Train Stop. J. A. Lanigan, Jr., Brooklyn, N. Y. Stop mechanism operated by cable drum on train when armature secured to cable end is arrested by track magnet.

1,180,159. Incandescent Electric Lamp. I. Langmuir, assignor to General Electric Co., Schenectady, N. Y. Tungsten lamp is filled with nitrogen at pressure of 300 millimeters of mercury or more.

1,180,173. Rail Joint. C. W. Montgomery and C. A. Kohler, Harrisburg, Pa. Manner of insulation.

1,180,174. Refrigerator Alarm. W. I. Moon and D. Hackmann, Baltimore, Md. Circuit controlled by drip-pan float.

1,180,184. Voting Machine. J. F. Price, Nashville, Ark. Has key-controlled electromagnetically operated type bars.

1,180,208. Electric Switch. G. B. Thomas and E. Anderson, assignors to the Bryant Electric Co., Bridgeport, Conn. Rotary, snap switch.

1,180,216. Float-Operated Circuit-Closer. L. L. White, Spokane, Wash. For oil reservoir.

1,180,218. Signal and Stopping Mechanism for Railway Cars. F. C. Williams, assignor to Safety Block Signal Co., Delaware. Semaphore mechanism.

1,180,236. Coin-Control Mechanism. C. F. Burkhardt, assignor to Burkhardt Automatic Shoe Polishing Machine Co., Buffalo, N. Y. Coin closes controlling-motor circuit of machine.

1,180,246. Vault and Safe Construction. N. B. Cregier, assignor to Vault Protection Co., Los Angeles, Cal. Alarm circuit controlled by vacuum pipe in walls.

1,180,264. Incandescent Body for Electric Lamps. A. Lederer, Vienna, Austria, Hungary. Consists mainly of tungsten which resists offsetting.

Reissue 14,113. Spark-Coil. C. H. Thordarson, Chicago, Ill. Original No. 958,899, dated May 24, 1910. Structure of core.

PATENTS EXPIRED.

The following United States electrical patents expired on April 25, 1916:

623,511. Automatic Electric Circuit-Breaker. M. Bouchet, Paris, France.

623,521 to 623,525. Electric Meter. T. Duncan, Fort Wayne, Ind.

623,526. Phase Adjustment. T. Duncan, Fort Wayne, Ind.

623,527 and 623,528. Electric Meter. T. Duncan, Fort Wayne, Ind.

623,529 and 623,530. Electric Motor. T. Duncan, Fort Wayne, Ind.

623,531. Multiple-Rate Electric Meter. T. Duncan, Fort Wayne, Ind.

623,532. Electric Meter. T. Duncan, Fort Wayne, Ind.

623,547. Ampere-Hour Electric Meter. G. Hummel, Munich, Germany.

623,570. Terminal Head for Electrical Conductors. C. H. Sewall, Chicago, and H. E. Procunier, Oak Park, Ill.

623,579. Differential Electromagnet. J. S. Stone, Boston, Mass.

623,583. Telephone Trunk Circuit. T. C. Wales, Jr., N. and H. M. Crane, Boston, Mass.

623,607. Electric-Lighting System. R. O. Hood, Danvers, Mass.

623,610. Electric Third-Rail System. L. M. Maxham, Boston, Mass.

623,611. Combined Listening and Ringing Key for Telephone Switchboards. W. O. Meissner, Chicago, Ill.

623,622. Electric-Motor Regulation. O. H. Pieper and A. F. Pieper, Rochester, N. Y.

623,623. Incandescent-Lamp Base and Socket. A. C. M. Prucker, Hanover, Germany.

623,625. Electric Brake. C. P. Pushaw, Washington, D. C.

623,637. Ship's Telegraph for Transmitting Signals, Orders, Etc. L. S. Thompson, Washington, D. C.

623,656. Portable Electric Lamp. A. Drescher, New York, N. Y.

623,659. Electric Belt. W. H. I. Geiger, Denver, Colo.

623,672. Railway Signal. J. Jorgenson, San Francisco, Cal.

623,678. Trolley Wheel. C. B. Lebcher, Miles City, Mont.

623,689. Pneumatic Electric Safe or Vault Protection. F. C. Smith, Delaware, O.

623,691. Process of and Apparatus for Manufacturing Alkali Metals. C. E. Acker, East Orange, N. J.

623,692. Process of and Apparatus for Manufacturing Metallic Alloys. C. E. Acker, East Orange, N. J.

623,702. Telephone Transmitter. P. C. Burns, Chicago, Ill.

623,717. Distributing Terminal. R. C. Donaldson, Pittsburgh, Pa.

623,730. Electric Incandescent Tube. W. J. McCutcheon, Pittsburgh, Pa.

623,778. Electric Igniter for Explosive Engines. J. H. Frew, Newcastle, Pa.

623,801. Combined Electric Arc-Lamp and Fan. J. Melzer, Cleveland, O.

623,811. Electric Glow Light. W. Nernst, Gottingen, Germany.

623,820. Electrically Propelled Road Vehicle. O. Patin, Puteaux, France.

623,821. Electrically Controlled Valve Gear for Gas or Other Motors. D. W. Payne, Elmira, N. Y.

623,846. Printing Telegraph. D. C. Smyth, Hartford, Conn.

623,887. Mechanical and Magnetic Amusement Game. H. Cottrell, Newark, N. J.

623,888. Electrodeposition of Zinc upon Iron. S. O. Cowper-Coles, London, England.

623,906. Electric Actuating Mechanism for Station Indicators. A. Hunter, San Francisco and C. Gustafson, Oakland, Cal.

623,908. Telephone Transmitter. E. H. Johnson, Omaha, Neb.

623,953. Electric Belt. W. P. Freeman, New York, N. Y.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, MAY 6, 19 6. No. 19.

EDITORIALS

DEVELOPING OUR WATER POWERS.

The discussion of water power and related problems at Washington last week by the American Institute of Electrical Engineers has served to emphasize some aspects of the question which are often overlooked and to bring together a consensus of engineering opinion of great value. The commercial value of water powers is frequently overrated, and it will come as a shock to the public, and perhaps to many engineers, to learn that in the eastern United States power can be supplied more cheaply from fuel than from water falls, unless the hydroelectric equipment is used to its full capacity more than half of the time. This is because the fuel cost is overbalanced by the fixed charges on the investment, which for hydroelectric plants may be several times as large as the investment in a steam plant of the same capacity. Relative comparisons seem likely to grow in favor of fuel. Both investment and operating costs for steam plants have been steadily decreasing. Operating costs for hydroelectric plants are already at a minimum, and there is little promise of decrease in investment per kilowatt of capacity. Fixed charges could be decreased, however, if lower interest rates could be secured, promotion expenses eliminated and speculation in desirable sites prevented.

Lower interest rates depend upon the attractiveness of the investment. Investors will supply funds for development at low rates when security is established and returns are certain. Returns depend upon successful commercial results and also upon the cost of completing the project and establishing the business. Hydroelectric developments have been notoriously uncertain as to the total cost of completion, and unless close to a good market for power, the disposal of the product is not always assured. This applies especially in the West, where a market for power is often lacking in the very region where water power is most abundant. The establishment of industries far from raw materials and from the point of consumption of the product is not feasible, especially if water transportation is not available. As a consequence, much water-power development in the Western States is at present held in abeyance.

Electrochemical industries as a rule utilize large blocks of power, and frequently operate continuously. They thus present ideal conditions for the application of hydroelectric power. Their commercial success usually depends, however, not only upon securing this power cheaply, but upon securing it at points which are favorably situated with reference to transportation, markets, and sources of raw materials. There are not a great many points in this country which meet all the conditions, and decidedly few where the power would be cheap enough to utilize for the fixation of atmospheric nitrogen. However, at least two large corporations stand ready to develop plants of this character if the conditions are made satisfactory to them.

The other element in securing capital at low rates is security of the investment. Not only must returns be reasonably well guaranteed, but the integrity of the principal must be protected. The most obvious way to insure this is through rights in perpetuity to continue the industrial operations. But this involves turning over into private hands the natural resources which are the heritage of all the people. The people have come to realize that this is an injustice to future generations and incompatible with the ideals of democracy. In a new country opportunities are many and the position which the individual attains depends largely upon his own efforts and ability. In an old country where all natural resources are in private hands, similar opportunities are not open, and the individual's social and economic position are largely dependent upon his ancestry, thus destroying the possibilities of real democracy. There is a growing fear in this country that we are developing an aristocracy of wealth that can only be avoided by preventing a monopoly of natural resources. This has found expression in relation to Alaskan coal lands and to the water powers which are still under government control. It is at last realized that a great mistake was made in turning over to the transcontinental railroads large tracts of agricultural, timber and mining lands which were useless at the time, but which are of immense significance and value to the following generation. Suits have even been instituted to recover portions in reference to which the terms of the grant were not fulfilled. It is a recognized principle of democracy that one generation of men shall not dispose of the rights of a following generation. The dead hand must not rule the living.

It is consequently not the intention of either legislators or executives of today to let the control of water powers pass into private hands by granting either titles in fee simple or perpetual franchises. The fifty-year lease has been much talked of, but unless coupled with security for the investor's capital, it will not invite the funds necessary for development. Public officials are entirely right in reserving ultimate public control of these resources, but the condi-

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tions of development must provide for the continued use of the power by the industries which are invited to establish themselves where they will be dependent upon this power.

The public is interested in the immediate development of our water powers from two considerations. One of these is the conservation of fuel, whose consumption may be avoided by substituting water power for other forms of power. The other is the national independence in the production of nitrogen compounds, which are indispensable for the manufacture of explosives, fertilizers, dye-stuffs, etc. Probably both of these have been overestimated. Independence in the production of nitrogen would be especially desirable in time of war, at which time other uses on a large scale could be avoided. One speaker at the meeting pointed out that sufficient nitrogen could be obtained if all the coke used in the country were manufactured in by-product ovens, instead of in the wasteful beehive ovens, a transformation which is already being brought about.

Whether any coal would be saved by the development of water powers is doubtful. Such power would usually be used in establishing new industries or for purposes not replacing other sources of power. Where such industries can be established under commercial conditions, they should by all means be developed, thus adding to the national wealth. But granting that coal consumption could be restricted, as it undoubtedly could be were all available water powers developed regardless of competitive costs with steam power, should this be done in the interest of posterity and at some slight sacrifice in present costs? This is a question of national policy not easy to decide. To what extent should the present generation sacrifice financial gains for the benefit of its successors? Certainly if such sacrifices are to be made, it is not by individuals but by the Government that the work must be carried on. Individual investors will not embark in investments which do not promise returns, for the benefit of posterity. Either the Government must do the work, or it must arbitrarily enforce higher prices for competitive power, neither of which courses would be likely to receive the approval of the present generation. About all the present administration can do is to permit development on the most liberal terms compatible with ultimate public control. These should include long-term leases, protection of the investment at the end of the term, assurance of continuity in the development and use of power. Payments to the Government should not be required. The value of a water power, as of any other natural resource, is the capitalization of its earning power. At present these earning powers are not high. In the future they may be, and it is the resulting eventual values that should be secured to the whole people and not handed over to private enjoyment. This can be done by terms of purchase based on cost, rather than future value, thus excluding unearned increment.

It was made evident by Congressman Smith's remarks at the meeting that Congress has heard too much from the promoters of projects interested mainly in their own financial gains, and too little from those who might make unprejudiced reports of the engineering and financial difficulties involved. The meeting of the Institute should have value in bringing the engineering features more prominently before Washington officialdom.

The discussion of Niagara Falls power by the American Electrochemical Society on the following day brought out a number of significant points. The industries there are already feeling the pinch of insufficient nourishment from their power plants. The principal opposition to developing more power has arisen from fear of destroying the scenic beauty of the Falls. But the principal menace to the scenic beauty lies in the rapid wearing back of the rock at the apex of the Horseshoe Falls. This could be greatly lessened, and the development of more power made possible without interfering with the scenic grandeur, by constructing a submerged diversion dam above the apex of the horseshoe. This is a solution which should satisfy all parties, and it would probably be undertaken by the power companies if they were given permission.

CONTACT POTENTIAL DIFFERENCES.

The paper by Dr. Irving Langmuir, entitled "The Relation Between Contact Potentials and Electrochemical Action," which was presented at the meeting of the American Electrochemical Society, gave a discussion of the century-old conflict between the two theories of electrochemical action in the light of modern investigations.

Volta, in the early days of the science, showed that plates of two different metals, when placed together and then separated, acquire electric charges. He attributed the electromotive force of a primary battery to this effect. The chemists, on the other hand, have attributed this effect to chemical action. Dr. Langmuir concludes that Volta was correct, and bases his conclusion upon six lines of recent research. These include investigations of thermionic emission, or the projection of electric particles from heated metals; the thermal effects accompanying such emission; the photo-electric effect; the spectra of metal vapors; the ionizing potentials of such vapors; and the direct measurement of contact potential differences. In the last category are the recent experiments of Professor Sanford, which support this point of view, although not referred to by Dr. Langmuir.

The source of energy in a voltaic cell undoubtedly lies in the chemical reaction which takes place, and without such chemical action a condition would soon ensue which would inhibit the flow of current. It does not follow from this, however, that the chemical action is the cause of the electrical effect, any more than radiation from the sun causes a hydraulic turbine to rotate, although it is the indirect source of the energy involved.

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INDETERMINATE CONTRACTS FOR STREET LIGHTING.

Wisconsin introduced to the country the indeterminate form of public-utility franchise, to replace that for a limited term of years which had previously been regarded as the accepted standard for such proceedings. The same state has now brought forward a similar method of dealing with municipal contracts for service from utility corporations. Heretofore such contracts have provided for service of a definite kind for a definite period and at a definite price. Advances in the art may have made the service seem inadequate or the price unreasonable, but the conditions of the contract could only be changed by mutual consent. At the end of the contract term, the contract might be renewed or a new one negotiated—provided the conditions could be agreed upon. Where they could not, certain towns have been left in darkness or other discomfort.

Where limited-term franchises are in existence, a utility company is in doubt as to its fate at the end of its franchise period. It must trust to renewal under reasonable conditions, or else charge rates sufficient to amortize its investment during the franchise period, to be safe. Where the municipality depended upon franchise bargaining to secure favorable rates or service conditions, a limited term for franchises was essential to the public welfare. The advent of the state commission with power over rates and service removed this necessity, and the introduction of the indeterminate franchise removed the necessity for utility companies to consider amortization of their investments.

Contracts for municipal service, such as electric street lighting, present similar aspects. Under a contract for a short term of years the operating company, in self-protection, is required to charge a price which will provide for the amortization of the investment during the contract period, since the disposition to be made of the equipment at the end is in doubt. New equipment may then be demanded by the municipality. An indeterminate contract avoids this difficulty, but it can be satisfactory only when based upon the payment by the municipality of actual costs, in the form of both operating expenses and fixed charges. If equipment is discarded and replaced before the depreciation account has accumulated enough for its retirement, then the municipality must bear the extra expense involved. Such an arrangement leaves the municipality a free hand in planning extensions and adopting new types of equipment, while at the same time it protects the investment of the electric lighting company and insures it against financial loss from this perplexing element of its business.

The Wisconsin legislature passed an act last year which authorizes municipalities in that state to make contracts of this kind. So far as is known to us, no town has yet availed itself of this power, but a paper presented at the recent convention of the Wisconsin Electrical Association by Mr. G. W. Van Derzee worked out the data for a community of 40,000 inhabitants, and showed the advantage to it of the indeterminate contract based on cost of service. The reduction in rates thus made possible and the emphasis which is placed on the identity of interest between the municipality and the utility company, will stimulate an increased intensity of street lighting and also help to develop satisfactory relations between the community and the utility corporation. The substance of Mr. Van Derzee's paper will be found on other pages of this issue.

MAGNETIC AND MECHANICAL PROPERTIES OF STEEL.

It has long been realized that the physical treatment and chemical constitution of steels which led to mechanical hardness were also effective in making the material magnetically hard, by which is meant that the coercive force and hysteresis are relatively high. Many attempts have been made to establish a close quantitative relation between these properties. There are a great many elements going to make up the condition of any specimen of steel. If all of these but one can be kept constant while that one is varied, it is not hard to establish a relation between that one element and the corresponding magnetic qualities. But when there is no control over any of the elements, so that all may vary simultaneously, then the relationship becomes very complex.

The International Association for Testing Materials has a committee at work upon this question, as it is realized that the testing problem would be much simplified if the mechanical properties could be determined by a magnetic test. The latter is not only simple in application in many cases, and can be carried out without mechanical injury to the specimen, but mechanical tests frequently involve the destruction of the specimen. The latter, consequently, can only be applied to samples, whereas a magnetic test could, if necessary, be applied to an entire product. For instance, when a quantity of product of supposedly uniform composition and treatment is subjected to a magnetic test, flaws in individual pieces may be readily brought to light. Such flaws might consist of interior blow-holes, incipient cracks, imbedded foreign material, hard spots, etc.

A review of the work which has already been done in this line is given in Scientific Paper No. 272 of the Bureau of Standards by Dr. Charles W. Burrows. The results of various experiments go to show not only the relation of chemical composition and heat treatment to the magnetic properties, but that mechanical treatment, such as stretching, has definite magnetic effects. If it can be shown that there is only one set of magnetic characteristics corresponding to a given set of mechanical characteristics, magnetic testing would assume a much more important place in determining the suitability of steel for its various applications.

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Happenings in the Industry

American Institute at Washington Discusses Water Power—Report of Washington Meeting of Electrochemical Society—Manufacturers of Electrical Supplies Hold Meetings in New York—General Conference on National Electrical Safety Code—Service-Installation Contest for Chicago Convention—Water-Power Association Answers Criticisms

ELECTRICAL ENGINEERS DISCUSS WATER POWER.

Meeting of the American Institute of Electrical Engineers Held at Washington, on April 26.

A meeting of the American Institute of Electrical Engineers was held at the New Willard Hotel, Washington, D. C., on April 26, under the auspices of the Committee on Development of Water Power and of the Washington Section of the Institute. Afternoon and evening sessions were held.

R. H. Dalgleish, chairman of the Washington Section, called the afternoon meeting to order, and after welcoming those in attendance called John J. Carty, president of the Institute, to the chair. Mr. Carty referred to the active part which engineers are taking in public affairs, and of the large achievements of electrical engineers. Three papers were presented at this session, the first being by Lawrence Addicks, on the subject of "Electrochemical Industries and Their Interest in the Development of Water Powers." Mr. Addicks said that the electrochemical industries have grown to be of great value to this country; they have a fundamental interest in the development of cheap power; they offer nearly ideal power loads of magnitude; they must be located strategically as regards supplies and markets; Niagara power is not cheap enough, nor is it sufficient in its present state of development to afford growth to these industries; the industries have so far been hardly strong enough to develop large powers themselves; great expansion should follow the development of cheaper power in accessible locations, and the country is vitally interested in the development of the nitrate industry, which must have very cheap power in great quantity in order to exist. In view of all these considerations, a liberal water power policy on the part of the government would seem to be a step in the right direction.

Allerton S. Cushman read a paper entitled "Water-Power Development and the Food Problem." Dr. Cushman pointed out that the increasing population of this country was accompanied by decline in nitrogenous food products and a smaller production per acre of all kinds of food than in Europe. Nitrogen is one of the principal fertilizer ingredients necessary for plant food. Nearly all the fertilizer used in this country is used in the eastern part, and water power must be developed where the demand for the intensive agriculture exists. A feasible and proper plan for water-power development will have a profound influence in supplying necessary fertilizer ingredients.

A paper entitled "The Relation of Water Power to Transportation" was presented by Lewis B. Stillwell. Mr. Stillwell discussed the relative importance of water power and steam power from the standpoint of cost. Electrification of steam railroads using hydroelectric power would result in economies of 18 per cent in total expense of operation. Recent progress in steam engineering has reduced the cost of electric power from this source, and this greatly affects the value of water power. It also limits the economic investment in developing a water power. Comparative costs of canals and railroads were given, with illustrations of comparative speed and power consumption.

After some brief remarks by Thomas Ewing, commissioner of patents, the discussion was opened by D. B. Rushmore, who traced the use of power in its various forms from the sail and windmill to its modern developments, and emphasized the necessity for conserving our power resources.

F. A. Lidbury said that the water-power needs of the electrochemical industries could be expected to grow considerably, but these needs are extremely diverse, as are also other important factors, such as labor. Certain electrochemical industries have as yet obtained no start in the United States, owing to their large requirements for power at a low price. Some of the industries started at Niagara Falls have moved away, and others will follow, on account of the scarcity of power there. Even where power is cheap the possibility of its use depends upon a favorable location with respect to transportation, raw materials, market, etc.

Henry G. Stott pointed out that hydroelectric apparatus had nearly reached a maximum efficiency, whereas within 15 years steam power costs in both fuel and fixed charges had been approximately cut in half, and still more may be expected in the future. Under average conditions steam power is cheaper where the load-factor is less than 60 per cent, whereas hydroelectric power is cheaper for load-factors higher than this. In many cases a combination of steam and hydroelectric plants will provide the smallest total cost of power. This would be true at Niagara Falls. The conservation of the coal supply is the only reason for using hydroelectric power in most cases where the load-factor is below 50 per cent.

Gano Dunn said that the average load-factor of the central stations in this country is not more than 26 per cent, which emphasizes the difficulty of water-power plants in competing with steam plants. If electrochemical plants could use secondary or off-peak power, the cost of power would be greatly reduced. Much can be done in utilizing water power at points where fuel is expensive, especially by its use in operating railroads. The time for more general electrification of railroads is at hand.

Leo H. Baekeland pointed out that even at Niagara Falls, power, even if unlimited in quantity, was too expensive for certain chemical industries, such as the manufacture of nitric acid. One reason for the expensive feature of water-power developments in this country is the demand for money for other enterprises, and the consequent high rate of interest, combined with the excessive promotion and banking charges which are usually involved. The fixed charges are consequently excessive. John B. Whitehead thought that the same study as given to steam power equipment might result in lower investment costs for water-power. The authors then closed the discussion.

At the evening session papers were presented on "Water Power and Defense," by W. R. Whitney, and "The Power Situation, Including Its Financial Aspect," by Gano Dunn. The first paper, in the absence of the author, was presented by John H. Finney. This paper pointed out the necessity of nitric acid or other nitrogen compounds in the manufacture of explosives, dye stuffs and fertilizers. At present the United States has no adequate domestic sources, and is dependent on imports from Chile. Home production is wholly a question of initiative and utilization of water power, but so far economic conditions have prevented it. National safety demands the development of a nitrogen industry,

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whether it be self-supporting or not, but the products are of value in times of peace as well as war. The different processes were considered, and a suggestion made that the experts of the various government departments take immediate action as to the best course to pursue.

Mr. Dunn showed how actual and threatened legislation, popular prejudice, and some unprofitable instances had retarded investment in water powers. The cost of steam power is falling, while the cost of water power is rising, due to increasing costs of labor and materials and increasing taxation. The possibility of utilizing off-peak power for industries not requiring continuous power may partly offset this. A hydroelectric plant usually requires about three times the investment for a steam plant of equal capacity. The risks incident to a limited-term franchise were considered, and the additional cost of power in case of amortization of investment were necessary. Water power should be developed to conserve the coal supply, but this cannot be done unless present restrictive factors be ameliorated, so that capital may be obtained at five per cent, instead of seven per cent, due to present risks.

The discussion was opened by F. A. Lidbury, who pointed out that off-peak power did not meet the requirements of most chemical industries, where the investment per kilowatt is usually larger than in the power plant. It is ridiculous to give municipal lighting or other short-hour use the preference in the application of water power when it has such a poor load-factor, more suited to the use of steam. If the big future for most water powers in this country is not electrochemical, there will probably be no future at all. Lawrence Addicks considered industries which might use off-peak power, but saw little promise for them. John H. Finney said that the aluminum industry required continuous power, both on account of the investment and of the necessary output. The great bulk of water-power development is for private or semi-public use, rather than as a public utility. Users of power, whether for chemical operations, irrigation work or railroads, require not only cheap power, but permanent power. The use should be in perpetuity, whether ownership of the power is so or not.

L. H. Baekeland emphasized the necessity of eliminating the unnecessary expenses in water-power development, such as speculations in sites, promotion and banking charges. Such conditions would have precluded development in Norway and other European countries. Control of the natural resources by the government, even to the extent to which this is done in Germany obviates such difficulties. In this country many enterprises, such as the New York traction companies, have been carried on for the benefit of neither the public nor the investors, but for those who get rich by wrecking the properties.

C. G. Atwater, in discussing Dr. Whitney's paper, pointed out that by-product coke ovens at present supply 220,000 tons of sulphate of ammonia each year, and this could easily be increased to 750,000 tons, which would supply the entire consumption of fixed nitrogen. We consequently have already an adequate source of such materials. Calvert Townley, who has recently been in Chile, spoke of the possibility of a considerable decrease in the price of nitrate from that country. D. B. Rushmore and Oscar T. Crosby also joined in the discussion.

The session closed with an address by George R. Smith, congressman from Minnesota, who told of the desire of congressional committees to obtain full information upon the water-power question, and of the conflicting testimony which is presented to them. The capitalist should be protected through certainty of tenure and reasonable return on the investment, and the interest of the public must also be protected. Regulation by state commissions is not feasible for power companies which transmit over state boundary lines. He favored a national commission to handle all the water-power resources of the country.

Meeting of Electrochemical Society Held at Washington.

The twenty-ninth general meeting of the American Electrochemical Society was held at the Hotel Willard, Washington, D. C., April 27, 28 and 29. At the opening session the reports of the secretary, treasurer and board of directors were presented, and showed the Society to be in a flourishing condition, the present membership being 1,400. The following officers were elected for the ensuing year: President, F. A. J. FitzGerald; vice-presidents, C. G. Schluederberg, A. S. Walker and F. J. Tone; managers, W. D. Bancroft, E. F. Roeber and Carl Hering; treasurer, Pedro G. Salom; secretary, Joseph W. Richards.

President Addicks, in his address, said in part: "The opportunity of the engineer is here, the events of the last two years having accomplished what would have required at least a generation of peaceful development. The great question is whether the engineer will rise fully equal to his opportunity. To do this he must first of all lay aside all narrow sectarianism, the technical men in all branches realizing that thye are of a common brotherhood. Then he must broaden his interests and not remain satisfied with the purely technical aspects of the problems which present themselves, but study and grasp their larger economic significance. Finally, he must not rest content with acting in a merely advisory capacity in the affairs of business, but have the self-confidence to see his work through from laboratory to factory, from factory to market, at home or abroad, and if necessary, from market to the economic situation beyond."

The papers presented at this session consisted of a symposium on "Co-operation in Industrial Research," by Lawrence Addicks, F. A. Lidbury, W. D. Bancroft, W. H. Walker, D. A. Lyon, L. H. Baekeland and W. R. Whitney; and the following: "Magnesium," by W. M. Grosvenor; "Liquid Chlorine," by G. Ornstein; "Hydrogen for Military Purposes," by E. D. Ardery; "Detectors in Wireless Telegraphy," by W. D. Bancroft. Professor Bancroft explained the action of electrolytic detectors, crystal detectors and coherers as due to a film of adsorbed gas whose thickness and resistance are decreased by electrical stress. In discussing this paper, Irving Langmuir said that Dr. Bancroft's theory of the adsorbed film accounted very satisfactorily for the action of coherers, but in the case of crystal detectors it seemed hardly possible that the adsorbed film of gas could account for the rectifying action which these detectors show, even with currents of extremely high frequency. He thought that the action of the crystal detector might be explained more simply in another way. The physical chemist usually assumes, in the case of a substance dissolved in liquid, that it would dissolve with infinite speed if the dissolved substance could be removed from the solution at the surface of contact as fast as it dissolves. He thought this was a fallacy. A similar case occurs with metals such as mercury in a high vacuum. Mercury evaporates in a high vacuum at a perfectly definite rate, which is not increased by further improvement of the vacuum. Electrons are emitted by a highly heated metal at a definite rate, depending on the temperature. To apply potential does not accelerate this rate in the case of two substances in contact, such as galena and platinum, the rate at which the electrons can pass from one to the other with a given condition of potential probably being finite. Because of the extremely short distance between metals at such contact, a small applied difference of potential corresponds with an enormous potential-gradient. In this case he should, therefore, expect the rate at which electrons would pass from one substance to the other would depend upon the potential difference. It is thus seen that a rectifying action is to be expected when substances such as galena and platinum are brought into contact with external electromotive force.

At the afternoon session there was a symposium on "Niagara Falls Power and American Industries," led by I. R. Edmands, F. J. Tone, A. H. Hooker and W. S. Landis. Mr. Edmands discussed the power development at Niagara Falls, giving its

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history and legal status. The available power can be greatly increased without marring the scenic beauty by building a submerged weir above the apex of the Horseshoe Falls. Mr. Tone described the electric-furnace products of the district, and Mr. Hooker the chemical industries. Mr. Landis considered the nitrogen industry and described the development of the three important processes for the fixation of atmospheric nitrogen. The total output has tripled in three years, but in the United States the industry has not made a start and there seems to be no place for it.

In the discussion, M. F. Bowen referred to the treaty between the United States and Great Britain and showed that a considerable quantity of water could still be used for power at Niagara Falls under that agreement.

C. G. Atwater referred more directly to the contribution of Mr. Landis on nitrogen and pointed out that in this country in 1915 there were produced about 200,000 tons of sulphate of ammonia from the coke and gas industries, and that there was a great increase to take place in this production. The transformation of ammonia to nitric acid by the Ostwald or similar process is the only point in which any uncertainty may be said to exist. This uncertainty, however, applies with equal force to the cyanamid process and is present in Mr. Landis's plan. The Military Board considered that in case of war 180,000 tons would be needed, and this amount is already produced, as he had shown.

J. Mathews, in connection with Mr. Tone's part of the discussion, said that there were now about 110 electric furnaces in use in the United States in all sections of the country, the production from these furnaces being about 3.5 per cent of the total steel production, and compared with the production of steel from the crucible furnace is about five times as great.

F. A. Lidbury made extended remarks on the subject, and pointed out that many large plants had left the Niagara Falls district and located additional plants either in Canada or in foreign countries, owing to the inability to secure sufficient power at Niagara Falls to keep pace with the extended growth of these industries.

A. P. Davis, chief of the Reclamation Service, gave an illustrated address on "Reclamation Service Water Power." Other papers presented at this session were as follows: "The Brittleness of Annealed Copper," by W. E. Ruder; "Cobalt as an Element for Thermocouples," by O. L. Kowalke; "Electrical Resistance of Copper-Nickel Alloys," by F. M. Sebast and G. L. Gray; "Faults in the Small Electric Arc Furnace," by W. M. McKnight; "The Rennerfelt Electric Arc Furnace," by C. H. Vom Baur.

In discussing the last paper, J. W. Richards said that the electric furnace is supposed to make steel at a much higher temperature than is used in the open-hearth or the Bessemer furnace, but that is not so—the majority of the electric steel furnaces run at about the same temperature as the open hearth, and while it might be heated to 1,900 or 2,000 degrees, that temperature would probably melt down the roof of the furnace, so that the practical limitations of temperature in the electric furnace, and the practical temperatures desirable to obtain, are very little higher, if any higher, than in the ordinary open-hearth and Bessemer practice.

A. R. Calder referred to the increased cost of crucibles, in which ferro-manganese steel is melted, to ten times what they were before the war, with a deterioration in quality of 50 per cent. The fact that the electric furnace is not an oxidizing furnace is one of the most valuable features of it.

In the evening there was an illustrated lecture by J. H. Pierce on "Water Power Development for Electrochemical Purposes."

At the session on Friday morning, the following papers were presented: "The Passive State of Metals," by C. W. Bennett and W. S. Burnham; "Overvoltage," by C. W. Bennett; "Overvoltage and Monatomic Hydrogen," by W. D. Bancroft; "Depolarization by Electrical Waves," by W. D. Bancroft; "Electrode Surface Phenomena," by W. C. Arsem; "Contact Resistance of Metal Electrodes," by N. K. Chaney; "Contact Potentials and Electrochemical Action," by I. Langmuir.

Mr. Chaney's paper gave an explanation of the high contact resistance between a zinc electrode and the electrolyte, based upon the supposed existence of a hydrogen film upon the electrode surface. In discussing this paper, President Addicks called attention to a previous discussion of his in which he said that for some time he had been inclined to think the explanation of transfer resistance is connected with the pressure of gas in the electrodes. The cathode effect is greater than the anode and the temperature coefficient is enormous, and the contact becomes small at high temperatures.

W. R. Mott was of the opinion that the ideas advanced in the paper were simply a continuation of the overvoltage idea, or rather of the voltage inefficiency of the salt, which consists of two losses, one of which is resistance at the electrode and the other of which is the electrochemical product that comes out in unstable form.

W. McC. Gordon pointed out that practically all electrodes show the capacity effects referred to if there is a dielectric between the electrode and the solution.

C. W. Bennett thought that the measurements made by Mr. Chaney are not measurements of any part of true overvoltage. It is true, however, that the ordinary measurements of overvoltage probably include contact resistances to some extent, and contact resistances will come in, in so far as the actual measurement is concerned.

Dr. Langmuir's paper considered the history of the theory of contact potentials, as originated by Volta, and adduced recent evidence confirming the correctness of this idea, which had been abandoned by most electrochemists. This evidence consists in measurements of the electron emission from heated metals, photoelectric phenomena, metal spectra, etc.

At the evening session the following papers were discussed: "Polarization in LeClanche Cells," by D. A. Mac Innes; "Electrolytic Formation of Perchlorate," by C. W. Bennett and E. L. Mack; "Unstable States in Arc and Glow," by W. G. Cady; "Electric Arcs in Vapors and Gases at Low Pressures," by W. A. Darrah; "The Moore Tube for Color-matching," by D. McF. Moore; "Corrosion and the Engineer," by W. H. Walker; "Effect of Rust Upon the Corrosion of Iron and Steel," by J. Aston; "Influence of Frequency of Current on Electrolytic Corrosion," by B. McCollum and G. H. Ahlborn.

At the final session on Saturday morning, held at the Bureau of Standards, the following papers were presented: "Electrolytic Zinc," by W. R. Ingalls; "Recent Progress in Electrolytic Iron," by O. W. Storey; "Some Unsolved Problems of the Electroplater," by G. B. Hogaboom; "Nickel Plating," by F. C. Mathers, E. H. Stuart and E. G. Sturdevant; "Rapid Nickel Plating," by O. P. Watts; "Tests of Tin Plating Baths," by F. C. Mathers and B. W. Cockrum; "Peptone as an Addition Agent in Stannous-Ammonium-Oxalate Baths," by F. C. Mathers and B. W. Cockrum; "Addition Agents in Electrodepositing Silver from Silver-Nitrate Solutions," by F. C. Mathers and J. R. Knebler.

The papers on nickel plating gave practical hints for securing good results and Mr. Watts advocates the use of hot baths, permitting increased current-density. Lawrence Addicks raised the question whether the current consumption would not be considerable in such a process, the current costing several cents a kilowatt-hour. G. B. Hogaboom replied that the cost of current was small considering the amount of work that could be done. There was a disadvantage in the process, however, in that the white silver deposits such as are seen on silver cannot be obtained; the white part of the nickel has a tendency to turn yellow, which works against the use of the process for silver.

J. C. Woodruff pointed out that the cost of current was a small item, the cost of preparation of the surface and the handling of the parts making up the greatest amount of the cost.

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Meetings of the Associated Manufacturers of Electrical Supplies.

A meeting of the board of governors of the Associated Manufacturers of Electrical Supplies was held at the Hotel Biltmore, New York, on April 19, when standing committees for the ensuing year were appointed, as follows:

Membership Committee.—W. C. Robinson, chairman, National Metal Molding Company, Pittsburgh, Pa.; Oscar Hoppe, American Circular Loom Company, New York; H. T. Paiste, H. T. Paiste Company, Philadelphia, Pa.; B. E. Salisbury, Pass & Seymour, Inc., Solvay, N. Y.; W. S. Sisson, D & W Fuse Company, Providence, R. I.; J. H. Trumbull, Trumbull Electric Manufacturing Company, Plainville, Conn.; Walter D. Steele, Benjamin Electric Manufacturing Company, Chicago, Ill.

Finance Committee.—J. F. Kerlin, chairman, National Carbon Company, Cleveland, O.; W. C. Bryant, Bryant Electric Company, Bridgeport, Conn.; Charles L. Eidlitz, Metropolitan Electric Manufacturing Company, Long Island City, N. Y.; R. E. Gallaher, New York Insulated Wire Company, New York; J. M. Shreve, Habirshaw Electric Cable Company, New York.

Legal Committee.—D. C. Durland, chairman, Sprague Electric Works, General Electric Company, New York; LeBaron C. Colt, National India Rubber Company, Bristol, R. I.; D. H. Murphy, American Conduit Manufacturing Company, Pittsburgh, Pa.

Publicity Committee.—A. W. Berresford, chairman, Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; John C. Bridgman, Hazard Manufacturing Company, Wilkes-Barre, Pa.; L. J. Campbell, Western Conduit Company, Youngstown, O.; S. B. Condit, Jr., Condit Electrical Manufacturing Company, Boston, Mass.; Harvey Hubbell, Harvey Hubbell, Inc., Bridgeport, Conn.

A special meeting of the lamp receptacle and socket section was held on April 19 at the Hotel Biltmore, New York. There was a full attendance, and many matters of importance were considered.

On April 19 at the Hotel Biltmore, New York, the chairmen of the various sections of the Associated Manufacturers of Electrical Supplies had a very interesting meeting, at which W. H. Merrill, president of the Underwriters' Laboratories, and Dana Pierce, vice-president of the Underwriters' Laboratories, were present. Mr. Merrill extended an invitation to the chairmen to visit the laboratories, with a view to becoming familiar with their method of inspection, standardization, etc., and in acceptance of this courtesy the following committee was appointed for this purpose: Shiras Morris, chairman of the snap switch section; B. E. Salisbury, chairman of the lamp receptacle and socket section, and H. R. Sargent, chairman of the fuse section.

A special meeting of the fuse section was held on April 20 at the Hotel Biltmore, New York, at which all members of the section were present. W. H. Merrill, president, and Dana Pierce, vice-president of the Underwriters' Laboratories, were present at this meeting, and at the invitation of the chairman of the section, H. R. Sargent, Mr. Merrill addressed the members informally on matters of standardization, etc., discussing the various methods employed by the laboratories along these lines.

On April 26 the molded or formed insulation section held a meeting at the Hotel Biltmore, New York. E. B. Hatch, the chairman, presided and the various sub-committees of the section made important reports.

The wire and cable section held a very interesting and important meeting on April 18, at the Hotel Manhattan, New York. The meeting was preceded by a dinner, at which all members of the section were present, in addition to a number of guests. At this meeting many suggestions for new activities of the section were considered and plans formulated for action. Several subcommittees, covering the various lines of industry embodied in this section, were appointed and it is expected that they will have interesting reports to make at a later meeting.

A complete report of the annual meeting of the Associated Manufacturers of Electrical Supplies, held on March 16, at the Hotel Biltmore, New York, has been prepared by the general secretary, Charles E. Dustin, and is ready for distribution to all members of the association. This report gives a full and interesting account of all action taken at the annual meeting, together with all details of the social session and banquet held in the evening of the same day at Delmonico's, New York.

General Conference on the National Electrical Safety Code.

A conference will be held at the Hotel La Salle, Chicago, Ill., on Monday and Tuesday, May 29 and 30, 1916, upon the National Electrical Safety Code which has been prepared by the Bureau of Standards. Sessions will begin Monday at 10:00 a. m.

To this conference are being invited the official representatives of the National Electric Light Association, the American Institute of Electrical Engineers, the American Electric Railway Association, the American Railway Association, the Association of Edison Illuminating Companies and of several electrical manufacturing associations, the International Association of Municipal Electricians, the Western Association of Electrical Inspectors, the National Fire Protection Association, the National Safety Council, the Workmen's Compensation Service Bureau, the Independent Telephone Association, and of the large telegraph and telephone companies. There will also be present representatives of some of the state commissions, of some of the largest cities, and some engineers with whom the bureau has conferred in the preparation of the code. The attendance is intended to be representative of all interests concerned, although it is not a public meeting and the attendance is not expected to be much more than a hundred.

The purpose of the meeting is to consider the code as it is now revised for publication, and this will be the last conference before publication.

In the preparation of the code the Bureau of Standards has conferred with all the interests affected, and has held about thirty conferences in different parts of the country, besides numerous informal conferences with small groups. A large amount of work has been done upon the code since the New York meeting of last October, and whereas a very large part of the code has been unchanged since that meeting, there have been a good many changes and developments in some parts, more especially in the section upon overhead lines. These changes have been submitted for criticism and discussion to a considerable number of conferees, and it is believed that they will receive the general approval of the conference at Chicago.

It is expected that the code will be adopted for a year's trial by commissions and municipal authorities after it has been published, with the recommendation that it be observed as far as possible during the first year, but that its complete observance will not in all cases be expected until after the experience of a year has shown what, if any, changes would be necessary. This trial year is recommended in order to afford an opportunity for a thorough study of the code in actual use, and of the most practical means of applying its requirements in different cases, not only by the companies and utilities which must observe it, but also by the administrative authorities of states and cities who must administer its provisions, and by manufacturers and others who must supply the apparatus and materials necessary in complying with the code.

A limited number of copies of the revised code have been prepared for the use of those who attend the Chicago conference, but no copies will be available for general distribution until after the Chicago conference, when the code will be published as soon as possible.

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Service-Installation Contest To Be Feature at Chicago Convention.

One feature of the coming convention of the N. E. L. A. at Chicago May 22 to 26, will be unique in the history of convention spectacles. The entertainment sub-committee of the general convention committee has arranged with the Commonwealth Edison Company for a service-installation contest to take place in Grant Park on the Lake Front, probably on Tuesday of convention week about noon.

Three poles will be erected in advance in Grant Park at the east end of the Van Buren Street viaduct about two blocks from convention headquarters. Each pole will be equipped with one crossarm supporting the wires of a "live" primary alternating-current circuit.

There will be three gangs of wiremen in the contest, one each from the Northern District, Southern District and Western District of the Commonwealth Edison Company. Each force of contestants will set a transformer on a pole at a distance of about 30 feet from the ground, make the connections between the primary circuit and the transformer, fasten a buck-arm to the crossarm, and from this buck-arm make a service drop and connect it to an outlet on a section of a brick wall provided nearby for the occasion. Connected to this outlet and conspicuously placed on top of the wall will be an incandescent lamp.

There will be three sections of the brick wall, all similarly equipped, one for each pole, and the first lighting of a lamp on a section of wall will show which gang of men did the work in the shortest time. The successful squad will receive a prize, and in addition to this, a premium of ten cents for each second under 15 minutes of the elapsed time necessary for the completion of the task.

This will be, perhaps, the most spectacular feature of the convention, and is sure to attract a great deal of attention both from electrical men and the non-electrical public. Homer E. Niesz is chairman of the entertainment sub-committee in charge of this contest.

Water-Power Association Answers Criticisms on Shields Bill.

An open letter addressed to the President of the United States was issued by the Water Power Development Association on May 1, urging him to use his influence with Congress in favor of the passage of the Shields waterpower bill.

The letter also replies to criticisms of the Shields bill made by Gifford Pinchot in a letter addressed to the President on January 29 and declares Mr. Pinchot's assertions to be "incorrect and misleading." The letter of the Water Power Development Association is signed by H. W. Hand, Calvert Townley, W. W. Nichols, Chester W. Larner and J. E. Way, who constitute the executive committee of the organization.

After reviewing the history of water-power legislation and especially of the Shields bill, which passed the Senate by more than a two-thirds vote after nearly a month of consideration by that body, the letter says: "To charge that the Shields bill is the bill of any 'interest' insults not only the Senate and Senators, but also public intelligence. The Shields bill reflects the view of no one of the parties to this long and complex controversy. It is not even the bill of its introducer, nor of the committee which reported it. It was practically drafted by the Senate itself, in the light of long consideration and thorough knowledge. It is to be considered on its merits."

Mr. Pinchot's criticisms, it is asserted, "are contradicted by the provisions of the bill."

Answering in detail some of Mr. Pinchot's specific criticisms, the letter continues as follows: "Mr. Pinchot asserts that the Shields bill 'give the use of enormously valuable public property to the water power interests without compensation.'

"If by this Mr. Pinchot means that no government tax for revenue purposes is imposed on the enterprise, he is correct. Such a tax would merely be a tax on the consumer of power, since it would be one of the elements necessarily involved in making the rates. Because this has been fully realized, the idea of raising government revenue from water-power development has been abandoned by most of its early advocates. But it is wholly untrue that the Shields bill gives the use of enormously valuable public property 'without compensation.'

"Section 2 of the bill, the section authorizing the permit, empowers the Secretary of War to require that the 'grantee shall, to the extent necessary to preserve and improve navigation facilities at least equivalent to those existing prior to the construction of such dam, construct, in whole or in part, without expense to the United States, in connection with any such dam a lock or locks, booms, sluices, or other structures for navigation purposes, in accordance with plans, specifications, and conditions approved by the Secretary of War, and made a part of such permit.' A similar provision relating to a hydroelectric development already completed cost the holders of the permit approximately $2,000,000 for a canal and lock constructed and transferred to the government. It might in some cases cost a great deal more.

"Mr. Pinchot also asserts that the Shields bill 'has been so drawn as to make it practically impossible for the people to take their own water powers back into their hands.'

"Section 6 of the bill contains a clear, practical and effective plan for 'recapture' after 50 years, the term of the permit. Under this section the United States may terminate the rights of the grantee after 50 years upon the taking over by the United States of all the property of the grantee which constitutes part of the plant and is dependent, in whole or in part, upon it for its usefulness and so acquired, or is necessary, appurtenant, valuable or serviceable in the distribution of water or in the generation, transmission and distribution of power, and upon paying to the grantee the fair value of the property taken and assuming contracts previously made under government sanction. By a further provision of this section, the United States is permitted not only to terminate the permit and take over the property for its own use, but also for the use of a subsequent permittee."

Strike at Westinghouse Plant.

On Friday afternoon, April 21, a strike occurred at the East Pittsburgh Works of the Westinghouse Electric & Manufacturing Company. No reason was given, as no grievances had been handed in to the standing committee representing both the company and employes.

However, it has developed that the principal demand is for an eight-hour working day, and it is understood that a communication was later sent to the management of the company demanding a reduction of the working hours from 52 hours to 48 hours a week, with no reduction in wages—this in addition to a 10-per-cent advance in wages recently granted all shop employes.

The Westinghouse Electric & Manufacturing Company is known to be committed as opposed to a reduction of working hours at the present time.

Company Installs 160 Ranges in Seven Weeks.

Charles B. Yonts, contract agent for the Illinois Northern Utilities Company, Dixon, Ill., reports his company has installed 160 Hughes electric ranges during the period from March 3 to April 20, this year. These ranges were installed in a part of the company's territory where there are about 19,000 inhabitants and 4,133 meters.

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Miscellaneous NEWS NOTES

Illumination of Balboa Coaling Plant.—Plans are being made for illumination of the berm cranes at the Balboa coaling plant at the Pacific end of the Panama Canal to the end that they may be worked at night as freely as by day.

Waterpower Sites in British Columbia to be Developed.—According to a statement of Hon. Lorne Campbell, Minister of Finance, the Provincial Government is considering a project for the development of the waterpower possibilities of British Columbia, on a large scale.

Efficiency Director Speaks on Business Methods.—At a meeting of the Jovian Electric League of Los Angeles, Cal., April 26, Jesse D. Burks, municipal efficiency director for Los Angeles, spoke on "Business Methods in Public Business." C. B. Hall was chairman of the day and furnished very interesting entertainment.

American Institute Active in Preparedness Propaganda.—John J. Carty, president of the American Institute of Electrical Engineers has sent a letter to the membership calling for the co-operation of every member to the end that a careful industrial inventory of this country's manufacturing and producing recourses for purpose of national defense may be made.

California Telephone Company Incorporates.—Articles of incorporation have been filed for the Southern California Telephone Company, with a capital stock of $10,000,000 as the first step in the proposed consolidation of the two telephone systems in Los Angeles. The incorporating directors of the new company are members of the legal staffs of the Home and Sunset companies.

The Submarine in the War.—At the meeting of the New York Electrical Society on April 20, a crowded audience listened to Simon Lake, the American creator of the modern level-keel type of submarine boat, lecture on "The Submarine in the War." The subject was graphically illustrated by lantern slides covering the whole range of submarine activity in war. Thirty-four members were elected at this meeting.

Illinois Rules for Overhead Construction.—The State Public Utilities Commission of Illinois will hold a hearing at Springfield on May 16, 9:00 a. m., for the purpose of ascertaining the views of all interested parties (particularly electric, telephone and telegraph utilities and carriers) relative to the tentative rules governing overhead electrical construction, which have been printed in pamphlet form.

American Association of Engineers to Hold Convention.—The first annual convention of the American Association of Engineers will be held in Chicago May 9 and 10. Two afternoon informal sessions will be held in the rooms of the Western Society of Engineers, 1735 Monadnock Block. To these and also to the annual dinner at the City Club all engineers interested in promoting the economic and social welfare of engineers are invited. Addresses will be made at the dinner by H. J. Reilly, of the *Chicago Tribune* on "Preparedness for the Engineer," and by Henry A. Allen, consulting engineer for the city of Chicago.

Utility Company Organizes in Colorado.—The Commonwealth Utility Service Company has been organized in Colorado Springs, with a capital of $3,000,000 by a group of Colorado Springs, Denver and New York men. Ligget-Hichborn & Company, of Boston and New York, is the financial agent of the new company, the officers of which are: E. C. Van Diest, Colorado Springs, president; R. L. Holland, Colorado Springs, vice-president; T. L. Wilkinson, Denver, secretary, and A. H. Hunt, Colorado Springs, treasurer. The board of directors is composed of the officers and John E. Ligget, New York; B. C. Ulman, Boston, and John F. Vail, Denver. The new company will operate a number of public utilities in the states of Kansas, Missouri, Nebraska, Iowa and Colorado. The general offices will be located in Colorado Springs.

Chattanooga Favors Electric Signs.—In response to the advocacy in Chattanooga, Tenn., of freer use of electric signs and revised ordinances to make them possible, it is given out that several of the business houses on Market Street are making preparations for installing signs, while the City Commissioners are considering designs for an elaborate sign on the municipal building.

Utah Engineers Hold Annual Banquet.—The Utah Society of Engineers held its annual banquet and election of officers in Salt Lake City, April 19. W. C. Ebaugh presided as toastmaster. H. M. Wells, City Commissioner, responded to the toast, "Municipal Problems," in which he outlined the importance of the engineer in connection with the civic and industrial problems of municipality as well as in other walks of life. Guy Sterling was elected president; C. J. Ullrich, vice-president; W. A. Wilson, second vice-president; Hugh C. Lewis, secretary, and R. B. Ketchum, member of the executive committee. Eighty members were in attendance.

Michigan Section of the N. E. L. A. Plans Convention-Cruise.—The Michigan Section of the National Electric Light Association has completed the itinerary for its 1916 convention-cruise. The steamer *Rochester* has been chartered and a trip through the islands of Georgian Bay and the north channel of the Great Lakes has been planned. The boat will leave Detroit at 1:00 p. m., Tuesday, June 20, and stops will be made at Penatang, Parry Sound, Killarney and Sault Ste. Marie. After a cruise along the north shore of Lake Superior, the return trip will be made, arriving in Detroit, Saturday, June 24. The entire cost of the boat trip will be $33 per passenger. Herbert Silvester, Rochester, Mich., is secretary of the Section.

Kansas City Section of A. I. E. E. Formed.—Eighteen members of the American Institute of Electrical Engineers eligible to membership in a Kansas City Section met April 25 and formed such a section. Gordon Weaver, power sales manager of the Kansas City Light & Power Company, who had made the preliminary arrangements, was elected chairman. Glenn O. Brown, laboratorian of the same company, was elected secretary-treasurer. The executive committee consists of A. A. Thompson, electrical engineer for the Kansas City Terminal Railway Company, chairman; J. F. Bratney, general superintendent of the Missouri & Kansas Telephone Company, and George C. Shaad of the Kansas State University at Lawrence. By-laws were adopted. The chief feature of the evening's program was an address by L. B. Cherry, a member of the Section, on "Electrolytic Refining of Gasoline." The next meeting will be held late in May, according to present plans.

Telephone Demonstrations to Be Held at Franklin Institute.—The American Telephone & Telegraph Company will give demonstrations of transcontinental and wireless telephony at Franklin Institute, Philadelphia, Pa., May 17. In the afternoon demonstrations will be given by telephone and talking-moving pictures, telephony from Philadelphia to San Francisco, and wireless telephony from the Arlington tower of the Navy Department, Washington, D. C., to New York City, and thence by wire to Philadelphia. In the evening there will be three 45-minute periods of demonstrations. Medals will be presented to T. W. Richards, director, Wolcott Gibbs Memorial Laboratory, Harvard University; J. J. Carty, chief engineer, American Telephone & Telegraph Company, and to the American Telephone & Telegraph Company represented by President Theodore N. Vail. Dr. Richards will speak on "The Fundamental Properties of the Elements," and Mr. Carty on "The Telephone Art." Mr. Vail will also give an address.

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Electricity in Cotton-Seed and Peanut Mills

Peanut Oil is Superseding Cotton-Seed Oil in Numerous Mills in the South Because of the Scarcity of Cotton Seed—Data Are Given on Numerous Successful Installations

Industrial Power Series—Article No. 163.

When cotton seed advanced from $18 to $40 a ton during the past year, caused partly by the short cotton crop and partly by the increased demand for oil, the cotton-seed oil business began to look up. Mill owners made a mad scramble to secure enough seed to keep their mills operating. Some of these operators were fortunate and others were not. Some of them who had their output sold were forced to buy seed at a high price and fill contracts taken when the price of seed was more nearly normal.

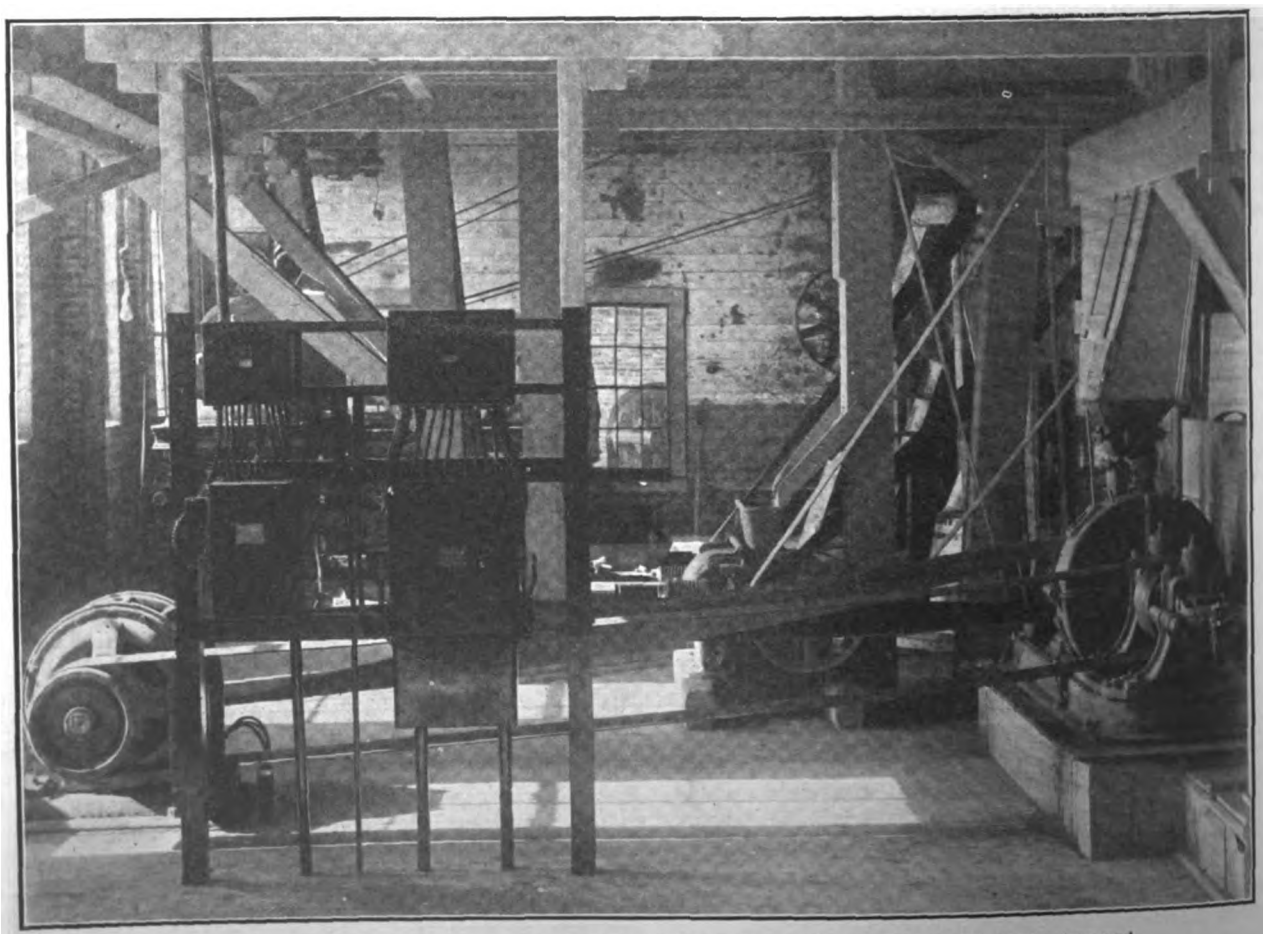
The natural result was that considerable attention was attracted to this business with one result at least which may be destined to make a great change in the operation of these mills.

Owners who could not obtain seed began to look around for something else from which to get oil and they found peanuts. Oil has been taken from peanuts in commercial quantities before, but little attention has been paid to it. Now, however, mill owners and farmers and even the bankers are investigating the possibilities of peanuts with the anticipation that this crop will eventually be one of the biggest in the South.

Cotton-seed oil mills and peanut-oil mills operate in practically the same manner and by the same method, with the exception that when peanuts are ground it is unnecessary to use the cotton linters and consequently a large part of the load is removed. Many mills in this section of the country are considering adapting their mills for both cotton seed and peanuts so that they can have a longer season of operation. This is one disadvantage of the oil-mill business: the long period of the year in which a costly investment is idle.

In the typical cotton-seed oil mill the seed are brought in in cars or wagons and is dumped into a screw conveyor which takes all the seed to the seed house or store room. Here the seed is piled up until required for use. The seed house is usually busy for two weeks or a month before the mill is started and here is the point where the entering wedge of electric drive can be started. The seed house forms the main source of supply which feeds the mill proper. Before being taken to the mill the seed is fed into a cleaning machine which takes out the dirt, trash and burrs. A small quantity of burrs and bolls are brought in with the seed. These are separated from the seed by means of a boll reel consisting of a cylindrical drum with large mesh at one end and smaller mesh at the other. The bolls go into the end where the small mesh is and in this end of the reel the seed falls through and is removed by conveyors. The bolls go to the other end of the drum where they are taken out and carried through an ordinary huller which removes the cotton. From the plant described below one 500-pound bale of cotton is obtained every week from this source.

After the seed has passed through the boll reel, it is then carried over two horizontal screens which are kept continually in motion. These screens are slightly inclined and resemble the concentrator in an ore-concentrat-



Cake Mill Driven by a 75-Horsepower Motor. Motor-Driven Cake Breaker Shown in Background.

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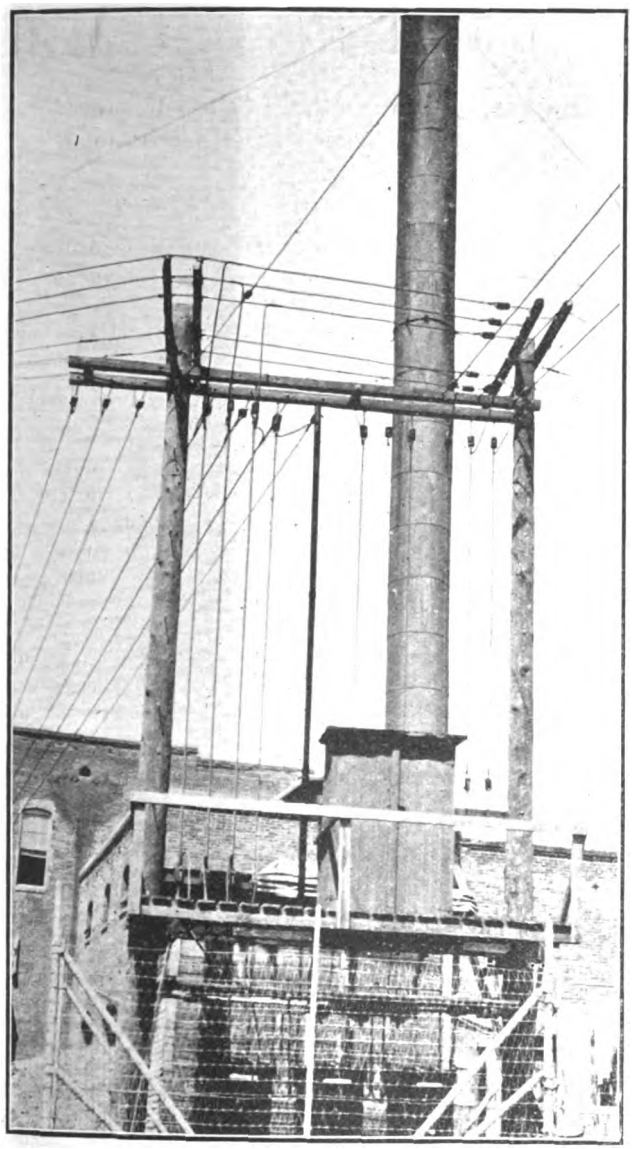


Distribution Rack Outside of Typical Oil Mill.

ing plant. As the seed rolls down the incline the dirt is jarred out and when it comes to the end of the screen it is then lifted bodily by a blast of air which carries it into a conveyor. The heavy dirt and dust are removed in this manner and the seed is ready for the mill proper.

The first stage of the mill process is the linters where the fine cotton is removed from the seed. These machines resemble an ordinary gin stand. The lint is taken off the saws in rolls and at intervals the rolls are taken off the linters and pressed into bales. There is a ready market for this product. A great quantity of it is used in making gun-cotton.

After the cotton has been removed the seed is ready for the hullers and separators. The first huller cuts up the seed which then goes into a second huller and separator. The seed not cut in the first huller is cut in the second and the separator removes the hulls from the juicy kernels. The hulls are conveyed into the hull storage house and the kernels are carried to the rolls. Here they are ground and made ready for the cookers.

The cookers are cylindrical in shape, being about 64 inches in diameter and 18 inches deep. Each cooker holds about 600 pounds of kernels and is kept continually revolving during the cooking process. Live steam from a small boiler is used for heating this mass which requires about 25 to 35 minutes to be put in condition for the presses.

When the cooking process has been completed the kernels are carried to the presses, each of which holds about 280 pounds. Here they are subjected to a hydraulic pressure of 4,000 pounds per square inch. This tremendous pressure forces out all the oil, which flows down over the presses into the vats below, and thence into the storage tank. The residue left is in the form of cakes about 13 inches by 32 inches and seven-eighths inch thick. These are stacked in tiers and often shipped in this form. Some of them are usually broken up and then ground into meal in which form they are used for feed purposes.

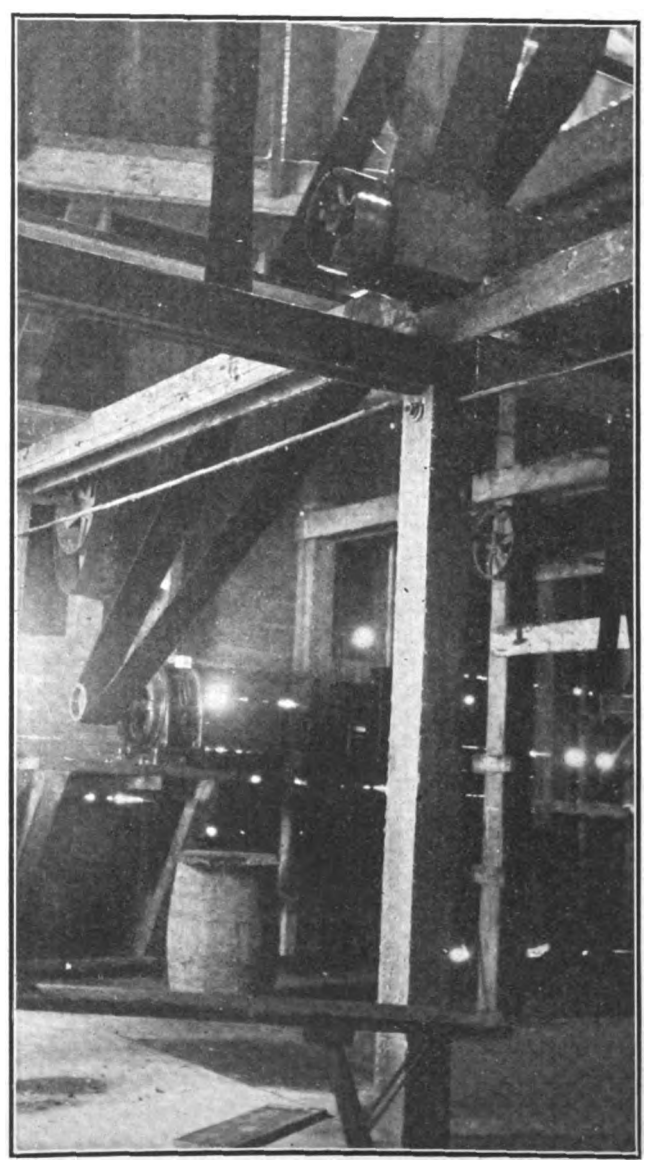
Analyzing this process from a mechanical standpoint, it will be seen that there are really three distinct parts of the main process which are independent of each other. These three parts are (1) seed house, (2) mill proper, and (3) cake breaker and grinder or attrition mill.

The mill described herewith is typical and will serve to illustrate the points to be considered in adapting mills for electric drive.

Equipment of a Typical Mill.

Inasmuch as the seed house operation is started before the main mill, here is the point which should be attacked first. With electric drive it is not necessary to have steam up and is not necessary to have any engineers or firemen around during the first part of the season. Squirrel-cage induction motors solve the drive problem since they are sparkless (no danger from fire), are fool proof and easily adapted to the constant-speed machinery in the seed house.

The electrical equipment of the seed house will depend



50-Horsepower Motor Belted to Unloading and Cleaning Machine.

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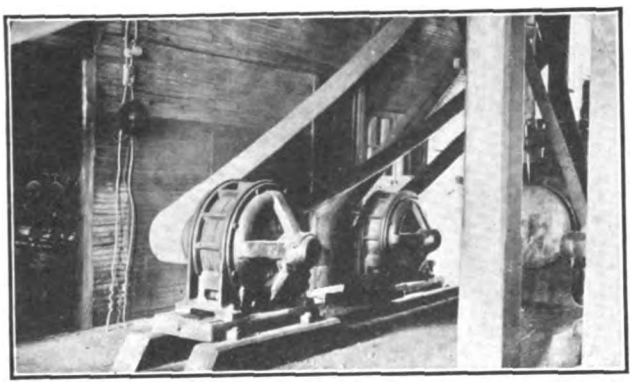
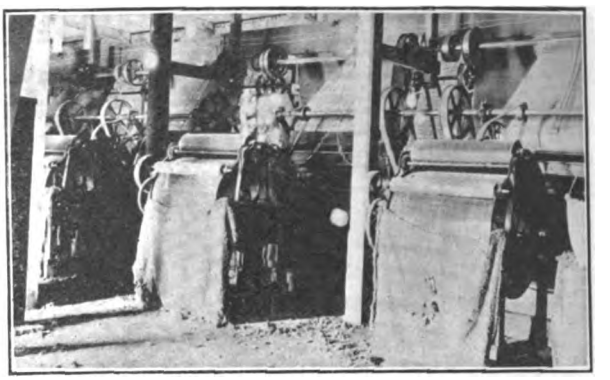


75-Horsepower and 50-Horsepower Motors for Driving Linters and Pump, Respectively.



Battery of Linters in Cotton-Seed Oil Mill Driven by 75-Horsepower Motor.

very much on the individual case in question. In mill No. 1 for which other data are given, four motors are used in the seed house. Most mills use one or two motors. One motor is used for the conveyor on one side of the seed house into which is dumped seed shipped in by rail. Another 15-horsepower motor drives the conveyor on the other side of the house into which is dumped seed brought in by wagon. This arrangement eliminates all unnecessary line shafting and permits cars and wagons to be unloaded at the same time. A 20-horsepower motor operates overhead conveyors and main elevators. A 35-horsepower motor operates the cleaning machinery. This arrangement gives flexibility and does away with power waste in the part of the house which is not operating. To minimize the power cost, conveyors should be looked after carefully, the bearings kept oiled and the screw in alinement.

In this same mill the linters, of which there are 15, are set in two rows. A 100-horsepower motor drives seven of these and all the conveyors between the two houses. A 75-horsepower motor drives the other eight linters and the conveyors under them. Both these motors are operating at the same time in most cases and the entire equipment could be driven by one motor. An interesting test has been made in this part of the mill and while results at present are not conclusive they at least show possibilities. One set of linters was equipped with ball bearings and the test made showed that this set used about 2,000 kilowatt-hours less per week than the other set. Roller or ball bearings will undoubtedly decrease the power required and as this is a constant grind 24 hours a day the aggregate amount of power thus saved is considerable. One mill which is equipped with roller bearing throughout operates on about 60 per cent of the power required for mill No. 1. The data given herewith will show just how much friction load there is in all parts of the mill.

In order to eliminate shafting and belts, the rolls in this mill were equipped with back-geared motors, one 25-horsepower motor being used on each side. A view of these is shown herewith. These have given good service and are efficient as regards operation.

The following data give an idea of the power required by the different parts of the mill and was obtained by putting meters on the various parts and taking actual tests:

MILL PROPER.

Meter No. 1—100 horsepower pulls all seed conveyors and hull elevators and conveyors from the seed house to hull house and seven linters.

	Kilowatts
Line shaft with all belts off	8.25
Conveyors and elevators	11.25
7 linters @ 2 kilowatts	14
Total friction load	33.50
Total load with mill crushing seed	50

Meter No. 2—75 horsepower pulls eight linters and one conveyor under linters.

	Kilowatts
Line shaft with all belts off	5.5
Conveyors	.9
8 linters @ 3.14 kilowatts	25.1
Total friction load	31.5
Total load with mill crushing seed	53.6

Meter No. 3—50 horsepower pulls three heaters and hydraulic pump.

	Kilowatts
Line shaft with all belts off	3.8
Hydraulic pump, not under pressure	.6
3 heaters @ 1.5 kilowatts	4.5
Total friction load	8.9
Total load crushing seed	17.4

Meter No. 4—50 horsepower pulls all hulling and separating machinery.

	Kilowatts
Line shaft with all belts off	7.2
First cut huller	4.8
Second cut huller	3
Countershaft, 1st and 2nd shaker	.6
3 beaters, conveyors and elevators	4.6
Total friction load	20.2
Total load crushing seed	23.7

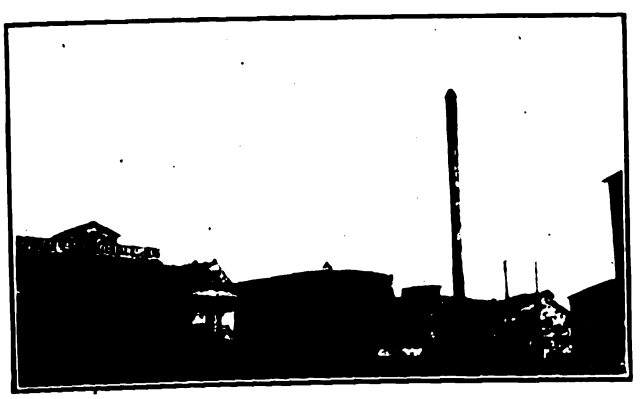
Meter No. 5—2 25 horsepower direct-connected to rolls.

	Kilowatts
Rolls running empty	13.5
Rolls crushing seed	30.5

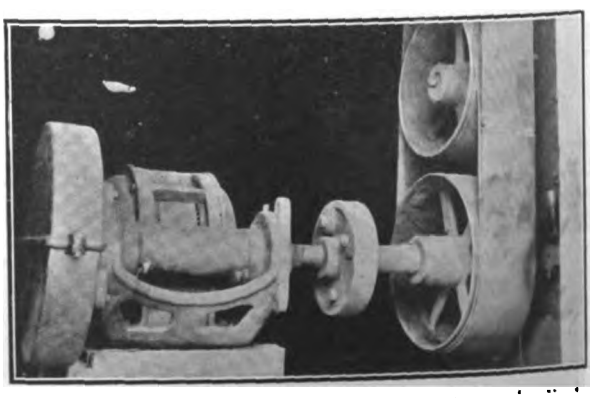
SEED HOUSE.

Meter No. 6—1 15 horsepower on wagon conveyor in seed house.
1 15 horsepower on railway conveyor in seed house.
1 20 horsepower on overhead conveyor and main elevators in seed house.

(Running light.)	Kilowatts
Wagon conveyor	1.8
Ball conveyor	2.25
Elevators and conveyors	4.9
Total friction load	8.95



Exterior of a Typical Oil Mill.



Backed-Geared Motor for Rolls.

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Oil Mill Data Sheet.

One-hundred-ton cotton-seed oil mill operating with an output of approximately 80 tons per 24-hour day. Plant operation varies from five to ten months per year, 144 hours per week. Total horsepower installed, 410. Total number of motors, 11. Average kilowatt-hours per operating month, 98,578.

Kilowatt-hour consumption for one year:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	42,816	May	100,000*	September	.....
February	104,669	June	.....	October	131,597
March	87,348	July	.....	November	126,106
April	110,000*	August	.....	December	86,093

Load-factor, 38 per cent.

Approximate energy consumption per ton of seed crushed, 65 kilowatt-hours.

*Estimated.

Motor Installation.

Following is a list of motors installed with their respective drives. Three-phase, 60-cycle, 2300-volt energy is used on all motors over 25 horsepower and 220 volts on smaller motors.

No.	Horse-power.	Speed, R. P. M.	Application.
1	100	720	Pulls all seed conveyors and hull elevators and conveyors from the seed house to hull house and seven linters.
1	75	900	Pulls eight linters and conveyor under linters.
1	50	900	Pulls three heaters and hydraulic pump.
1	50	1,200	Pulls all hulling and separating machinery.
2	25	1,200	Back-geared to rolls.
1	15	1,200	Belted to wagon conveyor in seed house.
1	15	1,200	Belted to railroad conveyor in seed house.
1	20	1,200	Belted to overhead conveyor and main elevators in seed house.
1	35	720	All cleaning machinery in seed house.

Eighty-ton cotton-seed oil mill operating with an output of approximately 60 tons per 24-hour day. Plant operation varies from five to ten months per year, 144 hours per week. Total horsepower installed, 290. Total number of motors, 10. Average kilowatt-hour consumption per operating month, 70,807.

Kilowatt-hour consumption for one year:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	77,660	May	4,938	September	8,380
February	86,570	June	9,900	October	90,930
March	86,500	July	340	November	67,760
April	16,482	August	.....	December	69,390

No.	Horse-power.	Speed, R. P. M.	Application.
2	25	1,200	Belted to attrition mills.
1	25	1,200	Belted to line shaft driving cake breaker, belt elevator and screw conveyor.
1	50	900	Belted to line shaft driving four linters, one 40-foot and two 25-foot chain elevators, and one 9-inch screw conveyor 200 feet long.
1	50	900	Belted to line shaft driving two hullers, four linters, two shakers, two hull beaters and three hull conveyors.
1	25	900	Belted to line shaft driving four linters.
1	50	900	Belted to line shaft driving four cookers, one set of 60-inch five-roll rolls, one shaker, belt elevator and three meat conveyors.
1	25	1,200	Belted to line shaft driving seed cleaner and cleaner reel.
1	25	1,200	Driving elevators and conveyors.
1	15	1,200	Driving one mixing and two feeding machines.

Eighty-ton cotton-seed oil mill operating with an output of approximately 60 tons per 24-hour day. Plant operation varies from four to eight months in the year, 144 hours per week. Total horsepower installed, 290. Total number of motors, four. Average kilowatt-hours per operating month, 81,671.

Kilowatt-hour consumption for one year:

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
January	70,660	May	.....	September	67,860
February	68,360	June	.....	October	101,200
March	.....	July	.....	November	111,640
April	.....	August	.....	December	70,410

Load factor, 19.5 per cent.

Approximate energy consumption per ton of seed crushed, 80 kilowatt-hours.

Motor Installation.

Following is list of motors installed with their respective drives. Three-phase, 60-cycle, 2,300-volt energy is used on all motors except 15 horsepower, where 220 volts is used.

No.	Horse-power.	Application.
1	150	Belted to line shaft driving main mill, linters, crushers and separators.
1	75	Belted to cake or attrition mill.
1	50	Belted to shaft driving all seed-house machinery.
1	15	Belted to cake breaker.

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	Kilowatts
Wagon conveyor loaded	5.2
Rail conveyor loaded	6.7
Elevators and conveyors	10.4
Total load conveying seed	22.3
Total friction load	8.95
Total load conveying seed	22.3

Meter No. 7—35 horsepower pulls all machinery in seed house.

	Kilowatts
Cleaning apparatus running light	15.6
Cleaning apparatus running with load	15.8
It requires in addition to above to operate bolly machine	3.6
Which gives total friction load when operating bolly machine	25

	Friction Load		When Crushing Seed		Corrected
	Kilowatts	Horsepower	Kilowatts	Horsepower	Horsepower
Meter No. 1	35.5	44	50	67	100
Meter No. 2	31.5	42.1	53.6	72	75
Meter No. 3	8.9	11.9	17.4	23	50
Meter No. 4	20.2	27	23.7	32	50
Meter No. 5	13.5	18	30.5	41	50
Total Mill Proper	107.6	143	175.2	235	325
Meter No. 6	8.95	12	22.3	30	50
Meter No. 7	19.2	25.8	20.3	27.3	35
Total Seed House	28.15	37.8	42.6	57.3	85

GRAND TOTAL.

	Friction Load		When Crushing Seed		Corrected
	Kilowatts	Horsepower	Kilowatts	Horsepower	Horsepower
Oil Mill Proper	107.6	143	175.2	235	325
Seed House	28.15	37.8	42.6	57.3	85
	135.75	180.8	217.8	292.3	410

These data conclusively show that over 50 per cent of the total load is chargeable to friction. This conclusion is further borne out by the fact that mills consume from 40 to 90 kilowatt-hours per ton of seed depending on the kind of equipment which they have.

With the moderately large size plants which are installed in oil mills the question of adopting electric drive strictly comes down to a matter of dollars and cents. Once the seed house is obtained for electric drive it is usually a matter of time only until the entire mill is converted.

It is necessary for the mill to have a certain amount of steam for operating the cookers and this is to a certain extent a handicap in introducing electric power. However, if a small boiler with steel casing is installed, this can be looked after by the clean-up man and requires no extra labor. The average rate necessary to get this business runs about one per cent per kilowatt-hour. Considering the character of the load this business is profitable to the large central station and to the mill operator.

One of the big advantages of having group drive with seperate meters on each motor is the fact that the operator can keep close check on his costs in various parts of the mill. Any defect is immediately shown up by the meter reading. By making small improvements in his mechanical equipment he can see the result immediately and is thus encouraged to further improve his mill.

Peanut Mills.

In the peanut mill the same general process is employed as is used in the oil mill. The peanuts are crushed hull and all and the hull forms a part of the meal and the cake. About 70 bushels of peanuts make a ton and almost one gallon of peanut oil is obtained per bushel of peanuts crushed. One ton of peanuts will yield about one-quarter ton of cake and meal.

The accompanying analysis gives the comparative food values of peanut cake, peanut cake and hulls and cotton-seed meal:

	Protein	Fat	Crude Fiber	Nitrogen Extract
Pure peanut cake	47.60	8.00	5.10	23.70
Peanut cake and hulls	30.46	10.87	24.49	21.84
Cotton-seed meal	44.84	8.66	9.08	25.29

From a central-station standpoint the desirability of crushing peanuts lies in the point that the season will be thus extended. The load-factor of the installation will be increased without increase of connected load.

Copper Thieves Busy in Kansas City.

Thefts of cable from overhead feed wires and from conduits are blamed for the serious interruptions to electric service in Kansas City, Mo., during the past few weeks.

The most serious incident and the one fraught with gravest possibilities was the outcome of the theft of several hundred feet of lead-sheathed cable from a conduit at Fifth and Oak Streets. This cable was a 6,600-volt line serving Cement City, seven miles from the power station. It had been idle a week.

The first indication of trouble was the breaking of the plunger on the transformer, and the breaking down of the oil switch serving the line.

While the trouble was being located there was no service on the electric light or street-railway lines, a large section of the city being affected. Incidentally, a transformer at the substation at Fifteenth and Walnut Streets was set on fire by the short. When the short-circuited Cement City line was cut out, service was quickly restored. The manhole at Fifth and Oak Streets, the station end of the cut cable, was found filled with smoke. Apparently there was no damage in the conduit, but hourly tests are being made to discover quickly any leakage indicating damage to insulation of cables in adjoining sections of the conduit. The damage in the station and substation was repaired in an hour; the stolen cable was replaced in 36 hours.

About 1,500 feet of cable is known, now, to have been stolen, usually in sections of a hundred feet or so, the length between manholes, and short lengths on overhead feeders. Most of these cables have been stolen while the lines were dead, and the facts were disclosed upon testing the lines before turning on the current. In at least one instance, live wires were cut, one of these being a 500-volt wire on a bridge near the Kaw River power house. The loose end of this wire fell to the bridge, and shorted.

Brockton Edison Company to Expand Stations.

The Edison Electric Illuminating Company, of Brockton, Mass., is planning to enlarge its principal generating plant at East Bridgewater at a cost of about $475,000. Two 600-horsepower boilers, with automatic stokers, a 10,000-kilowatt turbo-generator with condensers, switchboard apparatus, etc., will be installed under supervision of the Stone & Webster Engineering Corporation.

The present substation at Brockton is a combined alternating-current and direct-current station built about eight years ago. The load has grown to such an extent that it is necessary to greatly enlarge the substation facilities in the Shoe City. The plan is to use the present substation entirely for direct-current apparatus and build a new direct-current substation contiguous to it, containing one 2,000-kilowatt transformer bank and two 750-kilowatt transformer banks, giving 3,500 kilowatts in alternating-current transformers. The station will be designed for an ultimate capacity of 9,000 kilowatts.

The direct-current substation will be increased by the installation of a 750-kilowatt direct-current motor-generator set.

Meter Guarantees Discussed at Louisville.—Some controversy in Louisville, Ky., has been indulged in by members of the City Council over the practice made by the Louisville Gas & Electric Company of requiring deposits for meters before one is supplied and service given. Deposits are sometimes required from new customers whose bills are not guaranteed. According to a statement made by Robert M. Parks, city gas and electric inspector, there is no need for action by the Council on the matter, since he has never had any difficulty in making adjustments when complaint is made to him. The company prefers a guarantee instead of a deposit for the meter, since it pays six per cent on money thus taken.

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Street Lighting by Indeterminate Contracts

Outline of Plan on the Cost-of-Service Basis by Which the Municipality Assumes Responsibility for the Operating Company's Special Investment

The Legislature of Wisconsin passed an act in 1915, designated as Chapter 490, which provides that any city or village, except cities of the first class, may grant the right to construct and operate a system of lighting or waterworks to a corporation and may contract with it for service for an indeterminate term, provided that the prices are subject to adjustment at periods not longer than five years. Taxes may be especially levied for this purpose, notwithstanding any limitation to taxes or expenditures for this purpose which may exist in the charter of the city or village.

This law provides a method of settling many difficult street-lighting problems through a contract for an indeterminate period with payments based upon cost of service. A contract of this kind was discussed by G. W. Van Derzee in a paper entitled "Street-Lighting Rates and Contracts," which was presented at the convention of the Wisconsin Electrical Association at Milwaukee on March 17. The author assumed, as the first step, a careful selection of the proper type of lighting required to give adequate service at minimum cost. The next steps comprise a detailed and careful valuation of the physical property of the utility used wholly or in part for street lighting and calculation of the proper fixed charges and operating expense. Finally the problem involves the determination of the fundamental provisions of the agreement required to minimize loss to the utility and assure lower continuing costs to the municipality.

To illustrate in brief detail the sequence of processes involved in the determination of rates and selection of the most favorable type of contract, a hypothetical case of a city of 40,000 inhabitants was selected. It was assumed that the previous contract for street lamps had just expired and a careful study of the situation had shown that it was desirable to replace the present lamps and their supports, due to their worn out or obsolete condition, with new and improved lamps hung in the same location as the old. This situation permits the use of existing facilities such as wire, poles, special street-lighting station equipment, etc., and thus insures the municipality at the outset the lowest possible rates for service in the new contract.

A separate valuation of the physical property of the utility which is used exclusively for street lighting purposes, called "Special Street-Lighting Investment," and that used jointly for street-lighting and commercial or railway service, called "Joint Street-Lighting Investment," is first made.

Valuation of Street Lighting Equipment.

Special Street Lighting Investment includes equipment used exclusively for street-lighting purposes. Included in this class are suspension poles, wire and cable, pins and insulators, lamps and lamp supports, and special station street-lighting equipment.

The inventory and valuation of the Special Street Lighting Equipment is a simple matter compared to the Joint Equipment. Uusually, records are available of such special equipment. If not available, an inventory of all poles carrying street-lighting wires should be made. This can be conveniently done by an inspector provided with blank pole-inventory cards, showing a space for the pole number, size, and location, and a miniature of a standard pole top with crossarms, on which can be easily denoted by proper symbols the wires carried on the occupied pins. After complete inventory has been made, a valuation of the poles 100 per cent chargeable to street lighting is a simple matter. Wire and cable can best be scaled from maps showing location of poles and conduit, and the remaining items of Special Street Lighting Equipment can be counted by inspection. To illustrate the method of summarizing the valuation of the Special Street Lighting Equipment, a tabulation has been prepared, and for sake of simplicity it is assumed that the circuits are all overhead.

VALUATION OF SPECIAL STREET-LIGHTING EQUIPMENT.

Item	Unit	Quantity	Cost of Reproduction	Present Value
Poles	Each	1,000	$15,000	$10,500
Wire	Feet	360,000	10,800	8,100
Crossarms	Each	750	750	375
Pins and insulators	Contact	3,000	480	432
Lamp supports	Each	600	3,000	3,000
Lamps	Each	600	6,000	6,000
Constant-current transformers	Each	12	6,000	4,200
Total			$42,030	$32,607
Total plus 15 per cent for overhead expense			$48,335	$37,498

Lamps and lamp supports are the only new items in the proposed system, which accounts for their present value being equal to the cost of reproduction. The present value of the other items is estimated from a knowledge of the average age of each item and its expected life.

The difference between the total cost of reproduction, $48,335, and the present value, $37,498, namely $10,837, is the amount that should have been provided in the previous rates for street lighting to cover depreciation.

Joint street-lighting equipment includes the proportion of poles, conduit, cable, power-plant equipment, etc., used jointly by street-lighting, commercial or railway service, and chargeable to street-lighting service.

To obtain the proportion of the investment in jointly used power-plant equipment chargeable to street lighting, the entire investment in jointly used power-plant equipment must be computed, including proportion of buildings and land. Let us assume that such joint investment divided by the kilowatt maximum demand gives a cost of $100 per kilowatt of maximum demand. On the basis of 350 watts demand at the station, per lamp, the power-plant investment chargeable to street lighting becomes 600x0.350x$100 equals $21,000.

VALUATION OF JOINT STREET-LIGHTING EQUIPMENT.

Item	Unit	Quantity	Cost of Reproduction	Per Cent Chargeable to Street Lighting	Amount Chargeable to Street Lighting
Poles	Each	2,350	$35,250	25	$ 8,813
Crossarms	Each	2,000	2,000	25	500
Power-plant equipment	Kilowatt	210	.....	....	21,000
Total					$30,313
Total plus 15 per cent for overhead expenses					$34,860

For $34,860, the street-lighting business acquires the facilities of power production and distribution through joint use which would cost more than double the amount to any competitor of the utility required to reproduce equivalent facilities.

Having computed the special and joint street-lighting investments, we are ready to begin an analysis of the various component parts of the rate to be charged for the service and the form of contract best suited to requirements.

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The Component Parts of a Rate for Street Lighting.

In any well constructed rate for street-lighting service, every element of the fixed charges and operating expenses must be included. Fixed charges include interest on the investment of the utility in street-lighting equipment, an allowance for depreciation to cover replacement of worn-out or obsolete parts of the joint street-lighting investment, and a yearly rate of amortization of the special street-lighting investment sufficient to return to the utility during the term of the contract an amount equal to the cost new of special street-lighting investment, less the scrap value. In addition are the charges to cover taxes and insurance expressed as a function of the investment.

Operating expenses include the busbar cost of energy required for the lamps, operating supplies required to keep the lamps burning, such as lamp renewals, carbons or electrodes, maintenance of street-lighting station apparatus, lamps and distributing circuits, trimming and patroling service, and the proper share of the general and undistributed expenses of the utility.

It is evident that the various items of operating expenses just enumerated will be the same under any type of contract, as they are affected only by the kind of equipment used for street lighting. The fixed charges must depend upon the term of years the contract will run.

It has been common practice for a utility to enter into a contract for street lighting with a municipality for a definite period ranging usually from five to ten years. Such contracts usually stated a flat price per lamp per year which would prevail throughout the full term. The utility was compelled to so figure its rates under a term contract that at the end of the contract it had received in the rates charged, a sufficient amount to amortize the entire cost new of the special street-lighting equipment, less scrap value. This was obviously necessary as the utility, with limited returns on its business, under state regulation, could not gamble on being able to use the special street-lighting equipment either wholly or in part after expiration of the contract period.

Unquestionably, there is considerable useful life left in special street-lighting equipment at the end of the usual term contract, equipment which, from an economic and practical standpoint, could be used to good advantage in connection with almost any new plans for lighting which the city might propose.

It is evident that an ideal form of contract cannot be for a definite term, but must provide for the supply of street-lighting service on a cost basis and for an indeterminate period, or until such time as the municipality desires to terminate the contract. The condition of termination, where service is rendered on a cost basis, must necessarily be that the municipality guarantee the integrity of the utility's investment in special street-lighting equipment devoted exclusively to street-lighting purposes.

Cost of Service Contract.

The operating expenses are divided into two parts called "Direct Operating Expenses" and "Joint Operating Expenses." The direct operating expenses include those operating charges which are directly assignable to street lighting and are not apportioned parts of a similar expense shared by other branches of the business of the utility. Such expenses include trimming and patroling, maintenance of lamps and special station equipment, renewal of lamps, carbons or electrodes, and any other operating costs directly incurred in the operation and maintenance of the special street-lighting equipment.

Joint operating expenses are defined as those expenses in the operation of the utility which are jointly incurred for street lighting or other service. Such expenses include cost of power and distribution, and the proper portion of general and undistributed expenses of administration and supervision.

Special and joint investments have previously been determined by valuation to be the following:

INVESTMENT PER LAMP.

	Cost of Reproduction Total	Cost of Reproduction Per Lamp	Present Value Total	Present Value Per Lamp
Special investment	$48,335	$ 80.56	$37,498	$62.50
Joint investment	34,860	58.10	.....	.....
Total investment	$83,195	$138.66	.....	.....

The lamps are assumed to be 300-watt, type C, nitrogen-filled lamps, burning 4,000 hours per year.

The fixed charges on joint street-lighting investment include interest, depreciation, taxes and insurance, amounting in total to $7.55 per annum, which is 13 per cent of the joint investment of $58.10, made up as follows: interest 6 per cent; depreciation 5 per cent; taxes 1.5 per cent; insurance 0.5 per cent.

Interest at 6 per cent is assumed equal to the actual average cost of money, having in mind the guarantee to be given by the municipality as to the integrity of the utility's investment in special equipment. Under a definite term contract, nothing less than 8 per cent as a proper interest rate should be considered. Depreciation at 5 per cent is a normal figure, as are taxes and insurance.

The operating expenses listed under joint operating expenses include the following per lamp per year:

Current at busbar cost	$11.20
Maintenance of joint transmission and distribution lines	1.25
General and undistributed	2.50
Total joint operating expenses	$14.95

Annual costs so far considered are all of a joint nature and amount to $22.50 per lamp-year. The investment is such that it would in no way be affected by discontinuance of the street-lighting business. The municipality pays a reasonable rental for that part apportioned to its use and reasonable rates for the joint service performed for street lighting.

Fixed charges on special street-lighting investment are 13 per cent of the special investment of $80.56 per lamp and amount to $10.47 per lamp-year. The rates of interest, depreciation, taxes, and insurance are identical with those used in computing the fixed charges on the joint investment.

The municipality is to guarantee the integrity of the entire special investment. In the case under discussion, the special investment devoted to street lighting at the beginning of the operation of the contract amounts to $48,335, and there has been set up through the old rates, a reserve to insure replacement of such special investment, the difference between the amount of the investment and its present value $37,498, or $10,837. The municipality is given credit for the accumulated reserve and assumes an obligation only for the present value of the special equipment.

The utility agrees to account separately for the special investment, making additions thereto from time to time where added special investment is required by order of the municipality under this contract and deductions therefrom from time to time where special investment, no longer used and useful, has been retired from service. The utility also agrees to account separately for the depreciation reserve accumulated to insure replacement of special investment equipment, making additions thereto from time to time as provided by the depreciation element in the fixed charge of five per cent and an addition of interest on balances at some agreed rate such as three per cent.

Deductions would be made from depreciation reserve

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from time to time equal to the cost of special investment less scrap or recovery value, no longer used and useful, and retired from service.

The fixed charges on the special investment per lamp per year would be revised annually at the end of each year by computing 13 per cent of the special investment per lamp as found at the end of each year. The amount so found becomes the charge for this element in the rate for the ensuing year.

Whether the fixed charges on the special street-lighting investment go up or down at the end of each year, is entirely within the control of the municipality. If the new lamps are ordered in between existing lamps, it is clear that the average spacing of all lamps on the system will be less, that the average investment in special equipment per lamp will be less and consequently the fixed charges will go down. On the contrary, if long extensions are made with lamps widely spaced, there would be the opposite tendency. With systems as usually found, it is likely that more lamps will be added to existing circuits and the investment per lamp will go down.

The costs included under direct operating expenses are as follows per lamp per year:

Trimming and patroling	$ 2.50
Lamp renewals, 2.5 per year	8.00
Maintenance of lamps	.75
Lighting circuits and plant equipment	2.00
Total direct operating expenses	$13.25

The utility agrees to account separately for such direct operating expenses and this part of the cost will be revised at the end of each year.

The total cost per lamp per year for the first year may now be computed:

Fixed charges on joint street-lighting investment	$ 7.55
Joint operating expenses	14.95
Fixed charges on special street-lighting investment	10.47
Direct operating expenses	13.25
Total (contract rate)	$46.22

The municipality should have the right to audit the records of the utility.

To guarantee the integrity of the special investment, the municipality would agree that, upon termination of the contract at its election, it would pay the utility the difference between the cost of special investment in street-lighting equipment less scrap or recovery value, and the depreciation reserve accumulated to insure the replacement of such equipment.

Comparisons will now be made of the rate of $46.22 per lamp-year under the cost-of-service contract with the rates which would have to be charged on a five-year and a ten-year contract. In any form of contract, the operating expense portion may be considered to be the same as in any other form of contract, for the same service. On more careful analysis, however, we find that the operating expense portion of the cost-of-service contract rate is subject to revision annually and the revision is much more likely to be downward than upward, due to the constantly increasing economies being effected in operation. For this reason the operating expense portion of the cost-of-service contract rate over a period of years is likely to be considerably less than the operating-expense portion of the definite-term contract, which remains fixed in amount and had to be computed to take care of any contingency, as there is no recourse for the utility or contractor under a term contract, once the contract is signed on a flat-rate basis.

In a term contract, interest, taxes, and insurance are computed at a percentage of the entire investment. Depreciation is computed on the joint investment at five per cent or higher, and the depreciable part of the special street-lighting equipment is amortized over the period of the contract. The following table shows a comparison of the annual rates of charge under different forms of contract, each form of contract to give the utility about the same guarantee of integrity of its investment:

COMPARISON OF ANNUAL RATES OF CHARGE UNDER DIFFERENT FORMS OF CONTRACT.

	Five-Year Contract	Ten-Year Contract	Cost-of-Service Contract
Interest	$11.09	$11.09	$ 8.32
Depreciation	2.90	2.90	6.93
Amortization of special investment	11.24	5.62	None
Taxes and insurance	2.77	2.77	2.77
Operating expenses	28.20	28.20	28.20
Total	$56.20	$50.58	$46.22
Comparison if all equipment were new	$59.82	$52.39	$46.22

In figuring the amorization of the special equipment, the present value of such equipment has been used, namely, $62.50 per lamp, and the scrap value has been figured at 10 per cent of that amount. This leaves an amount of $56.25 to be amortized over the period of the contract. Had the equipment been new, the amount to be amortized would have been the cost of reproduction per lamp, $80.56, less the scrap value, $6.25, which equals $74.31. This materially increases the total cost per lamp-year under the five and ten-year contracts and brings out more clearly the real advantage to be gained by the municipality in cost under the cost-of-service contract.

From a close analysis of the advantages of the cost-of-service contract as compared with the term contract, the following conclusions may be drawn:

(1). The rates per lamp-year under a cost-of-service contract will average 10 per cent lower than those that can be offered under a ten-year contract, and 20 per cent lower than those under a five-year contract.

(2). The utility is guaranteed the integrity of its special street-lighting investment and, therefore, is able to offer the municipality street-lighting rates at actual cost.

(3). The rates include only normal allowances for depreciation and no amortization of special equipment made necessary in a term contract.

(4). The municipalities will profit year by year in any economies practiced by the utility, due to the annual adjustment of direct operating expenses.

(5). As the number of lamps in the municipality increases, the tendency is for the average spacing to decrease, which will lower the average special investment per lamp and decrease the element of fixed charges on the special street-lighting investment.

(6). No limiting conditions of spacing of new lamps from nearest existing lamps need to be imposed in the contract, as the municipality has the privilege of specifying lamps at any location it desires and pays the entire cost therefor to the utility.

(7). Lamps may be moved or removed, service may be changed from overhead to underground, new types of lamps may be substituted for the old at any time the municipality desires, but the full cost of making any such changes is borne entirely by the municipality, the utility doing the work at cost.

(8). The municipality receives all of the advantages it could claim under municipal ownership and none of the disadvantages.

(9). Periodic controversies over rates, contracts, etc., will be avoided.

(10). The municipality secures full benefit of joint use of investment and operating organization of the utility on a division of cost rather than upon a basis of duplication of investment and operating organization. It reaps full partnership benefit without risk or use of capital and without managerial effort or responsibility.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Georgia Company Issues Booklet on Telephone Service.

The Georgia Railway & Power Company, of Atlanta, has published an illustrated, 24-page booklet entitled "Our Service Over the Telephone." The purpose of the booklet is to make the company's relations with the public over the telephone uniformly courteous and efficient. It is admitted that there are times when it is easier to be curt than courteous, but the cultivation of the habit of telephone courtesy is urged. The difficulties of serving by telephone are enumerated, and are given as reasons why this service should be rendered with extra care.

In a chapter on telephone complaints, it is pointed out that employees should be careful to elicit by proper questions the details needed to avoid misunderstandings, to which most complaints are due. The real cause, whether it is the company's fault or due to the customer's misunderstanding, should be found out, and in any event the attitude of the employee should be that the customer is conferring a favor by extending the opportunity for rendering service.

When the telephone rings the caller is waiting. He knows his call has arrived at the building because the private exchange operator has answered. Beyond that the employees of the company are responsible for unnecessary delays in answering.

The booklet concludes with a short description of the Georgia company's private branch exchange.

Knoxville Company Secures Street-Lighting Contract.

After a long series of investigations on the part of the city commission the Knoxville City Commission has given a ten-year contract for street lighting to the Knoxville (Tenn.) Railway & Light Company. Under the terms of the contract it may be annulled after five years if one year's notice is given. The city agrees to use at least 600 arc lights, 2,000 candlepower, at $54 per year, and $18 per year for 25-candlepower incandescent lights, the number of these to be subject to the city's order. At the same time the company agrees to provide, free, energy for the White Way installation on Gay, Market, Vine and Wall Streets, the city to provide the lamps, etc., at a cost of from $8,000 to $10,000. Both systems will be lighted at sundown, the street lights to burn until sunrise and the White Way lights until midnight. A rebate of nearly $4,000 is given by the company for service since October 1 last. Arc lights, therefore, have been costing the city $72.50 per year.

In this connection the Knoxville Railway & Light Company has proposed to the outlying municipalities of Park City, Lonsdale and Mountain View to provide from 20 to 35 additional lights to those now in use at practically no increase in the cost of the service to these cities. It is stipulated that these contracts are to run for ten years from May 1.

In both sets of contracts there are the usual provisions as to outage allowances, breakage, replacements, etc.

Realistic Flashing Sign at Boston.

The Beekman Tourist Company, Boston, Mass., has installed a flashing sign, on the front of its Washington Street offices, which gives a graphic representation of tourist facilities. The

Spectacular Electric Sign in Boston.

sign is a glass-faced, V-shaped box with metal back and sides, each angle being 10 by 4 feet.

On one of the angles, painted on the back of the glass, is a colored representation of a railroad train, and on the other angle, a steamship. Behind the train are 73 incandescent lamps, and back of the steamer 70 units, both groups being controlled by an electric flasher which gives the illusion that both train and ship are in rapid motion. The searchlight of the steamship flashes on and off, and lights shine through the portholes, while smoke pours from the three funnels and as it issues a red tinge gives the impression that it disappears astern.

The train headlight throws powerful rays and the lights behind the drivers produce the appearance of rapid motion. The small wheels of the coaches are given a like effect.

What a Nickel's Worth of Electricity Will Do.

The Rutland (Vt.) Railway, Light & Power Company thus pithily sets forth the low cost of various domestic uses of electricity:

Do you know that with electricity, for the price of a street car ride, you can:

(1) Light an average room with Mazda lamps three hours a night for 12 days?

(2) Clean your house six times?

(3) Do the family washing eight times?

(4) Run your sewing machine three hours a day for a week?

(5) Operate an electric fan three hours a day for six days?

(6) Make toast for breakfast for the family every morning for a week?

(7) And everybody has heard of the most useful of all electrical appliances—the iron.

The company exhorts owners of unwired houses to link themselves to its system and enjoy all the above-named comforts and conveniences. A year to pay is allowed; the minimum monthly lighting bill is only 50 cents in Rutland territory.

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Backing Up the Daily Advertising Copy

By Charles H. Seaver

Unless the daily newspaper advertising is followed up with suitable literature, letters, telephone calls or personal solicitation, the full force of the advertising cannot be realized and the prospect is left in an undecided state of mind because of lack of sufficient information. Suggestions for the preparation of booklets, letters, etc., are presented in this article. In two previous articles the preparation of advertising copy was discussed.

Newspaper advertising is essentially brief. By its very nature it cannot give complete information on any phase of the business, and so in general is purely informative, or suggests that the reader take some immediate action. Except where some small, inexpensive electrical utensil or appliance is put forward, the action suggested is nearly always to "ask for further information." As indispensable as newspaper advertising is, it must be enforced and supplemented by other forms of publicity. The number of these available makes it possible to present each subject in many ways in varied and attractive dress.

Value of Booklets

Of these secondary forms of advertising, the booklet probably claims first place. While it lacks the low price and the hammering ability of the newspaper advertisement, it permits clearer exposition of any special features, can be more attractively and effectively illustrated, and is very sure to be at least looked over by every person into whose hands it goes. Sent to a carefully selected mailing list, it is fairly certain that every book will receive attention and that many will be carefully read.

The special-subject booklet often hits the mark, and hits it hard, but the cost of production puts it out of the question—even in its simpler forms—if the number to be printed is much below 2,500 or 3,000. Its most valuable field is not in indiscriminate distribution, even if the subject treated is one of general interest. The problem is to get a live mailing list of prospects in each line—and to keep it up to date. Even with the greatest care the booklets will get into the hands of some who are not even capable of purchasing the articles exploited.

Suppose, for instance, that a quantity of rather expensive books or recipes were to be distributed. It is desired that they be placed in the hands of women interested, and that the women who receive the books attach enough value to them to keep them. It is safe to say that if they were mailed directly, a considerable number—even though the books might be valuable—would not be carefully read, or would eventually find their way to the waste-basket.

If, on the other hand, the books were given out in return for some service, the value attached would be much greater. This scheme is old, but is as effective now as ever. The service might consist in sending in the names of several other women who were interested in electricity. The list might be one of unwired houses in the vicinity. Thus the service would be twofold. It would place the books in the hands of women interested at a time when the interest was active, and at time when the booklet was expected in payment for service rendered. Representing some work or trouble, the book would seem more valuable, and its advertising force would be greatly increased.

Actual work of preparation of the booklet dummy, the method of laying out the pages attractively and in such a way that they will be understood by the printer, are details that cannot be gone into here. The selection of paper, buying of drawings, printing, preparation of attractive, interesting copy, are problems that demand special attention. Only the larger companies can allow themselves the luxury of specially prepared booklets.

For the majority of stations, the manufacturers' booklets meet every need. The use of them is even more general than in the case of the ready-made advertisements. Here, as with the newspaper copy, the information is concise, well put, the illustrations are good; with intelligent, well-thought-out use of the right books at the right time, excellent educational results may be obtained. With proper enclosures, pertinent to the subject, real business is sure to follow.

In addition to books published by the leading manufacturers and distributed free, are those published by co-operative electrical bodies and sold at a cost barely covering their production. Every one is recommended. Among these might be named: Home Thoughts Electric, Electric Service in the Home, Why Electric Service Benefits a Store, Electricity in the Church, Light, Its Use and Misuse. There are a number of others of the same general character.

The first four are published by the National Electric

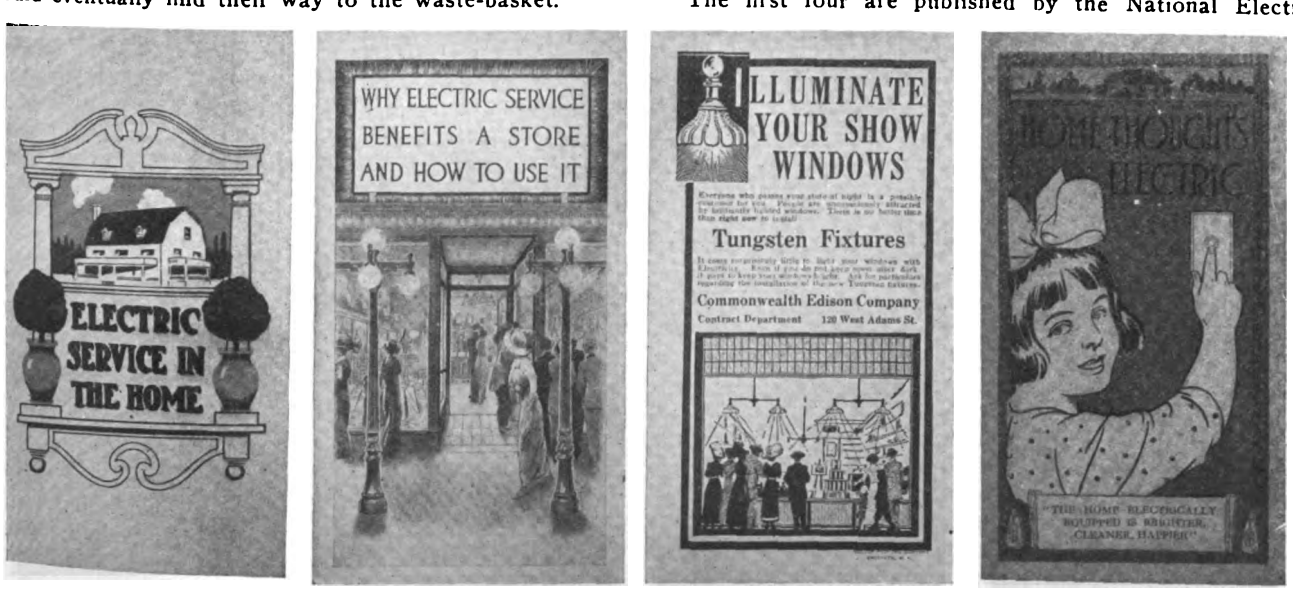

Fig. 1.—A Group of Booklets Published for Central-Station Distribution.

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Light Association, and the latter by the Illuminating Engineering Society. Imprinted on the back with attractive advertisments, these booklets have practically as much in-

Dear Sir:

We wish to call your attention to the fact that we are now offering for sale Exhaust Fan Blowers. We are enclosing a booklet descriptive of them.

It costs very little to run these blowers, and one of them attached to your hot air furnace will distribute heat all over the house in a more even manner than would otherwise be possible, even with the use of considerable more coal. It forces the air into the furnace and sends it heated through the long, as well as the shorter pipes.

Trusting that you will definitely consider the installation of one of these blowers before the cold weather sets in, and that you will notify us in case you need further information on the subject, we remain,

Yours very truly,

Fig. 2.—This Stereotyped Form of Letter Should Be Avoided.

dividuality as a special booklet published by the company using it. The examples shown in Fig. 1 are probably as effective in an advertising way as they would be if the company's name appeared on the front instead of the back, left blank by the publishers for that purpose. A good imprint is indispensable to a booklet of this sort.

Good Circular Letter Important.

With the booklet, the circular letter and the return card are so intimately connected, that one can hardly be taken up without the others. In them there are the three essential parts—in expanded form—of a good newspaper advertisement: the appeal to interest, the selling argument, and means to an easy reply.

Especial care should be given to the letter where the stock booklet is used, for here lies the opportunity to secure a personal interview with the recipient. A circular letter is not a thing to be hastily dictated. Have a man in mind. Say the things to him you would say if you handed him the booklet. Avoid stereotyped forms. Then the letter will be yourself. It will be interesting. Avoid such openings as "The inclosed booklet will be of interest to you," and endings that carry no more persuasion than the time-worn "Trusting that we will receive the return card by an early mail, we remain."

The only recommendation such phrases have is that they are easier. They require no thought. Everybody has received letters of this sort, and we all have thrown them away with hardly a glance.

How much better it is to get away from the too formal, cold-blooded style! For instance, the opening paragraphs below at least have the merit of being different: "When you figure the cost of your washerwoman for a year, doesn't it give you a start? Yet your big washing expense is an item that can be cut down. Just look at the table of costs on page six of the little book we have put in this envelope. The washing machine in the cases cited—as it would in yours—more than paid for itself the first year." Is this not an improvement on the "we remain" ending?

"Sign your name on this stamped postcard now and drop it in a mail box. One of our men will come out to see you, and tell you a lot of thing that could not be put in such a small book."

Pick out the interesting part of the book and refer to them in your letter. Be enthusiastic, and let the letter show it. If you cannot be enthusiastic, let someone else write your letters. No definite style can be recommended, but the letter should be brief and plain. Use short words. Avoid involved sentences and long paragraphs. A right and wrong sort of letter are reproduced in Figs. 2 and 3.

Much the same things apply to the mailing card. There must be something about it that saves it from destruction at least long enough to be read. Mailing cards that run in series are to be preferred if the campaign is an extended one. Each card can be made to build on the previous ones, and if the subject is treated rightly, a permanent impression will be made on a good percentage of people receiving the cards. The mailing card with a detachable return part is most valuable, as it gives the reader an immediate means of showing his interest.

Very often a newspaper advertisement is of sufficient interest to warrant sending it to a mailing list of considerable size. In such cases it is a necessity—to get best results—that the attention be directed to the strongest points of the "copy." This can often be done by a letter.

Dear Sir:

Extra heat, WITHOUT EXTRA COAL!

That ought to sound good to you, especially if your furnace didn't do its work well through the coldest days of last winter. Didn't it seem IMPOSSIBLE at times to keep all the rooms warm?

It will be easy this winter if you have an Exhaust Fan Blower in your furnace. The little folder shows how one of these blowers looks. You can see from the picture inside just where it goes in the furnace. It brings the air in from the cold air box and blows warm air right into your rooms. Instead of warming your cellar up you have heat where you want it.

For the cost of burning an incandescent lamp you can make your house comfortably warm with less fuel than you have been using. You will get more heat and find your coal bill actually smaller.

Let us tell you more about this little motor fan. Sign the card and mail it RIGHT NOW while you are thinking about it.

Yours very truly,

Fig. 3.—A Style of Letter That Compels Action.

Advertising on Monthly Bills.

Monthly bills present an admirable opportunity of making announcements of special rates, and pushing seasonable appliance. It is advertising that is practically 100 per cent effective. Every man who receives a bill is sure to see at least the display lines of an advertisement contained

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on it. Central-station companies dealing in electrical merchandise, as well as light and power, have secured excellent results from an installment plan advertised in this way. Lamps and other articles were sold to customers of the company whose bills are shown here, for 10 per cent of the price of the article in cash, and 10 per cent added to each lighting bill for each of the nine succeeding months. Advertisements of this sort should be short, seasonable, and in conjunction with current newspaper advertising.

There is room for some difference of opinion as to whether the church program, the lodge program, and the political publication are advertising or not. No great return is expected from it, but it is often the means of securing the good will of the organization and with this usually goes the good will of the members. A limited amount of advertising of this sort can hardly be avoided.

Miscellaneous Publicity.

Key tags, hangers for vacant houses, and novelties of all sorts have been brought into use with varied success. The live companies are hitting the prospect from every angle. The key tags mentioned, are being provided by a number of companies, and given out to any real estate dealer or renting agent who may desire them. One side is imprinted with the name of the agent and the number of the flat for rent, while the other carries the advertisement of the central station and specific directions for securing lighting service. The tags are neat, durable, and the demand there is for such an article is evidenced by the fact that in one large city 5,000 of these were distributed to real-estate dealers in a few months, mostly in response to a circular letter, inclosing a mailing card. The lithographed hangers shown at the top were distributed at the same time.

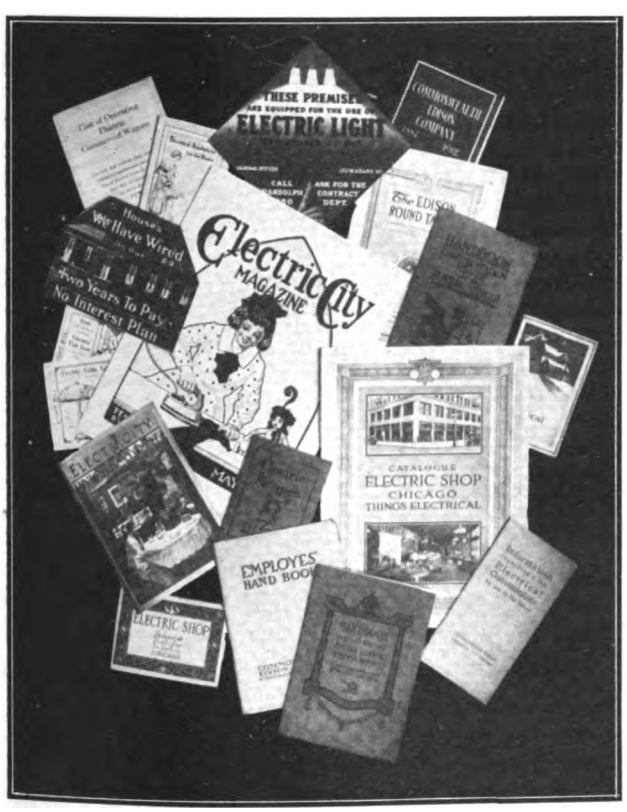

Fig. 4.—A Group of Attractive Central-Station Literature.

Although the moving picture has developed in only the last few years, it has already risen to considerable importance in almost every line of advertising. Several central stations are employing this means of impressing upon the public the desirability of things electrical. More or less elaborate picture plays have been worked out, all with the idea of making the prospect apperceive the electrical appliances. He sees them in connection with his home as he does after reading a newspaper advertisement of the right sort. Some of the largest manufacturers turn out a number of films which they furnish to central stations, and which may, through arrangement with local picture theaters be run off to selected audiences or the general public.

Even the bill board and the street-car card are telling the traveling public of the merits of central-station electric service. A wide-awake company operating in Kansas City, used an illuminated bill board with a rather poorly painted, humorous figure—and what is more—got results from it. Perhaps this is good advertising, and according to at least one prominent advertising man, there is only one test for advertising. "If it gets results," he says, "it is good—no matter what psychologists, artists or commercial men may say to the contrary."

On the whole though, the best advice to the central station is—have your advertising, whether it be booklets, letters or boards as dignified, as forceful, as are the conduct and selling arguments of your best salesmen. It is the long persistent advertising campaign that gets the business, and the sale of electric light and power is not a subject that is adapted to long continued "humorous" exploitation. It is no joke.

Electric Flags Being Boomed.

The Boston Edison Company is carrying on a vigorous campaign for the introduction of electric flag signs. Two form letters, with inclosure of an illustrated description of lighted flags, are being mailed: one to commanders of Grand Army posts, Sons of Veterans camps and other patriotic organizations; the other to clubs, hotels and department stores, which are fast adopting them.

A specimen flag is operated at the Boylston Street store and a special "flag man" is on call of anyone returning a postcard, included with the letters. Attention is called to the fact that the use of the flag for such display is entirely lawful, except when advertising matter is affixed to it. Four sizes are offered by the Edison Company—4, 6, 8 and 10 feet, respectively. They contain, for lighting one side only 94, 110, 130 and 160 lamps, and for lighting both sides, 170, 220, 260 and 320 lamps.

New Service Rates in San Joaquin Valley.

The California Railroad Commission has issued orders establishing new rates and rules for the service of electricity by the San Joaquin Light & Power Corporation and the Mt. Whitney Power & Electric Company, which public utilities cover Fresno, Kern, Kings, Madera, Merced, Stanislaus and Tulare counties, and have more than 27,000 consumers in the San Joaquin Valley. The flat rate for 12 months' agricultural power service is cut from $50 to $42.30 a horsepower, and a new scale made for all uses of electricity. Transformers and reasonable extensions are to be furnished free to the consumers and the contract term for agricultural power is reduced from five to three years. The minimum monthly charge for residence lighting is reduced from $1 to 75 cents, and the residence lighting from 10 cents a kilowatt-hour to a block system starting with 8 cents.

Kansas City Company Sells Many Vacuum Cleaners.

The Kansas City Light & Power Company, partly through definite co-operation in the campaign of the spring clean-up in Kansas City, has produced large results in the sale of vacuum cleaners, both of those selling for $15 and those priced at $40. It seems likely that during April and May, the company will have sold 1,000 of the cleaners. An interesting sidelight on the campaign is the recent sale of three cleaners to women in Denison, Tex.

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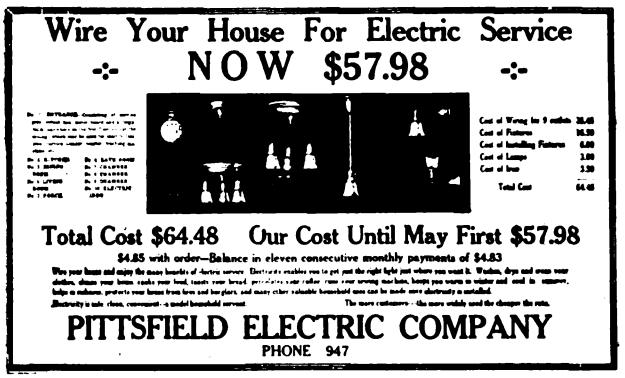
Excellent Results from Pittsfield House-Wiring Campaign.

By arrangement with the local electrical contractors, the Pittsfield (Mass.) Electric Company has for the past few weeks conducted a special house-wiring campaign that has been productive of excellent results. A definite schedule of wiring prices has been determined upon, based upon the number of outlets, and ranging from $14.21 for iron-conduit entrance and one outlet to $99.27 for entrance and 41 outlets. Likewise a definite schedule of fixture prices



Special House-Wiring Offer of Pittsfield Company.

has been compiled by several dealers and new customers are permitted a wide choice in the selection which they may desire.

The Pittsfield Electric Company has prepared several booklets, folders, etc., for use in the campaign and in addition uses liberal space in the newspapers. The customer can select any of the contractors to do the wiring or can arrange for the purchase of fixtures from any dealer, at the agreed prices, and is allowed 12 months in which to pay, the company reimbursing the dealer and carrying the account.

Several special proposition at reduced rates have been offered with considerable success, one particularly popular offer being the wiring of a house for nine outlets with fixtures and electric iron, all for $57.98. The regular price for this outfit under the prices prevailing during the campaign would be $64.48.

Practice of Massachusetts Companies in Requiring Deposits from Customers.

At the recent Question-Box convention of the New England Section, National Electric Light Association, at Boston, the question of requiring deposits from customers was accorded considerable attention. The discussion brought out the fact that one company with a large volume of seashore resort business requires deposits from all concession holders. The company holds the deposits until the end of the season, one year returning about $30,000. The Hull municipal plant requires a $10 deposit from each customer, of whom many are keepers of shops and restaurants at Nantasket Beach.

It was considered best to treat deposits as separate accounts from bills, not to be applied to the bill until service is discontinued. The New Jersey Public Utilities Commission has ruled, however, that a deposit must be applied to a customer's debt before service can be shut off. Legal advice in Massachusetts held that service should not be discontinued until the customer gets a reasonable sum in debt to the company, above the amount of deposit. The company securing this opinion has it in the deposit receipt that the amount is not applicable until discontinuance of service on written notice of the customer.

A company requiring a deposit from every new customer was taken issue with by a prospect who took up the matter with the Gas and Electric Light Commission. The latter called attention to the interest requirement in Massachusetts, not clearly defining the issue. The law is taken to mean that a company which requires a deposit should make it high enough to afford itself protection.

Customers' Accounts.

The relative merits of ledger and card-index form of handling customer's accounts were also considered at an accounting session. It was brought out that in one company one clerk can handle 4,500 to 5,000 accounts with the card system, where 2,500 accounts were the maximum under the book system. One advantage of the card system is that it permits the clerk to readily produce the individual account for the customer's examination, enabling him to see what he paid a year, or two years ago. It also involves less work in providing for a growing volume of accounts. One company uses a loose-leaf system, one sheet to an account. The ledger is written up from addressograph plates. Records of business done are drawn off on a summary sheet following every 50 accounts.

The Portland company has introduced a system briefly described as follows: Bills are printed in series of five with stub and carbon for copying. The forms are filled in with a bookkeeping typewriter. The first carbon copy is given to the collector, the third copy being kept for permanent record. The record of kilowatt-hours, rate, amount, money, past due and total are in line and in the record copy show in a single space. Computations and totals are made automatically on the machine, saving a great amount of labor. This system does not carry accounts for housewiring, sales of appliances, etc., for which separate bills are rendered. In the business office, customers objecting to the amount of bill are referred to a Complaint Desk, where meter readers' cards are kept.

House-Wiring Campaign in Louisville Breaks Record

During the week ending March 25 the house-wiring campaign being conducted by the Louisville Gas & Electric Company in conjunction with the various contractors and dealers in the city broke all records. Salesmen of the Louisville Gas & Electric Company alone secured 82 contracts, making a total of 682 contracts secured by the company's salesmen since January 1. The City Building Department issued a total of 62 wiring permits that week.

Rate Reduction in Leitchfield, Ky.

A voluntary reduction in rates for electric service has been announced by the Leitchfield (Ky.) Light & Power Company, proceeding on the expectation that the lower rate will result in greater consumption. Under the new schedule the lighting service will range as follows: First 10 kilowatt-hours, 15.5 cents per kilowatt-hour; next 20 kilowatt-hours, 12 cents; 10 cents per kilowatt-hour if more than 30 kilowatt-hours are used in a month, and in addition a 10 per cent discount for payment before the tenth of the month. The reduction has been received favorably by the patrons of the company.

Appealing to the Savings Habit of Customers.

The tendency of people to save is being encouraged by advertisements used by the Texas Power & Light Company featuring the 10-per-cent discount when bills are paid within ten days from date of billing.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

SPECIAL FEATURES OF DEPARTMENT-STORE WIRING.

Electrical Work in the Remodeled and Enlarged Schuster Department Store in Milwaukee.

The modern department store contains a great deal of electrical equipment which presents to the electrical contractor putting in the installation exceptional opportunity

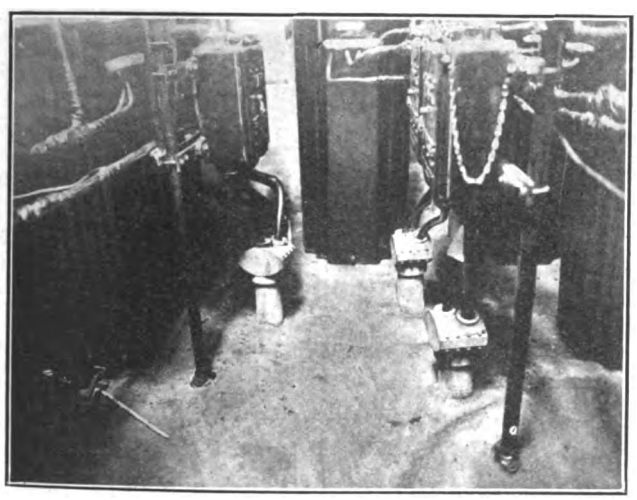

Fig. 1.—Interior of Transformer Vault.

to deal with special features. Such an installation is that in the recently enlarged Schuster Department Store at Third, Garfield and Fourth Streets, Milwaukee, Wis. A previous article appearing in these columns while the work was going on covered the general features of this job, particularly the switchboard and circuit layout. This article will attempt to deal only with certain special features.

The building has been enlarged by the addition of an extension westward so that the store proper covers the entire north half of a block; across the alley to the south is a new service building, containing the boiler room, main switchboard and electrical distributing center, carpenter, sign and other shops, etc. The electric power plant that was formerly in the basement of the old portion of the building has been abandoned and dismantled and electrical energy is now purchased from the Milwaukee Electric Railway & Light Company. The electrical work included rewiring a large part of the old building, wiring the new addition, furnishing, setting up and connecting the switchboard, and changing the supply for the old part of the building from the isolated plant to the new switchboard. This latter operation required a great deal of ingenuity, since it was required that service be maintained to all of the departments in the store without interruption. The rewiring also had to be done without interfering with merchandising. Some of the special methods developed for this purpose have already been described.

When the contract was made with the central-station company it was stipulated that two independent sources of supply be provided. The one normally used is a special underground three-phase, 2,300-volt cable running direct from the Commerce Street power house, about two miles away; the other source, which is used only in emergency or failure of the normal source, is the regular 2,300-volt, three-phase distribution system in this district. This requirement was in order to insure uninterrupted service and for this purpose an interlocked pair of oil switches was arranged in each of these high-tension supply sources and the switches were so connected that, if failure of the normal source should occur, this could be disconnected at the same time the emergency or auxiliary source was connected in. The necessity for this interlock arose from the undesirability of connecting the two sources together at the same time, which might have slightly different voltages and therefore possibly cause trouble. These switches as well as two independent banks of transformers are installed in a transformer vault located under the sidewalk on the Fourth Street side of the service building. The switches are mechanically operated from the main switchboard, which is in the basement of the service building and about 82 feet from the switches themselves. The operating mechanism consists of a set of cold-rolled shafts with several bell cranks to pass around corners and obstructions. These shafts are run through two-inch pipes for protection. They are mounted on roller bearings to reduce the friction to a minimum. A great deal of care was necessary in installing this operating mechanism, because it had to be true to within a small fraction of an inch in order to insure the proper opening and closing of the switches.

Two sets of transformer banks are installed in the trans-

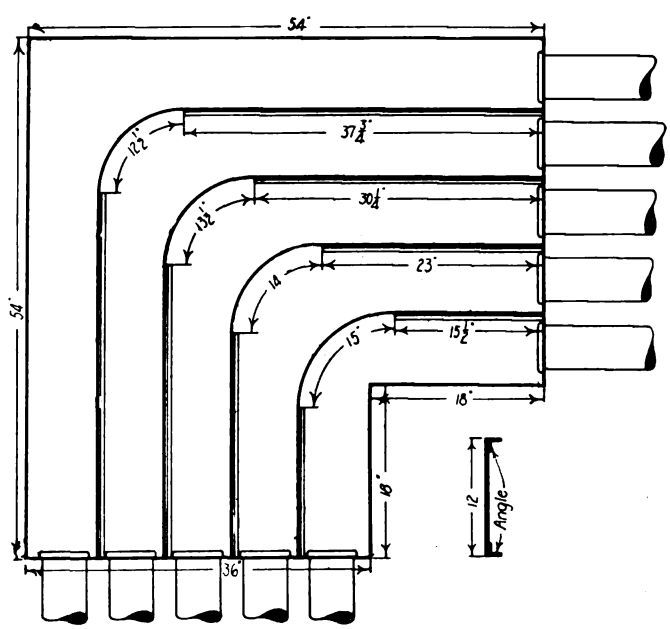

Fig. 2.—Plan of Special Junction Box.

former vault referred to. One of these consists of three single-phase transformers for the lighting circuits and the other consists of three similar transformers for the power circuits. Each of the three main lighting circuits is a three-wire 110-220-volt circuit connected to one phase or unit of the lighting transformer bank. These three main lighting

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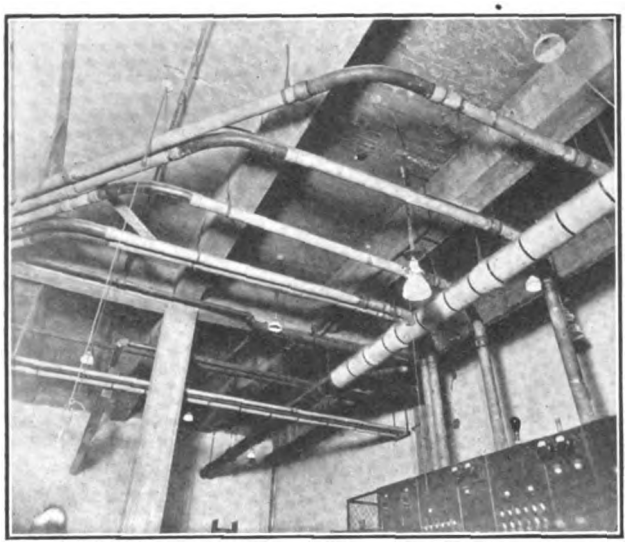

Fig. 3.—Conduit Bends Above Switchboard.

circuits are kept independent throughout the installation and feed different portions of the building. The load between these three phases is quite well balanced. The power transformers are similarly connected in delta and step down to three-phase, 220-volt power circuits. Two sets of secondary cables are run from the power transformers to the distributing board. A view of the lower portion of the transformer vault is shown in Fig. 1. On account of the confined space it was difficult to secure a good general view. In the illustration is shown how the secondary cables in groups of three enter the special conduits which carry them to the switchboard. These conduits are each of four-inch size and are provided with Adaptibox service or pot heads.

The five conduits pass through the floor of the transformer vault and run up the side thereof to about the level of the basement ceiling. They then run eastward and in the large room where the switchboard is located

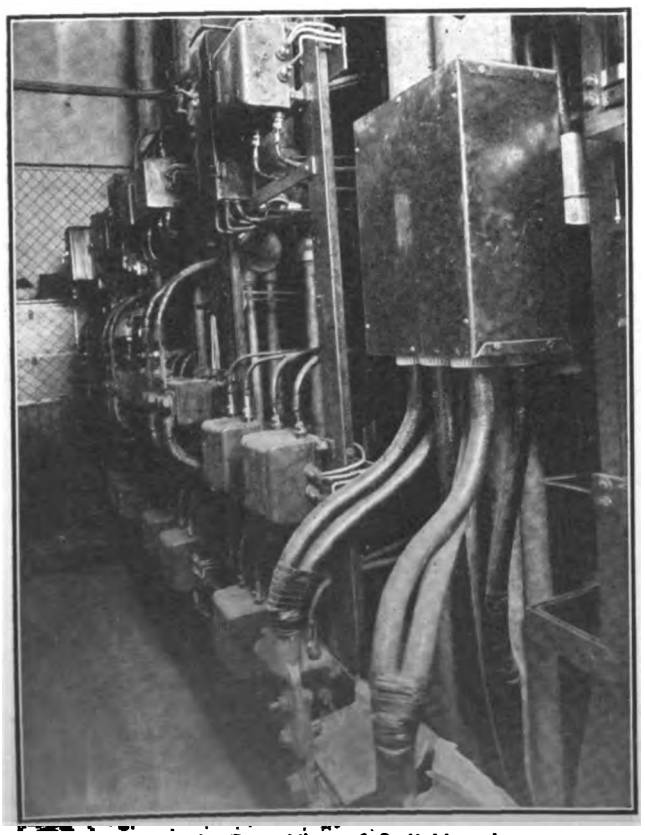

Fig. 4.—Rear View of Switchboard.

they turn abruptly northward to the board. Since the length of run is quite considerable, it was necessary to introduce a junction box which was placed at a 90-degree bend near the center of the run. This box, an inside plan of which is shown in Fig. 2, is of special construction and, like two other large special junction boxes on the premises, is provided with intermediate partitions to separate the several groups of cables. This was insisted on in order to minimize the possibility of trouble from one set of cables communicating to an adjoining one in the box. From the diagram it can be seen that the partitions, four in number, are made of sheet steel and held in place by angle irons at the top and bottom. By changing the radius of the bend in each partition approximately the same amount of space was provided for each set of cables. Two other boxes with partitions were also installed. These were rectangular in form and the partitions were straight sheets, being used for identically the same reason. These two

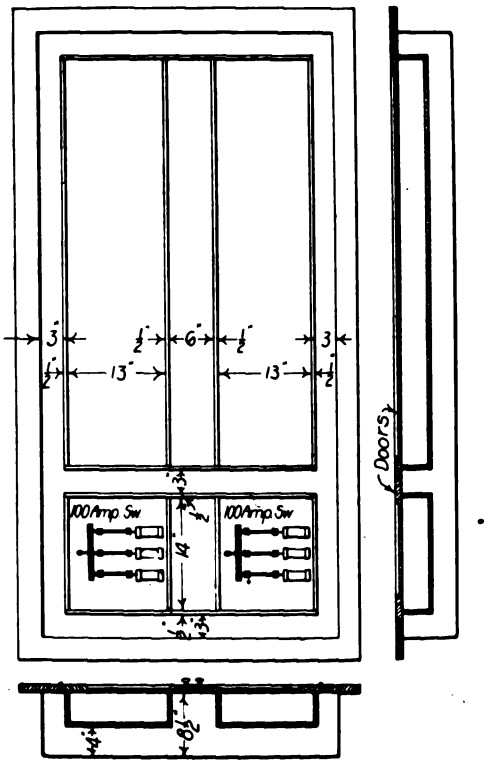

Fig. 5.—Arrangement of Typical Lighting Cabinet.

boxes were necessary in order to change over from the old isolated plant to the new central-station supply. Their use facilitated connecting in the cables without interruption of service.

In Fig. 3 is shown the group of five cables previously referred to passing to the top of the switchboard. Abundant space on the ceiling permitted use of 45-degree bends at this point. Each of these conduits contains three 500,000-circular-mil cables which connect to sectionalized busbars at the back of the board. A view of this is shown in Fig. 4. Without going into the details of the wiring of the switchboard, which has already been described in the previous article, it may be said that among the distinctive features on this board is the large number of meters used for keeping a check of the light and power load to each department. The necessity for making these numerous meter connections complicated the wiring at the back of the board and the lack of room necessitated the use of special fittings, including numerous Adaptiboxes. The arrangement of the buses was such that the circuits to the old portion of the store were run from one phase, while the circuits to the north half and south half of the new part of the store were run from the two other phases. All of the power

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circuits are 220-volt, three-phase and those for the elevator include a reverse-phase relay to insure proper connection of the phases.

In rewiring the old portion of the building use of National metal molding was freely made in the rearrangement of circuit outlets and regrouping of the number of outlets to conform to modern Code requirements. Numerous additional outlets were also provided, particularly for fans on the columns as well as numerous floor and baseboard receptacles to permit lighting of showcases, etc. In the new portion of the building iron conduit was used throughout and since this portion is of reinforced-concrete construction, special methods were developed for insuring proper location of outlets while the concreting was being done. Throughout the show windows fronting on three streets, new lighting equipment was installed. In order to facilitate this work, each of the outlet boxes used was of the Adaptibox type provided with threadless lugs which saved a great deal of time otherwise required for threading conduit. Several hundred of these fittings were used. A considerable number of showcases were also wired. The lighting cabinets used throughout the building were specially designed for the purpose and arranged as shown in Fig. 5, with main switches in separate compartments in the lower portion of the cabinet. These cabinets have liberal wiring space and are equipped with Cutter panels. The height of the panel section varies from 22 to 38 inches for circuits ranging in number from 12 to 24.

Aside from the installation of the transformers and high-tension equipment in the transformer vault, all of the electrical work was done by Henry Newgard & Company, of Chicago and Milwaukee.

Among the Contractors

Hobin & Marry, Galesburg, Ill., have been awarded the contract for wiring for lights and telephone system in the new First National Bank Building, Abingdon, Ill.

Charles A. Honold Company, of Sheboygan, Wis., has been awarded the contract for all the electrical work, including the installation of power, lighting and telephone equipment, in the new city hall at Sheboygan. All wires will be placed in conduit. The building will cost $100,000 and is to be completed September 1.

Pierce Electric Company announces the removal of its office and warehouse from 335 West Madison Street to 215 West Randolph Street, Chicago, Ill.

M. W. Nelson, formerly of St. Louis, Mo., has established the Electric Shop in Clarksville, Tenn., and will carry a line of electrical supplies and do contracting work.

Charles Pfotzer, an electrical contractor of Hamilton, O., has installed a charging plant to handle storage batteries for electric cars and trucks, and has also taken the Hamilton agency for the Electric Storage Battery Company's batteries. He intends to cover the storage battery field fully, and will arrange to take care of all kinds of repairs in that line of work.

Ralph Krows, of the Krows Electric Company, Seattle, Wash., recently gave a series of lectures and experiments with electricity to boys. They were given in the Green Lake and Queen Anne branches of the public library and were on the telephone, wireless telegraph and similar electrical inventions.

Eardley Brothers Company, Salt Lake City, Utah, has been awarded the contract for installing a lighting system on the Utah state capitol grounds. Sketches, layouts and specifications were originated and submitted by each contractor. The proposal offered by the Eardley company covered 72 Day-Way standards, 62 being single-light and 10 five-light, calling for a total of 112 nitrogen-filled, 250-candlepower, 6.6-ampere lamps. The Day-Way system is manufactured by the Luminous Unit Company, St. Louis, Mo.

The Chicago & Northwestern Railroad Company has had plans prepared for what will be the largest grain elevator in the world, to be erected at 120th Street and Calumet River, Chicago, Ill. Witherspoon-Englar Company, 53 West Jackson Boulevard, Chicago, has the contract for the general construction, Cecil Hodgson being in charge of the electrical construction. Westinghouse, Church, Kerr & Company, Chicago, will make the power-plant installation, consisting of two 1,500-kilowatt, one 500-kilowatt and one 50-kilowatt turbogenerators and switchboard. A. S. Schulman, 417 South Dearborn Street, Chicago, has the contract for the wiring of motors and lights, telephone and signal systems, and will place the motors in position. The wiring will all be in conduit. Panelboards and control systems for 7,000 horsepower in motors and 2,000 lamps will be installed. A unique system of lighting distribution, combining alternating and direct current, will be used. Regularly the lights will be fed from the alternating-current mains, but when the power apparatus in the elevator is shut down it will be possible to switch the lighting system on the direct-current exciter unit. The elevator will be completed by the first of next year.

Russell & Company, 444 Columbus Avenue, New York City, have been awarded the contract for a large fireproof residence for Harris Fahnestock at 15 East Sixty-sixth Street, New York City. The work will include wiring for light and power in rigid conduit, intercommunicating telephones, re-set annunciators, fire-alarm and burglar lamps, and electric heating in all bathrooms. Switchboards and panelboards will be in fireproof cabinets.

The contract for the $100,000 power plant to be erected by the Iowa Railway & Light Company at Perry, Iowa, has been awarded to W. J. Zitterell & Company, Webster City, Iowa.

J. F. Gazan has purchased an interest in the Electric Sales Company, Savannah, Ga. The company is planning to discontinue its contracting business, but will make extensions in the supply and fixture departments.

The Pendleton (Ore.) Electric & Supply Company, of which Charles Milne is manager, has removed its shop and offices from Court Street to the Gritman Block on Main Street.

The Auto Electrical Repair Shop, L. N. Niccolls, manager, formerly located at 724 Commerce Street, Tacoma, Wash., has removed to 752 Broadway, that city. Considerable electrical equipment and battery-charging apparatus is being installed.

Operation of Motion-Picture Machines.

Motion-picture machine operators in Louisville, Ky., have learned something from a representative of the Louisville Gas & Electric Company. For a long time one of the operators had been having trouble in starting his machines, using two or three alternately. The machines use direct current, which is transformed on the spot. When the carbons are warm the current is 40 to 45 amperes, and the machines will blow their fuses when the amperage mounts above 50. This operator found much trouble in starting on cold carbons, the current rising to the point where the fuses go out. At the suggestion of the central-station man the operator now first switches on the alternating current, so as to warm up the carbons on the second machine. By this means the danger of fuses blowing is eliminated, and the warmed carbons make a much better light, so that the pictures right at the outset are thrown bright and clear on the screen.

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Alternating-Current Motors—III

By Justin Lebovici

The previous installments of this article explained the fundamental principles underlying motor construction and operation, and described the induction motor, explaining its rotating magnetic field. This, the final installment, deals with commutator motors, explaining the differences between different types, and shows how series or shunt characteristics may be obtained.

Commutator Motors.

The rotating member of the commutator motor is constructed in the same way as the armature of a direct-current machine having a direct-current armature winding, commutator and brushes.

While in the induction motor the primary was connected to the line and the secondary short-circuited, in the commutator motor the current can be conveyed both to the stator and the rotor, while part of the latter may also be short-circuited.

The direction of rotation of a direct-current motor remains the same when the impressed electromotive force is reversed, because the current in the armature circuit and in the field circuit is changed at the same time. Theoretically, then, a direct-current series motor can be operated on an alternating-current single-phase circuit, provided the field structure is laminated to prevent serious losses and heating in the same. By means of an invention due to Eickemeyer, the self-induction of the armature circuit is reduced by the use of a winding on the stator which is called the compensating winding. The compensating winding closely surrounds the armature winding and is energized by a current in a direction opposite to that of the armature current and of the same magnetomotive force. With the exception of very small motors, some form of winding having the same function as the compensating winding will be encountered in nearly all types of alternating-current series motors.

We distinguish the following essential elements of nearly every single-phase commutator motor:

(1) The exciting winding producing a simple alternating magnetic field.

(2) The rotor with its commutator and brushes. Any current passing through a pair of brushes is assumed to produce a magnetomotive force along the line joining them.

(3) The compensating or neutralizing winding, a stationary winding closely surrounding the armature winding, having its axis coaxial with the armature winding and its function being to reduce the magnetic flux of armature reaction. The compensating winding does not produce any torque with the armature ampere-turns; the torque being produced by the exciting field in conjunction with the armature ampere-turns as it has also been shown for the single-phase induction motor in a previous section.

We will use the generally adopted diagrammatic notation for circuits and connections. In this notation (see Fig. 32) a zigzag line is used to represent a stator winding. In Fig. 32 E represents the exciting winding and C represents the neutralizing winding. The assumption is made that these windings are harmonically distributed. A circle R is used to represent the rotor having its winding connected to the commutator. Small rectangles on the circumference represent the brushes.

The single-phase commutator motors may be grouped according to different viewpoints:

(*a*) According to how the exciting current varies with the load current. This point of view gives us the three divisions with which we are familiar from our dealings with the direct-current motor, i. e., the motor with either direct-current shunt-motor characteristic (or short shunt-motor characteristic), series-motor characteristic or compound-motor characteristic.

The Shunt-Type Machine.—This machine has been invented by L. B. Atkinson and is shown diagrammatically in Fig. 33. The motor consists of a slotted stator equipped with a single-phase winding E distributed, as a rule, over two-thirds of the stator surface. The air gap is uniform, the same as in the ordinary induction motor. The rotor (R), similar to a direct-current armature, is equipped with two sets of brushes (for each pair of poles) perpendicular to each other in the bipolar representation shown in Fig. 33. The axis of one pair of brushes yy lies usually parallel to the primary winding E which is connected to the line LL. The brushes yy are called the energy brushes. The other set of brushes is perpendicular to the first set as a rule; these brushes are termed the exciting brushes. As we will see later, the brush line yy may be shifted from the line of primary winding without materially affecting the full-speed characteristic of the machine. The explanation of the action of the motor is similar in every respect to the one given for the single-phase induction motor. At standstill there is only a single alternating flux ϕ available along the y-axis, the short-circuited winding yy acts as the secondary of transformer with E as a primary. There is no starting torque and the motor has to be brought up to speed with one of the connections which will be discussed in section *b*.

When the rotor is moving, approximately the following conditions exist. The electromotive force E_1 is impressed upon the stator winding and a certain value of current flows in the stator coil. The magnetomotive force due to the resulting ampere-turns of this current produces the flux ϕ, lagging about 90° behind E_1 and the alternations of this flux generate in the stator coil and between yy electromotive forces in a time-phase position lagging 90° further.

When the circuit yy is closed a current I_2 will flow in this circuit due to the electromotive force E_y, and this current will tend to decrease the flux ϕ, forcing the primary winding to take up an increased current in order to maintain the flux ϕ at its original value.

The rotor conductors lying symmetrical to the xx axis are cutting the flux ϕ and electromotive forces of rotation are induced which are adding up to a resultant electromotive force E_x at the xx brushes. The electromotive force E_x is maximum when the flux ϕ is maximum and zero when ϕ is zero, or in other words, E_x is in time phase with the flux ϕ and has the same frequency as the flux ϕ. The brushes xx being short-circuited, a current I_q will flow in this circuit, which, due to the self-induction of the circuit, will lag approximately a quarter period behind E_x. In space the current I_2 and the flux ϕ_q are in quadrature; in time I_2 and ϕ_q are very nearly in phase, therefore I_2 and ϕ_q combine to a resultant torque. The flux ϕ and the current I_q, while a quarter period displaced in space, can produce no torque, being a quarter period displaced in time. The quadrature flux ϕ_q has the same function as the flux of a direct-current motor, hence the name of exciting flux given sometimes to this flux and the name exciting brushes given to the brushes xx. The exciting flux ϕ_q produces a torque with the current I_2 flowing between the brushes yy; this current may then properly be regarded as the armature or energy current, since it has the same function as the armature current in a direct-current motor. Hence the name of energy brushes given to the brushes yy. While in a direct-current motor the energy current is conducted to the brushes, in this type of motor the energy current is induced in the rotor by transformer action. The electromotive force E_x and in consequence the flux ϕ_q are proportional to the speed and to the flux ϕ, or if n_2 be the speed of rotation and n_1 the synchronous speed $\phi_q = n_2\phi/n_1$.

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The flux ϕ_q induces through its pulsation an electromotive force between the brushes xx which we shall call E_{xp}. Due to the fact that the brushes xx are short-circuited, E_x induced by rotation in the flux ϕ and E_{xp} induced by the pulsations of the flux ϕ_q must be pretty nearly equal to each other, or $E_x = E_{xp}$ from which we obtain:

$$n_2\phi = n_1\phi_q \quad \text{.....(37)}$$

In the same way an electromotive force of rotation is induced between yy due to the flux ϕ_q proportional to the speed and the flux ϕ_q; call this electromotive force E_{yr}. The electromotive force E_{yr} together with the electromotive force E_y determine the current which will flow between yy. These brushes being short-circuited, E_{yr} must be nearly equal to E_y, from which we have

$$E_{yr} = E_y$$

and

$$n_2\phi_q = n_1\phi \quad \text{.....(38)}$$

From equations (37) and (38) it follows that n_2 approaches n_1, or the speed of this motor must be near synchronism independently of the load; hence the direct-current shunt-motor characteristic.

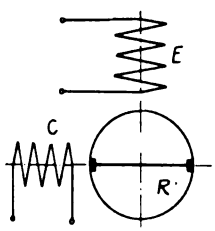

Fig. 32.

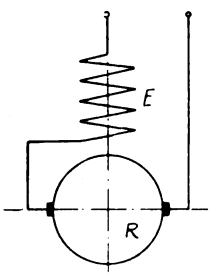

Fig. 34.

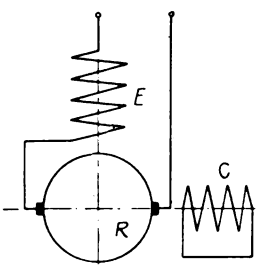

Fig. 35.

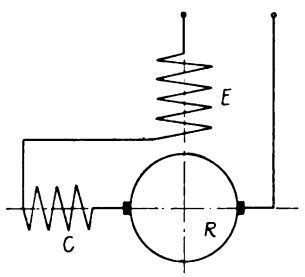

Fig. 36.

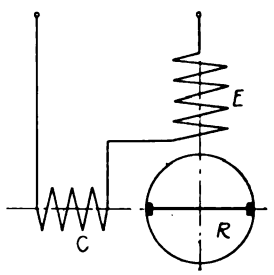

Fig. 37.

Equation (38) indicates that when the electromotive force of rotation in the flux ϕ_q equals the electromotive force induced between the energy brushes yy by the main flux ϕ, a condition of balance is reached and the speed of the motor has become constant. This gives us at once several methods of varying the speed of such a motor, as this condition is the same as that which limits the speed of a direct-current motor.

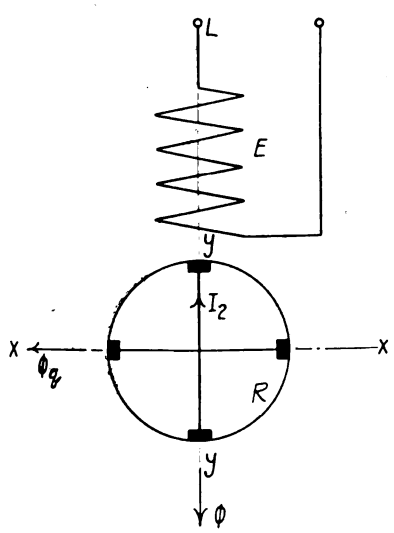

Fig. 33.

Nearly all practical forms of shunt commutator motors make use of power-factor compensation. In this, in the possibility to vary the speed of these motors, and in the fact that these motors can readily be connected for starting in such a way as to obtain a good starting torque, lie the advantages of this type of motor over the shunt induction motor. These points will be treated later in more detail. The disadvantages of this type of motor are its low inherent efficiency and the added care of a commutator.

The Series-Type Machine.—As the name of this machine implies, the exciting current is proportional to the load current. Typical of this type of motor is the simple series motor without neutralizing coil (Fig. 34). This type is used only for small motors. The compensated series motor can be of the inductively or conductively compensated type. The inductively compensated motor is shown in Fig. 35, the conductively compensated motor in Fig. 36.

Instead of the rotor current being led directly into the rotor, the same can be conveyed by induction or transformer action. If we do this we are led to the so-called Atkinson repulsion motor shown in Fig. 37.

The two stationary coils E and C can be combined in one, as has been done in Fig. 38, arriving thus to the Elihu Thomson repulsion motor called simply repulsion motor. The repulsion motor consists of a stator winding uniformly distributed over about two-thirds of the stator surface, and a commutator armature carrying a pair of brushes (per pair of poles) short-circuited at an angle α from the line of stator magnetization (see Fig. 38). The angle varies between 15 and 45 electrical degrees. The speed of the motor can be varied by shifting the brushes and thus changing the angle α or by varying the impressed electromotive force at the terminals. A variation of this repulsion motor is the Deri motor shown in Fig. 39. The Deri motor has not gained wide application in this country, though favorably received in Europe. This motor is equipped with two sets of brushes (in the bipolar diagram) as shown in Fig. 39 and the speed is varied by shifting one set of brushes, BB, while the other set, AA, remains stationary. The advantage of this motor over the previous motor is finer speed regulation and very much improved starting conditions.

In Fig. 37 the exciting winding E is placed on the stator; the same can also be placed on the rotor, as shown in Fig. 40, which represents a compensated repulsion motor. The name compensated is used to designate the fact that this motor has an improved power-factor as compared to the previously described repulsion motors. It bears four brushes per pair of poles, one pair of which is short-circuited and the other pair connected in series with the stator winding perpendicular to their axis. This motor, used in connection wth a series transformer (S. T.) is known as the Winter-Eichberg-Latour motor. It has been used as a railway motor, and is shown in Fig. 41. There are other forms of the series type of commutator motor, but due to the fact that they have not come into more general use we have omitted them in our general survey.

Combinations of connections from the two previous groups lead to a type of motor whose characteristics approach those of the direct-current compound motor.

(*b*) In place of starting from the motor speed characteristic we could have grouped the single-phase commutator motors according to the way the energy current is transmitted to the rotor, leading to the following classification:

(1) The current is conveyed to the armature conductively. The straight series motor is the representative of his type. The voltage at the terminals of the compensating winding, except for the impedance drop, is zero.

(2) The current is conveyed to the rotor inductively. The compensating winding is directly connected to the line and the energy current is supplied to the rotor by induction. The re-

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pulsion motors and the shunt commutator motors could be grouped in this class.

(3) The current is supplied to the motor by induction and conduction. Both stator and rotor are connected to the line. The compensated repulsion motor belongs to this class.

(*c*) Viewed from another point, single-phase commutator motors may be grouped according to the arrangement of the excitation:

(1) The exciting winding may be placed on the stator as in series motor or repulsion motor.

(2) The excitation is divided between the stator and the rotor as, for instance, in the adjustable-speed shunt commutator motor, which will be treated later.

(*d*) The alternating-current commutator motors could also be divided into motors with projecting poles and motors with uniform air gap, but this is not an essential feature.

We have dealt only with the single-phase commutator motors because these motors are oftener met in practice; also because the diagrams of the polyphase commutator motor can be obtained by combining the diagrams given in the above summary. Thus, superposing two compensated series motors as shown in Fig. 42, and at the same time shifting the axis of one motor 90° against the axis of the other motor, we obtain the two-phase series commutator motor shown in Fig. 42.

But the compensating winding and the field winding can be combined in one winding, as has been shown for the repulsion motor. Doing this and superposing three single-phase motors shifted against each other by 120 electrical degrees, we obtain another type of polyphase series commutator motor. In Fig. 43 a three-phase series commutator motor is shown.

In the same way, superposing two or more single-phase shunt commutator motors, as shown in Fig. 44, we obtain the polyphase shunt commutator motor. A two-phase shunt commutator motor obtained in this way is shown in Fig. 44.

The methods of varying the speed of the single-phase commutator motor mentioned above are available for varying the speed of the polyphase commutator motors.

The life of a commutator motor depends in the first place upon the life of the commutator and this again upon good commutation. The question of the possibility of satisfactory commutation, together with the low efficiency of the shunt commutator motor, explains why so many schemes have been proposed to obviate the use of the commutator for the greatest part of the time of operation, even in those motors which are built with a commutator for the purpose of starting the motor. The motor of the last type which has met with most success is one which is started as a repulsion motor. After the motor has reached nearly normal speed all the commutator bars are short-circuited, thus transforming the repulsion motor into a single-phase induction motor. Usually the commutator is vertical and the brushes are lifted from the commutator at the time the latter is short-circuited.

In mechanical construction the induction motor is far simpler than the commutator motor. The speed of an induction motor cannot economically be varied over a wide range by any known method. The speed of the induction motor when applied to a varying load is stable only near synchronism. Whenever the speed of an induction motor is varied by inserting resistances between the slip rings, an amount of energy in proportion to the desired reduction in speed from synchronism is lost. The commutator motor, on the other hand, is not limited in its performance to synchronism and, as has been shown before, single and polyphase motors can be built having similar characteristics to direct-current motors. Variable and adjustable speed can be economically obtained over a wide range.

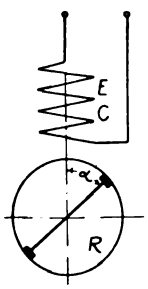

Fig. 38.

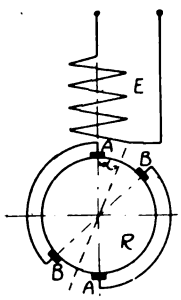

Fig. 39.

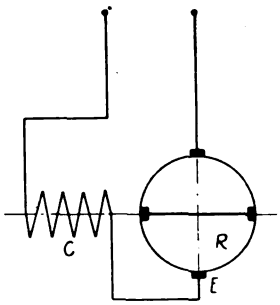

Fig. 40.

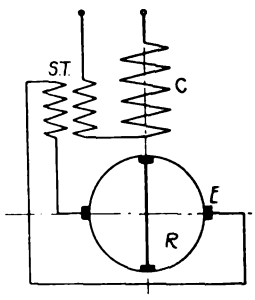

Fig. 41.

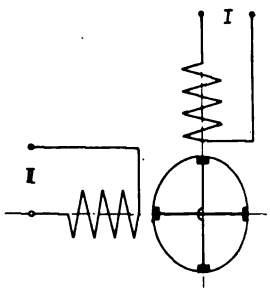

Fig. 44.

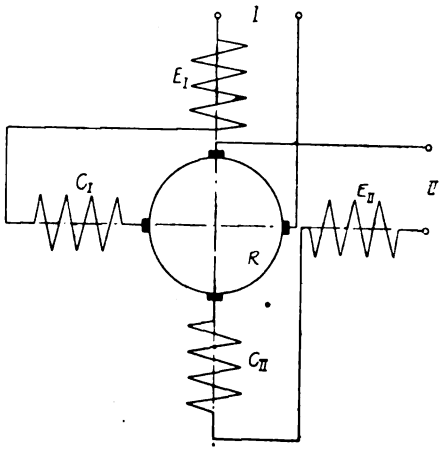

Fig. 42.

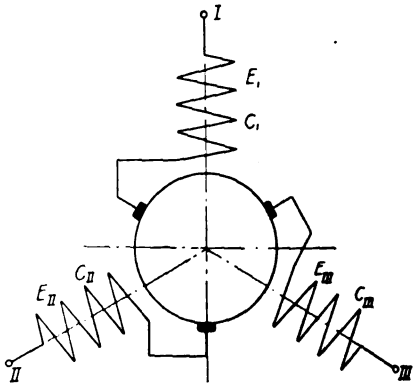

Fig. 43.

At present, especially in the United States, users prefer the simplicity of the induction motor, even when the commutator motor is more advantageous.

The output of the commutator motors is limited by commutation and, where variation in speed in large units is important, sets made up of induction motors and commutator motors can be used.

The energy available at the rotor terminals of a polyphase induction motor due to reduction in speed can be utilized in a second induction motor. Such a connection of two induction motors mechanically connected with each other is known as cascade concatenation. The number of speeds that can be obtained in this way is limited by the number of poles in the two motors, and the power-factor of such a set is necessarily low.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

PREPARING THE GROUND FOR INTENSIVE CULTIVATION IN MERCHANDISING.

Business-Building Suggestions to the Electrical Dealer for Fertilizing the Ground.

By W. B. Parker.

All business enterprises must progress or go backward, and it is much easier to go backward than to progress. Methods that were once successful are so no longer. The man who is content merely to keep his store open and see that his stock is fairly complete might have succeeded in a past year but has not one chance in a million of attaining even a measurable degree of success today. Absolute failure, with the final assistance of the sheriff as a salesman, is much more likely to be the result.

The intelligent retail dealer, no matter what his line may be, must realize that his possible profits are being cut down by the energetic competition—often unfair—that he is compelled to meet daily. But the remedy is in the hands of the dealer himself. It is not enough to be ready to serve patrons to their entire satisfaction—when you are called on. You must find a way of telling all your possible patrons of the stock and service awaiting their requirements, so that when they need anything in your line they will naturally turn to you instead of going to your competitor, who possibly is advertising cut prices just at that time. One of the largest Chicago department stores has made its name a synonym for the highest quality of goods and satisfactory service, so that no price bait offered by others can draw their customers away. And they have done this by dignified but persistent advertising—both newspaper and mail—and by living up to their promises.

The right kind of advertising—telling your prospective customers of the advantages of giving you their business—is the key to success. The main thought to keep in mind is that advertising is simply a way of convincingly telling possible patrons of your ability to serve them. It does not mean taking a little space in your local newspaper "to help the paper out" or buying space in church, charitable, or labor publications so as not to offend these organizations. It means a plan carefully thought out with the definite end in view of reaching, in an effective way, those who should be your customers.

The first question for the electrical dealer to decide is the territory from which he could reasonably expect to draw business. Surrounding every city or town are smaller places, as well as the open country, that can properly be included in any plan of expansion. This, of course, does not apply to the dealer in one section of a large city. In his case the best results will be obtained by confining his efforts to that section alone. But, in either case, the idea should be to include all districts where there is a reasonable prospect of securing results. The mistake most commonly made is that of not working up enough territory instead of too much. This does not mean that the entire territory decided on as the prospective field must necessarily be developed at one time. It is better to keep before the people of a small district all the time than to reach a larger district so occasionally that the cumulative force of the advertising is lost.

It is simply a question of the amount of money that can safely be appropriated to the purpose of business building, but where it is found advisable to so limit this amount that all the desirable territory cannot be reached on the start, it is well to make definite plans for constant additions to the working field, as fast as finances warrant. Like success in farming, success in merchandising resolves itself into securing as much fertile ground as possible, and practicing intensive cultivation on all secured.

There are four methods of advertising generally accepted as valuable—newspapers, billboards, circulars and letters. Billboard advertising is good as general publicity, where immediate returns are not demanded, and where the advertising appropriation is sufficiently large to use this method in addition to newspapers and letters. Circulars may be valuable in some localities if used in connection with special bargain offers, but as a general rule are much less resultful than newspapers or letters. Therefore these two forms are all that are worth consideration as a permanent part of a business-building plan, and are all that will be considered here. They are the seed that are sure crop producers.

While all newspaper advertising is good, some newspapers are more effective than others, and, where the cost must be carefully considered, the circulation and quality of circulation of the various newspapers in the territory should be thoroughly looked into and space contracted for in only those papers that reach the largest number of the class of readers you wish to interest. Large circulation does not always mean circulation among a class who are financially able to purchase electrical appliances, even if reached and interested. Do not buy space because the publisher of the paper is a good fellow, but because you believe it has a sufficient number of the kind of subscribers you want as customers. Many a man has convinced himself that "advertising doesn't pay" because, among other things, he did not use ordinary business judgment in buying it.

After the newspaper question has been decided, the thing to do is to make up a list of all persons you desire to interest so that it will be at hand when you are ready to add direct mail advertising to your newspaper advertising. It will be found cheaper in the long run to make up this list on cards in the first place, and to keep them in alphabetical order. It is much easier to note changes of address on a card list and keep it up to date by adding to it and taking out those who move away than if the names are kept in a book or on sheets of paper. An up-to-date card list of this kind is always found a very valuable asset to any dealer. The financial responsibility of those listed can also be indicated, and by using two colors of cards the list can be separated so that those of good rating can be easily picked out when it is desired to mail to this class only.

Northern Idaho Company's Appliance Campaign.

The Northern Idaho & Montana Power Company is conducting a campaign in its various divisions for the placing of electric household devices upon its lines. The campaign is being conducted under the supervision of A. F. Douglas, in conjunction with experts of the various manufacturing companies. A sales force was put in the field at Newport, Wash., on April 17, and in two days succeeded in selling 52 appliances, including 16 electric flatirons, 25 grills and one electric range.

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Business Hints for the Electrical Dealer

Keep the Men Who Are Building Up Your Business—An Illustration of the Fallibility of Guarantees—It Behooves the Dealer to Practice What He Preaches—A Few Ideas Concerning Advertising

By G. D. Crain, Jr.

Don't Let the Good Ones Get Away.

There is a certain electrical contractor-dealer who practically has been marking time for the past five years. In spite of the fact that the industry as a whole has been making splendid progress during that period and that as a member of the most rapidly growing trade in the country he should have expanded with it, he barely has been able to hold his own. Relatively speaking, his place in the community is lower now than it was then. That is to say, if one were asked to name off-hand the leading houses in his line, this contractor-dealer might be included in the first half-dozen; five years ago he would have been in the first three.

What is the explanation?

Simply this: he let his good men get away.

That is a statement worth pondering over: he let the good ones get away.

The ordinary plodders, who have comparatively few ideas, and whose supply of "pep" is definitely limited, are still with him. The live boys, who have snap and ginger, who know how to turn prospects into sales and who keep the cash register out in the store ringing right along—most of them, sad to say, have departed.

This member of the trade started the business, put a lot of hard work in on it and has always looked on it as his personal, individual enterprise. He has failed to realize that the boys who have been getting the business and building up the trade are entitled to consideration, and that a big man is not going to continue to work merely for a salary. The good men have wanted businesses of their own, if they were not to have a stake in his, and the result is that three or four hustling electrical concerns are now operating in that town, as off-shoots of the original house. The men at the head of them are using the experience and ideas, and doing business with the customers of the old house, of course, all of which makes it more difficult for the latter to stay up front.

It pays to make it worth the while of the producers tc stay on the job. Don't let the good ones get aawy.

The Guarantee Question Again.

The question of guarantees on electrical goods is one that will not down, and because of its importance, as well as because it has many angles, discussion of the general problem is always in order.

Right now the matter of guarantees on type C nitrogen lamps has come to the front, because of the number of adjustments which dealers are required to make. Many of those who are handling this class of business are agitating in favor of removing the 1,000-hour guarantee entirely and putting the business on a no-adjustment basis. This would undoubtedly simplify matters somewhat, and might even make it possible to reduce the price on these goods, which now as a matter of course must absorb the cost of making good guarantees.

As one big dealer explained, the trouble comes in applying the "average" feature of these guarantees.

"If a consumer were to buy a case of these lamps," he said, "and the guarantee was made to apply on the service received from the whole case, taking care of the average service of 1,000 hours would be all right. But the trouble is that one particular lamp may burn only 500 hours, while its mate will give 2,000 hours of service. The dealer and manufacturer are called on to make good for the first, but never hear about the other. In this way the average is made valueless and the guarantee is made to apply simply on the ones which do not give full service.

"Another point is that the cost of these lamps has led many consumers to take an unreasonable stand. A man brought in a $7 lamp the other day and asked that it be replaced. It was evident from examination of it that the lamp had broken as the result of coming in contact with water. On this basis we declined to make good. The customer contended that water had never touched it, although the evidence was in plain sight.

"Personally, I believe that it would be a good thing to take the guarantee off these lamps, leaving the way open to settle for obviously defective goods on the merits of each individual case."

Do You Practice What You Preach?

The other day a women went into an electrical store to pay her bill. The cashier's window was not lighted from the front, and as she made her way in that general direction she said, "You may do lighting work for other people, but you don't seem to do much for yourself."

The proprietor of the store overhead this remark, and lost no time in getting the point. He promptly had a lamp put in place over the window and it burns all day. Those who come into the store for the purpose of paying bills or to transact any other business with the office have no difficulty in determining where to go.

It is an old saying that the shoemaker's children often go unshod, but it should not be said that the electrical dealer is slowest to take up the use of the goods he is recommending to others. If an office-equipment dealer came into your store and tried to sell you a new set of filing cabinets, vertical style, and you happened to see in his own office an outfit of old horizontal files still in use, it would take the edge off his argument, wouldn't it? The same thing applies to the electrical man who isn't using the goods he sells.

The dealer referred to above, however, is not overlooking many bets in this direction, as indicated by the way he made use of the criticism his customer gave out. For example, his lighting arrangements involve the use of the indirect fixtures which are featured in his sales work. He has an up-to-date intercommunicating telephone system. He uses his basement for the storage of motors and other supplies. As a guide to whether energy is being wasted there, he has a red lamp which remains lighted when those in the basement are on. By noting this lamp he can tell when somebody leaves the basement and allows the lights to remain on.

He is, in short, alive to the possibilities of the use of electrical devices in his own business, and this very alertness to use this class of goods helps him in the sale of them. When he goes to the csutomer he is able to say: "We have used this particular item in our own store and have found it very satisfactory."

A direct testimony of this kind is always more effective than a lot of general talk about what the goods will do for the prospects, and the dealer who can refer to his own

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experience is frequently able to work up a line of argument that would not occur to him otherwise.

"Copy" for White Space.

The average electrical contractor and dealer is a pretty live man when it comes to the details of his business, especially those pertaining to the technical side. But it is doubtful whether he is always "up" on such matters as writing advertising matter.

That is why the concern planning to spend money this spring and summer in advertising for house-wiring work, in selling electric fans and in working up business on other classes of goods, ought to get expert help in the preparation of its advertising matter. If the concern is using newspaper space, the solicitors employed by the dailies patronized will gladly lend assistance and most of them are well equipped to prepare copy.

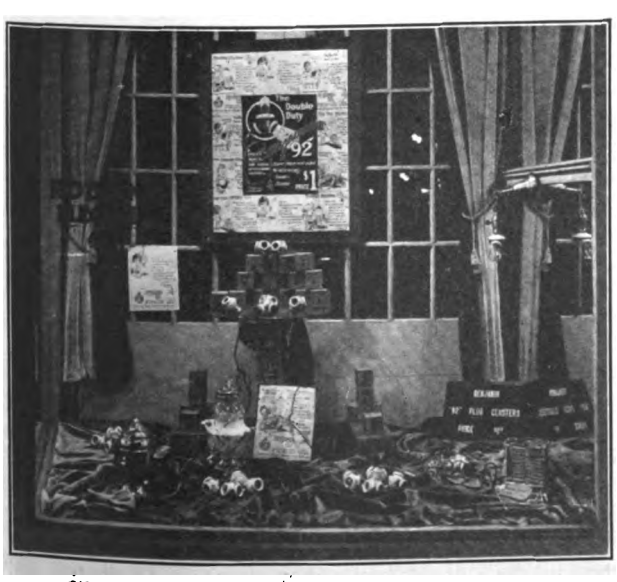
Members of the Society for Electrical Development are making use of the services of its advertising department, which criticises copy and suggests many necessary changes. The writer recently saw some of its criticisms and found them to be intelligent, logical and to the point. New copy had been written in a good many cases, and the value of the space to be used was thus increased, because no matter how good the advertising medium the results will not be great unless the matter which goes into the space is satisfactory.

One point emphasized in a certain case was that the dealer was not using enough space. He was trying to tell his story in a crowded little four-inch space when the proper statement of the proposition would have taken at least ten inches. Another suggestion was, if small space is to be used, that the dealer should try to score but one point at a time, instead of stating the whole proposition.

Studying the advertising you did last year and trying to improve it is one way to get better results. In this connection it may be said that it would pay every dealer to keep a record of all of his advertising, so that he can look back and see just how he has been exploiting his business. A book in which copies of advertisements could be pasted, and the results obtained from the different classes of publicity set down, probably is the best method of keeping advertising records.

Noteworthy Pittsburgh Window Display.

The accompanying illustration shows a very attractive window display of the Robbins Electric Company, of Pittsburgh, which attracted considerable business. The Benjamin cluster socket is featured, the display being a part of a national campaign on these devices.



Window Display of Robbins Electric Company.

Japan Now Manufacturing Most of its Electrical Supplies.

The American consul at Yokohama, Japan, has transmitted a report showing that the electrical supplies industry in Japan has grown to a remarkable extent in the 25 years of its existence, and the country is no longer dependent upon foreign countries to supply its needs.

Efficient moderate-size motors and generators up to 100 horsepower are manufactured at moderate prices. The small sizes of motors up to 10 horsepower are made in large quantities, and comparatively cheaply, and the export prices would compare favorably with those of European factories. Transformers are turned out at low prices and of good efficiency, but the iron sheets are in nearly all instances imported.

In electrical conductors, Japan is in a position to compete with the United States and Europe in quality and price, as it is a large producer of copper and silk, and its spinning and textile industries are well developed. Japan also has the advantage of cheap water power and labor. With the exception of submarine telegraph cable, the former large import of insulated conductors has entirely ceased. All classes of electric lighting and power cables, rubber and paper-insulated for high or low tension, are made to any specification; flexible silk cords, all types of telephone cable, military and naval cables, are well made in large quantities in well laid out factories and under expert and scientific supervision.

Porcelain insulators and porcelain ware and glassware for all purposes are largely exported. Brass work, switches, lamp-holders, and cut-outs, although perhaps not quite as good as the best European types, are sold at low prices and prove quite satisfactory.

Metallic-filament lamps are made in large quantities, but practically all the producing factories are controlled by a monopoly which controls the export trade. This may be overcome in the near future, as lamps made under other patents are reported to be shortly coming into the market.

Switchboards, instruments, and meters are still imported where high-class work is required, but for ordinary use the Japanese-made article meets the requirements at half the price of the imported goods. The same may be said about laboratory and testing instruments and telegraph instruments, the native-made articles improving all the time and the imported goods being gradually superseded.

In telephones, Japan is not only self-supporting, but is doing a considerable export trade to its near neighbors.

All the various electrical accessories are now being manufactured by small Japanese factories. Electric fans, torches, bells, batteries, devices of every kind as used in Europe and America are obtainable at prices often lower than they can be produced in western countries.

The prospects for the electrical manufacturing industries in Japan are good, but foreign buyers must bear in mind that the reputation of the Japanese manufacturer is not yet established, and that, therefore, it would be best for them to carry on their business through reliable agents only. Japanese in the electrical industrial trade are not as yet acquainted with the export trade and have no catalogs of their manufactures.

Incandescent Lamps for Government Use.—The lamps purchased by the Federal Government, amounting to about 1,250,000 annually, are inspected and tested by the United States Bureau of Standards. The specifications, under which they are tested, are published by the bureau and are recognized as standard by the manufacturers as well as by the government. They are used also by many other purchasers of lamps.

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National Association of Electrical Inspectors.

HUBERT S. WYNKOOP, President, 1574 Fiftieth Street, Brooklyn, N. Y. WASHINGTON DEVEREUX, Vice-President, 131 South Fourth Street, Philadelphia, Pa. WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
R. P. STRONG, Representative on Electrical Committee of National Fire Protection Association, 809 Hibernian Bank Building, New Orleans, La.

Executive Committee
J. C. FORSYTH, Chairman, 123 William Street, New York City.

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H. G. Veit, Cleveland, O.

"LET THE CODE DECIDE."

Secretary's Message.

As previously stated, the Western New England Section held its April meeting on April 12, at the City Hall, Holyoke, Mass., at which meeting E. L. Bradley, 146 Hart Street, New Britain, Conn., and Raymond Hotchkiss, 71 Leete Street, West Haven, Conn., became members. Arthur J. Newell, of Holyoke, gave an address on the "Electrical Inspector and Contractors." Dinner was served at the New Nonotuck Hotel, and at 4 p. m. City Inspector Paul Neumann conducted the party through the works of the Holyoke Water Power Company and the Municipal Electric Light Station.

The annual meeting of the California Section was held April 8 at Jules' French Restaurant, San Francisco, the general subjects being "Ground Clamps" and "Overload Protection of Motors on Running Leads." It was felt that ground clamps accommodating smaller than No. 6 wire were inadvisable from the field standpoint. The officers elected for the ensuing year were: B. C. Hill, City Hall, Oakland, Cal., president; F. R. Ellison, 1712 Bridge Avenue, Oakland, Cal., vice-president; G. A. Cleary, Milbrae, Cal., secretary-treasurer; A. V. Yowens, City Hall, Palo Alto, Cal., and J. A. Royster, Martinez, Cal., Section Executive Committee. B. C. Hill and G. A. Cleary, representatives on the Executive Committee of National Association of Electrical Inspectors.

The Secretary again earnestly calls the attention of members, *section* as well as *at large*, to the immediate payment of dues for 1916 *if it is desired to remain on the mailing list.*

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Designation of Switches.

Question 324. In many cases there seems to be a confusion of definitions concerning different types of switches, few persons agreeing exactly. Will the Executive Committee members give their understanding of the terms "three-way switch," "three-point switch," "three-pole switch and "three-circuit switch?"

Answer 1(M). A three-way switch is one so constructed that if two are installed in the same circuit, the current may be controlled at either one independently of the other.

A three-point switch is one by which current from one conductor may be distributed to any one of three other conductors.

A three-pole switch is one which controls the current in three conductors simultaneously.

A three-circuit switch is one by means of which the current may be controlled consecutively in three circuits all having one wire in common.

Answer 2(U). This question is hard to answer because the wireman finds some makers call a three-point switch a three-way switch. They also call a four-way switch a four-point switch. A three-pole switch is one that has three line wires of a three-wire circuit entering it, disconnecting all three when turned off.

A three-circuit switch is one that connects the line to three different circuits (used in heaters and electroliers). Some manufacturing catalogs call these "three-circuit electroliers" and three-point switches.

Answer 3(R)*. A three-way switch is one used in combination with another similar switch to control a device independently from two places.

A three-point switch is one having a controlling arm which can rest selectively on three successive points.

A three-pole switch is one designed to close simultaneously three separate poles.

A three-circuit switch is one arranged to control three circuits having one common wire.

Answer 4(A)*. As nearly as I can find out a three-way switch is one having one feed wire entering the switch and two bus wires running between the switches with a feed connecting the second switch either from the light or cutout.

A three-point switch is a different term for the three-way switch.

A three-pole switch is one having three pairs of contacts on the one handle.

A three-circuit switch is also called an "electrolier switch."

Answer 5(O). A three-way switch is one used in lighting work with three terminals so that one is alternately connected to the other two.

A three-point switch, when referring to lighting work, is the same as a three-way switch.

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A three-pole switch is one designed to open simultaneously all the wires of a three-wire circuit.

A three-circuit switch is a term used in connection with "progressive" or "electrolier" switches and might refer to the "three-heat" switch used to control heating devices.

Answer 6(T). Three and four-way switches are used for the control of lights from two or more localities. The three-point switch is a type of electrolier switch used to control groups of lamps. A three-pole switch is one suitable for use on a three-phase or three-wire Edison circuit.

Answer 7(S)*. A three-way switch is a single-pole switch constructed so that in common with another it may be used to control a device from two places.

A three-point switch is one which completes a circuit through three distinct contact points.

A three-pole switch is used for the control of three-wire circuits.

A three-circuit switch is one to control three circuits either one at a time or all at a time. About here they are commonly known as three-*section* switches.

Answer 8(F and G). A three-way switch is a type of switch used to control a consuming device from two distinct places.

A three-point switch has three contact points and one main lever which can rest on any of the three.

A three-pole switch is to open or close three separate wires.

A three-circuit switch is to control three taps or branches from the same circuit as on an electrolier; first point gives group one of lamps, second point *adds* group two, third point *adds* group three, fourth motion disconnects the lot.

Answer 9(E). A three-way switch is a single-pole switch with three points of contact for controlling a device from two places.

A three-point switch has one common feed connecting to any one of three distinct circuits.

The most common type of a three-pole switch is the three-blade knife switch, though it is also made in snap form; all three wires open simultaneously.

A three-circuit switch is what is commonly known as an electrolier switch.

Answer 10(N)*. The nomenclature of switches is in a very mixed and illogical shape. I recently had some correspondence with an English firm in which they stated they could not tell from our catalogs what an American switch really was, but had to see a sample or wiring diagram. French correspondents have said the same thing.

The "three-way" as commonly defined is really a *three-point, two-way, single-pole transfer switch;* it is not a three-way switch at all.

The "three-point," as many call it, again, is not this, but is a *four-point, three-way, selective distributing switch.*

The "three-pole" switch is a *six-point, three-way disconnecting switch.* It controls three wires simultaneously. It may be a three-circuit, single-pole, simultaneous control switch, or again a one-circuit, triple-polarity, simultaneous control switch. The "three-circuit" switch, as the term is usually used, is a five-point, *three-group* (or section) *paralleling and disconnecting, single-pole switch.*

In English and other foreign catalogs I have usually found that the switches are listed so clearly and logically that there can be no mistake, which is very far from the case with us.

Three-Wire Distribution for Electric Signs.

Question 325. Are outside electrical signs permitted to be three-wire distribution where a three-wire feed is provided in your territory?

Answer 1(D). Yes, if it appears necessary.

Answer 2(R)*. Yes, in this jurisdiction it is allowed.

Answer 3(P)*. Three-wire sign circuits are permitted here.

Answer 4(S)*. They would be allowed if they did not conflict with Rule 23*d*, fifth paragraph.

Answer 5(B)*. Three-wire distribution is permissible under the Code.

Answer 6 (F and G). We accept three-wire distribution for outside electrical signs where three-wire feed is provided.

Answer 7(E). We can only speak for the custom of our department, which has been uniformly to discourage the use of three-wire distribution in *all* forms of installations where fuses are omitted in the neutral. The objection to the practice outlined in the question, as defined by Section *d* of Rule 23, might well be applied to outside electrical signs.

Answer 8(O). Rule 23*d*, fifth paragraph, prohibits three-wire branch circuits and this rule applies to outside signs or any other wiring protected by service cutout and switch.

Answer 9(T). I can find nothing in the Code to prohibit this, *provided* circuit is installed as required by rules for three-wire system.

Answer 10(H)*. Not to my knowledge.

Answer 11(N)*. Provided the feed comes from building side of service switch with grounded neutral *unfused* they are not allowed. This covers every case in my territory.

Capacity of Gatun Hydroelectric Plant to be Increased.

Extensive changes have been authorized for increasing the capacity of the hydroelectric plant at Gatun, Panama Canal Zone. New turbine wheels have been ordered for the three turbogenerator sets, each of 4,400 horsepower, instead of 3,100 horsepower as at present. No change will be made in the generators, as the very liberal design of these units makes it possible to operate them with an output of 3,650 kilovolt-amperes, at 80 per cent power-factor and 55 degrees centigrade temperature rise.

In order to take care of the increased output of these generators, four new 400,000-circular-mil cables have been ordered for installation between the hydroelectric station and the Gatun substation. The present cables between these two points are ten in number, and of No. 0000 size.

In addition, two 4,000-kilovolt-ampere power transformers have been ordered for the Gatun substation. These are the largest transformers that can be installed in the existing compartments. There is now one vacant compartment for one of these transformers, and the other compartment will be provided by moving one of the present 2,667-kilovolt-ampere units to the Cristobal substation, where it will be needed to take care of the increased load at that point, due to the operation of the new coaling plant, terminal piers, and the projected submarine base.

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BOOK REVIEWS

"Modern Illuminants and Illuminating Engineering." By Leon Gaster and J. S. Dow. New York: The Macmillan Company. Cloth, 462 pages (5¼x8½ inches), 204 illustrations. Supplied by the Electrical Review Publishing Company, Inc. for $5.00.

Few writers have faced a more difficult task than that of presenting a treatise on practical illumination which will not be antiquated in a comparatively short time. However, the authors (whose names have long been familiar to those interested in illuminating engineering) have succeeded admirably in producing a volume which might serve for several years as a textbook on this subject and for a much longer period as a work of reference. This is true partly because the volume reflects the discussion platforms provided by the Illuminating Engineering Societies of both England and the United States and aims to be impartial, partly because of the large number of references to periodicals, and also because of the systematic way in which so large a mass of valuable matter has been condensed and presented in attractive form.

Besides tracing the history of illuminants and of their efficient use, the authors devote long chapters to the effects of light on the eye, the influence of color and the means of varying the color of illuminants, the design and calculation of illuminating equipment for various indoor and outdoor purposes, and the measurement of light and illumination. The effect of glare and the rules for avoiding it, the influence of color on visual acuity, the need of good industrial lighting as a means of preventing accidents, the importance of the silhouette effect in street lighting, the value of shadows in artistic lighting, the defects of common types of shades, the desirable intensities for various classes of service—these are but a few of the points treated in harmony with the developments of the last few years, but in such clear language as to be easily understood by laymen. In view of the British authorship, the 205 illustrations are international to a surprising degree, but the footnotes referring to articles in periodicals relate chiefly to European publications and would be improved by references to the corresponding reprints or abstracts in American journals. Occasionally, the authors' aim at impartiality is unfortunate, as when they cite Dr. Rideal's paper on the comparative hygienic value of gas lighting without mentioning that the Rideal tests were made under conditions not ordinarily found and with electric lamps of a type that has long been obsolete. However, these instances appear to be too rare to seriously mar a volume which can be recommended to all who wish a handy volume on this general subject.

ALBERT SCHEIBLE.

"The 'Mechanical World' Electrical Pocket Book for 1916." Manchester: Emmott & Company, Limited. Cloth, 240 pages and diary (4x6 inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for 30 cents.

The 1916 edition of this handy work has been revised and new sections introduced on earthing, or grounding, on efficiency of direct-current machines, and on lamp transformers. The section on switchboards has been extended, and new material introduced dealing with storage batteries and new types of lamps. There are a number of valuable and useful tables, and the volume altogether constitutes a helpful addition to the electrician's pocket, especially when no more pretentious handbook is carried.

"The Mechanical Engineers' Pocket-Book." By William Kent. Ninth edition, revised with assistance of R. T. Kent. New York: John Wiley & Sons, Incorporated. Leather, 1526 pages (4x6¾ inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $5.00.

The reputation established by the earlier editions of this handbook will be fully maintained by the present edition. Much new material has been added, comprising altogether about 300 pages, notably on the testing of engines and boilers, machine-shop work, electrical machinery and applications of electricity. In all about 80 pages are devoted to electrical subjects, and this portion of the book has been entirely rewritten. Enough electrical material is given to cover the ordinary wants of the mechanical engineer. As the name implies, the volume is distinctively designed for the mechanical engineer, and the fields of the electrical and civil engineer are avoided as largely as possible. A number of other sections, such as that on machine-shop practice, have been entirely rewritten and improved. Data on the power requirements of machine tools are given, and these, with the section on motor applications, are a notable addition to the book. New tables include those on electrical conductivity, lamp characteristics, properties of structural steel, analyses and heating values of coals, and properties of ammonia. The book is less than two inches thick; hence not as bulky as some of the other handbooks recently issued. This is a distinct advantage; yet even it can hardly be appropriately termed a "pocket book." The typography in general is good, but some of the tables could be improved in this respect.

"Pole and Tower Lines for Electric Power Transmission." By R. D. Coombs. New York; McGraw-Hill Book Company, Incorporated. Cloth, 272 pages (6 x 9 inches), 162 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

Electric power transmission has made such rapid strides in the past few years as to almost prohibit pausing for the collection and compilation of data pertaining to it. Further, the careful designing of a line carried one into the depths of the laws of mechanics and required a considerable amount of time and energy to be spent in their adaptation. The author, mindful of this condition and with the welfare of this branch of engineering in mind, collected these data and produced the adapted formula. The data give a clear idea of what has been done and how successfully, and the formula applied gives the knowledge of the strength and characteristics of the various forms of construction. With this knowledge, there should be assured only that electrical transmission construction which is durable, safe and economical.

The following subjects are treated in a clear and concise manner: types of construction, conductors (their physical characteristics), supports (wood, concrete, steel poles and steel towers), special supports (for more severe duty), wood and its preservation, foundation (calculation of various kinds), protective coating, various line materials, erection cost data, ground wire and protection, and specifications.

M. H. WAGNER.

"Examples in Magnetism." By F. E. Austin. Second edition. Hanover, N. H.: Published by the author. Flexible leather, 90 pages (4¾x7½ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $1.10.

The use of quantitative problems in obtaining a mastery of any physical subject is always advantageous, and this volume will consequently fill a need for many teachers and students. An explanation is first given of the topic under consideration, an example is then worked out, and additional problems given, the first of which has the answer appended. The range of problems covers the field of the physicist rather than the electrical engineer, and brings in but little practical application of magnetic theory. Needless complication is introduced by mixing English and metric units. One of the pedagogical fundamentals is to take one step at a time, and to becloud the real magnetic problem with conversions from one system of units to another is unfortunate. It is bad enough to have to make such conversions after familiarity with one's subject is attained. The diagrams in the book are generally clear. The publisher is to be congratulated upon the use of uncalendered paper, but why green ink should be chosen is not clear. The references given do not seem at all suited to the subject matter of the problems, and are full of typographical errors.

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NEW APPLIANCES

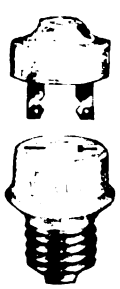
A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hubbell Polarized Separable Attachment Plug.

The rapid increase in the use of portable tools and machinery has brought about a demand for a convenient polarized separable attachment plug for use on direct-current circuits and with devices where definite polarity is necessary. This is particularly true with storage-battery circuits and certain magnetic appliances. To meet this need the firm of Harry Hubbell, Incorporated, Bridgeport, Conn., has placed on the market a small separable attachment plug with polarized contacts in which the slits in the base part of the plug are at right angles to each other and the knife-blade contacts of the cap correspond. By this arrangement it is evident that it is impossible to reverse the polarity after it has once been established in the cap.

Another feature of this plug is that the contacts are so arranged as to make the device practically universal in

Hubbell Separable Plug with Polarized Contacts.



Standard Hubbell Plug Adapted for Polarized Cap.

its applicability. These fit into the Hubbell T-slot receptacles, both of the surface and flush types, for either alternating or direct current. This interchangeability makes the plug a very valuable one, since it may be used as a polarized plug when necessary or as a universal plug, if definite polarity is not needed. To increase the service possibilities of this new plug, the base of the well known and standard separable plug No. 5406 has been arranged so that it may take either the porcelain cap usually supplied with it or the cap of the new plug, which is designated as No. 6915. This is well shown by the two accompanying illustrations of these two plugs. From this it is evident that the new plug is made of a composition which is a tough, heatproof compound with a nickel-plated screw shell, the whole presenting a compact and pleasing appearance.

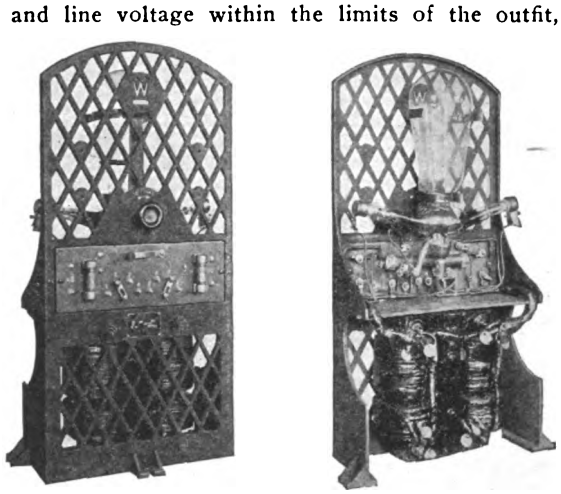
New Mounting for Protecting Thermoelements.

A mounting for protecting laboratory thermoelements from damage by contamination or by mechanical strains has been developed at the Bureau of Standards in connection with investigations of the expansion of substances on heating. Protective mountings with convenient heads for attaching the leads to the millivoltmeters that indicate the temperatures are common with industrial thermocouples, but the wires of the average couple to be seen in a physical or chemical laboratory are either entirely unprotected or else merely have portions adjacent to the junctions inserted in glass or porcelain tubes. The mounting regularly used in the expansion laboratory of the bureau not only affords adequate protection to the thermoelement, but also adds greatly to the convenience of its use.

Scientific Paper No. 276, entitled "Protected Thermoelements," discusses this subject and persons interested may obtain copies of it, free of charge, upon request to the Bureau of Standards, Washington, D. C.

Battery-Charging Outfit for Electric Vehicle Batteries.

To meet the demand on the part of electric-vehicle owners for a simple, convenient, reliable and economical means of charging batteries, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has developed a rectifier outfit which consists of a transformer-reactance and Cooper Hewitt rectifier bulb mounted on a cast-iron frame. The transformer is so arranged as to deliver, without the use of extra resistance or reactance coils, the gradually decreasing current best suited for battery charging. Terminals are provided for connecting the alternating-current lines and the battery circuits to the outfit. Fuses for overload protection are placed in both the alternating and direct-current circuits. A simple starting switch, and two link connectors, by means of which transformer connections are changed to suit any particular battery and line voltage within the limits of the outfit, are



Front and Rear Views of Battery-Charging Rectifying Outfit.

additional features. The bulb is tilted by means of a handle on front. Provision is made for mounting a voltmeter and ammeter directly on the frame, if these instruments are desired.

This outfit has been designed primarily for the business man who is not an electrical expert and who cannot afford to spend his time caring for the charging apparatus or in delay incident to an unreliable charging outfit.

New Ideas in Cutler-Hammer Sockets.

Because of the greatly increasing use of candle fixtures the new C-H candle-length sockets made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., are of particular interest. In these sockets the standard screw

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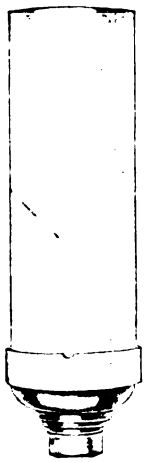


New C-H Plain Candle-Length Socket.

Candle-Length Socket with Side-Outlet Cap Applied on Candle Stick.

C-H Side-Outlet Socket (No. 7560) Applied on Candle Stick.

shell for receiving the lamp is placed at the top of a four-inch candle, while, as shown in the accompanying phantom view, the usual C-H push-button mechanism and binding screws are at the bottom, this portion being identical with that used in the standard type of C-H socket. In place of the brass shell a tube of fiber is employed which fits securely into the cap. This type of candle socket is neat in appearance and is very easy to wire, the conductors being secured under the binding screws in the regular way. No other wiring from switch mechanism to screw shell at top is required. This shell is mounted on substantial supports which also act as conductors. The whole device is in one piece and therefore eliminates the need for stocking and handling the various parts usually required, and reduces the amount of work necessary in constructing the fixtures. The screw shell at the top is the standard type and regular Edison base lamps may therefore be used.

Two styles of C-H candle-length sockets are made, one being better suited for ceiling or wall fixtures, and another being particularly suitable for portables. The latter style has an extra outlet in the side of the cap. In the position of the portable shown in one of the illustrations the extra outlet and the method of bringing the cord out of this outlet is shown. The push-button operation is claimed to have several points of advantage; the buttons are inconspicuous, they operate by a slight pressure of the finger tip, and on portables there is no tendency to pull the lamp over. When desired these sockets are furnished without operating mechanism. As with all C-H sockets, these have the same high capacity rating, 660 watts, 250 volts.

Another addition is the new side-outlet socket (C-H No. 7560) which is like the standard C-H push-button lamp socket, except that it has an extra outlet in the cap. This outlet provides a passage for the conductors, and the support for the socket may therefore be a gas fixture, a rod or other solid pedestal instead of a pipe or tube. Since no wiring is necessary for such fixtures it is possible to make up attractive table lamps and portables quickly and at a low price.

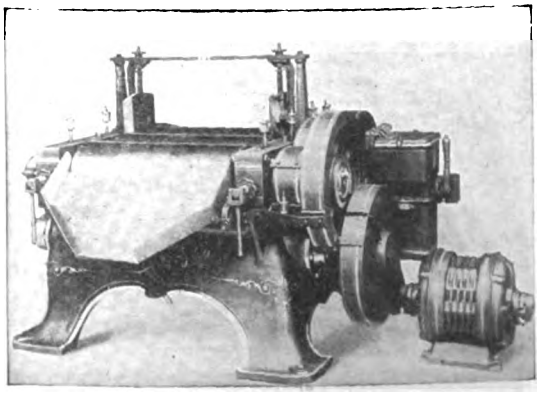
Phantom View of Candle-Length Socket.

Candle-Length Socket Used on Bracket.

Motor-Driven Ink or Pigment Mill.

The demand for a printer's ink or pigment mill to grind inks, flat-drying wall paints, enamels, and color varnishes, led to the development by the J. H. Day Company, of Cincinnati, Ohio, of the Day three-roll printers' ink or pigment mill.

Large chilled iron rolls are used for grinding that are mounted on a solid frame which is a single casting. Its great weight eliminates the possibility of vibration, and



Electrically Driven Ink or Pigment Mill.

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insures the stability required in producing the finest quality pigment.

The bearings for the rolls are very heavy and fitted in large planed housings, which are provided with phosphor-bronze bushings of peculiar construction forming an oil-flooded bearing and thus preventing the journals from heating. All the gears are machine cut, have a wide face, heavy pitch, and run as nearly noiseless as possible.

To facilitate cleaning, the scraper apron is made adjustable to any angle. It follows the roll, which can be moved in and out by means of a handwheel, and can be released from contact with the roll, drawn back and readily cleaned. The rolls, which are hollow, can be fitted with packing boxes to admit steam or hot water, when desired, or when required the rolls can be water-cooled.

The illustration shows a Day mill direct-connected to a three-phase induction motor. The motor is of the squirrel-cage, constant-speed type and is equipped with a hand-operated auto starter. Both the motor and starter were manufactured by the Westinghouse Electric & Manufacturing Company.

Mohrlite Indirect and Semi-Indirect Lighting Equipment.

The growing popularity of both indirect and semi-indirect lighting is bringing about a great deal of research in these lines which is resulting in the development of new lines of fixtures. Among manufacturers of such equipment is The Mohrlite Company, Urbana, O., which has produced an array of lighting equipment as the result of extended scientific research work. The fixtures constituting the Mohrlite line consist essentially of two parts, an upper surface of special shape resembling the conical, and a lower reflecting bowl or combined reflecting and diffusing globe. The upper reflecting surface is so designed as to throw the light that falls upon it downward and sideways into useful directions, the curve having such a form as to accomplish this in a very effective manner. In the case of purely indirect fixtures all of the light is thrown upon this upper surface. In the case of semi-indirect fixtures most of the light is thrown up in this way, but a certain percentage is allowed to pass through a diffusing globe, which is made of Moonstone glass. This is a beautiful white glass, which has come into extensive use in lighting fixtures of the better type.

The Mohrlite fixtures are made in two general types, the commercial, which has comparatively plain lines and is unornamented, and the ornamental type fixture, in which is incorporated as much ornamentation as meets the taste of the purchaser. Two examples of these fixtures are shown

Mohrlite Ornamental Indirect Fixture.

Mohrlite Commercial Type Semi-Indirect Fixture.

in the accompanying illustrations. The first is an ornamental type, which has been found particularly attractive and suitable for use in residences, apartments and exclusive club houses. The lower bowl in this case is made either from Moonstone white glass or of a composition embodying an indirect reflector on the inside. This fixture can be arranged for either three or four lamps, these lamps ranging in size from 15 to 60 watts. The diameter of the top of the fixtures is 24.5 inches, and the approximate full depth of the fixture is 15 inches. In the ornamental line a large variety of decorative treatments and finishes can be included in the ornamental band about the upper surface and in the lower bowl.

The second illustration shows one of the commercial forms of fixtures, which can be made even with more plain lines than that shown. The particular fixture illustrated is of the semi-indirect type, and can be made in a large variety of sizes. It is designed for use with a single lamp, and this lamp may be of any size between 15 and 500 watts. The diameter of the top of the fixture varies from 15 to 31.5 inches, and its depth from 12 to 23 inches.

Insulating Underground Cable Joints by the Conducell Method.

The development of the central-station industry in our large cities has involved the use of increased transmission voltages and more and more use of underground cables. Since reliability of service is of prime importance extra attention is now given to the making of the cable joints, which have almost invariably proven to be the weakest parts of the cable system. Even with this extra care, however, cable breakdowns due to faulty joints are still prevalent.

To eliminate this source of trouble an improved method of insulating cable joints has been developed by the Mica Insulator Company, 68 Church Street, New York, N. Y. It has been devised especially for the three-conductor cables used for three-phase transmission and consists of four principal parts. There is an outer seamless sleeve,

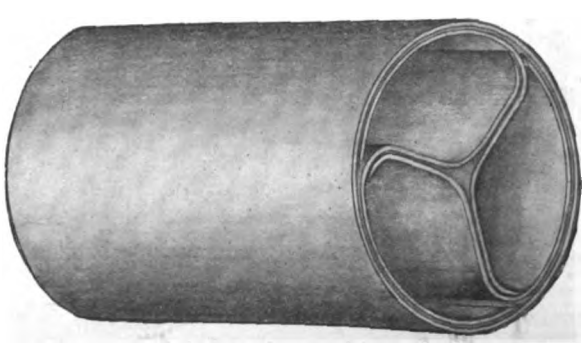

Fig. 1.—Arrangement of Conducell Separating Barriers and Inclosing Sleeve.

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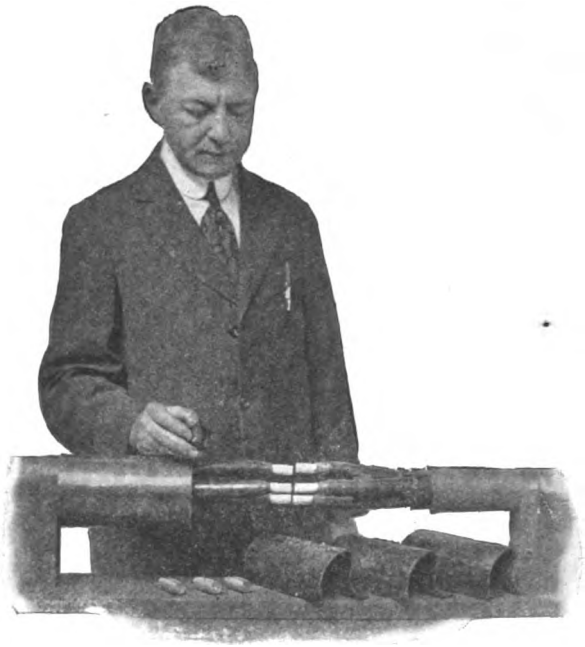


Fig. 2.—Cable Ends Ready to Be Soldered.

inside of which fit three interlocked insulating separators or barriers. Fig. 1 shows these parts assembled apart from a cable and gives a good idea of the arrangement, which is appropriately named Conducell. These parts are made of Micanite sheets either one-eighth or three-sixteenths inch thick and molded to the form shown.

The method of jointing a cable is very simple. The lead sheath is cut back 7.5 inches on each end and the outer insulation removed 6.75 inches from the end. On each conductor the insulation is removed so as to expose a little over one inch of the bare conductor. The end of the insulation is tapered off and the section of lead sheath to go over the joint, together with the outer Conducell sleeve, slipped over one end. The three conductors are now spread apart a short distance by means of a special separating piece. The joint now appears like that shown in Fig. 2. Now the cable is ready to be spliced, which is done by soldering copper sleeves over the abutting conductor ends. The usual practice of taping each conductor is eliminated; instead of it the three specially shaped barrier pieces, shown lying directly below the joint, are inserted between the conductors one by one, their outer surfaces forming a cylindrical contour. This is shown in Fig. 3 where the outer Micanite sleeve is ready to be slipped in place. When this is done it is apparent from Fig. 1 that there is a double wall of insulation between each of the conductors and between the conductors and the outer protecting lead sheath. In other words, each conductor is incased in a separate compartment or cell. As soon as the lead sleeve is slipped over the assembled Conducell and properly "wiped" to the cable sheath at each end, the joint is ready for filling with any approved insulating compound. The Mica Insulator Company produces a special compound, known as Conduline, which is particularly suited for this purpose.

Fig. 3.—Conducell Barriers in Place and Ready for Outer Sleeve.

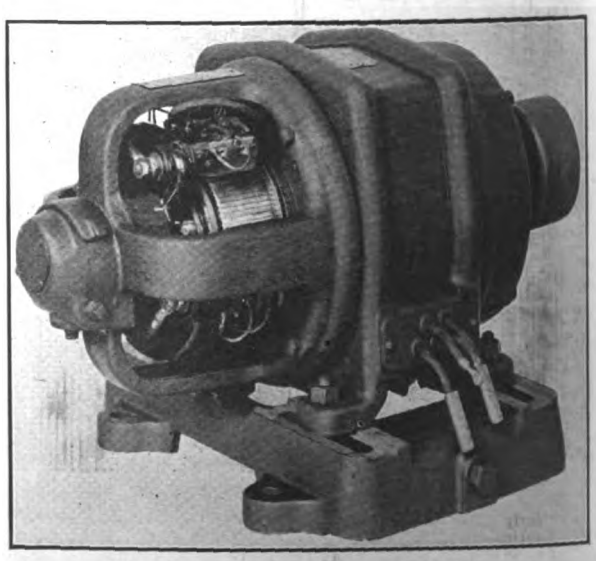
From the foregoing brief description it is clear that the advantages of the Conducell arrangement are twofold, first, that the conductors are separated by positive and uniform insulating barriers combined with an insulating compound that eliminates the danger of moisture or air being trapped in or allowed to enter the joint; second, that the entire joint is easily and reliably made. The Conducell system is made in three sizes, ranging from 2,000 to 25,000 volts.

New General Electric Single-Phase Motors.

A new line of single-phase motors of type RI form C has recently been put on the market by the General Electric Company, Schenectady, N. Y. These motors combine to a high degree those mechanical and electrical qualifications which appeal to both the central station and the final user.

Electrically considered, it is claimed that the characteristics of these new motors will bear rigid comparison with the best among motors designed for use on alternating-current circuits. Power-factor and torque—so often the limiting features of single-phase motors—have been given special consideration. The power-factor is high at no load, and practically approaches unity at the usual operating loads. The torque—starting, accelerating and maximum running values—provides ample turning moment to meet practically all the demands of electric drive. In the reduced number of parts, absence of centrifugal devices, simplicity, and strength of brush rigging, care in insulation and the protection of vital parts the new line of motors evidences the painstaking attention focused upon all mechanical and electrical details.

These motors are built to cover a range between 0.25 and 20 horsepower inclusive. A simple change in the connections of outgoing leads makes these motors adaptable for either 110 or 220-volt circuits.



New General Electric Single-Phase Motor.

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New Type of Haag Twin Electric Washer.

A new electric washer of the twin type has recently been developed by Haag Brothers Company, Peoria, Ill. This is an improved form of machine described in our issue of February 12, 1916. A feature of this new machine is the two controls with which each tub is provided.

New Type of Haag Electric Washer.

The mechanism is stopped or started automatically by raising and lowering the lid, or by means of levers at each end of the machine. If the operator wishes to use but one tub, the other can be stopped with this lever without raising the lid, or both tubs can be stopped without lifting the lids, thus retaining the heat in the water while the machine is idle.

The wringer revolves completely around in either direction and can be locked in any position. A wide, reversible drainboard prevents water from splashing on the floor when wringing.

There is very little machinery on the tops of the tubs and the mechanism is so constructed that it is impossible for the hands or clothing to become caught. The light weight of this mechanism makes it easy for the operator to raise the lid. The machine is 26 inches wide by 52 inches overall, with the extension rack folded. This rack is 18 inches wide.

The platform is made of angle steel and the legs are finished with extension castings which permit the height of the machine to be adjusted to suit the operator. The drain pipes are threaded for hose attachments. The tubs are made of 1.25-inch Virginia white cedar.

These machines are equipped with the new Robbins & Myers washing-machine motor which was recently described in these columns. This motor is provided with special end heads which have overhanging grids to protect the motor from water and at the same time allow thorough ventilation. The motor is mounted on a platform under one of the tubs and is belt-connected to the machine.

British Aluminum Developments.

The British Aluminum Company, Limited, has completed and put into service its additional plant for the manufacture of carbon electrodes, but the erection of its new alumina works has been delayed owing to shortage of labor and material and will not be in operation for some months. The Orsieres power scheme stands deferred as no further development work thereon can be carried out until the end of the war.

Aluminum is being put to many new uses consequent upon the war and it is anticipated that recent uses and developments will go a long way toward making up for any falling off that may occur in the ordinary demand during the period of recuperation required by all countries involved in the war. Recent experience will have the effect in the future of considerably broadening the uses and application of the metal.

View in the Armature-Winding Department of the Robbins & Myers Company, Springfield, O.

Nearly 600 girls are employed in this department, in which armatures for the smaller motors are wound. The business of the Robbins & Myers Company has shown such a rapid growth that new additions to the plant have been necessary every year during the past four years. At the present time buildings are being constructed which will be ready for occupancy this summer and which will increase the size of the plant by nearly 50 per cent. This company specializes in small motors, from 25 horsepower down to the smallest sizes used commercially, and in electric fans.

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INDUSTRY ACTIVITIES

Roth Brothers & Company, Adams and Loomis Streets, Chicago, Ill., has issued Bulletin No. 212 on type C and type IX alternating-current motors.

The Wagner Electric Manufacturing Company, St. Louis, Mo., announces the removal of its office in Denver, Colo., to 1633 Tremont Street, to continue in charge of O. H. Davidson. A stock of motors will be carried at this office.

Kerwin Brothers, Oelwein, Iowa, have issued a bulletin on the K-N electricity saver, which is an automatic switch arranged to operate a snap switch in combination with two single-throw, single-pole switches in series for manual control.

Hughes Electric Heating Company, Chicago, Ill., has just closed a contract with the Illinois Athletic Club, of Chicago, calling for two electric ovens to be used in the new grill room of that institution. The connected load of the two ovens will be 22 kilowatts.

Bayer Steam Soot Blower Company, St. Louis, Mo., has published a 16-page bulletin entitled "The Bayer Steam Soot Blower for Horizontal Fire-Tube Boilers." The bulletin shows details of construction and operation and gives the experiences of a number of users. A copy will be sent free to engineers upon request.

The Anchor Electric Company has been organized by Gregory O'Kelly and J. L. Kennedy and has established offices and manufacturing quarters at 557 West Jackson Boulevard, Chicago, Ill. The company manufactures renewed tungsten incandescent lamps, Roger's therapeutic lamps, high-frequency electrodes and glass work for electrical and other uses.

Shaw Insulator Company, Newark, N. J., has issued bulletin A16, which is devoted to Shaw lightning protective equipment. This bulletin discusses lightning protection in general and then describes in detail the various types and parts of the Shaw lightning arresters. These devices are made for potentials ranging from 60 to 66,000 volts. The company also has available for distribution folders describing its third-rail and line-suspension molded-composition insulators which have been used on a large number of important electric railway systems.

The Electric Storage Battery Company, of Philadelphia, Pa., has recently opened a new Exide battery depot and service station at 184 Clinton Avenue South, Rochester, N. Y. The company's former quarters in Rochester at 44 Cortland Street became too small for the growing business in that territory, necessitating the removal to a larger and more attractive depot, which has a floor space of 7,000 square feet. The company carries in stock in Rochester a complete line of both Exide starting and lighting batteries for gas cars and Exide batteries for electric vehicles, giving it facilities to render very prompt service in that territory.

Ivanhoe-Regent Works of General Electric Company, Cleveland, O., has begun the third volume of its monthly house organ, *The Hunchman,* by presenting in the April issue interesting facts of its new Rozelle glassware. This is made in four shapes, both shades and bowls, and has a body of Veluria glass which is very artistically given colored decoration. These colors are fired and are, therefore, permanent. As usual, this issue of *The Hunchman* also contains numerous other illustrated articles relating to other Ivanhoe-Regent products, such as metal reflectors, Regent glassware for residence lighting, Holophane show-window reflectors, etc.

Central Electric Company, 320 South Fifth Avenue, Chicago, Ill., is distributing the latest issue of its automobile accessory catalog No. 37, which contains 320 pages of illustrations and descriptions of accessories for all makes of cars.

The National Conduit & Cable Company, 41 Park Row, New York City, in its last issue of "Copper Gossip," states that the character and extent of operations in the copper market indicates that the demand for that commodity may be expected to be kept up at an impressive rate during the entire year.

Sangamo Electric Company, Springfield, Ill., announces that it has recently secured an order from the Dayton Engineering Laboratories Company, of Dayton, Ohio, manufacturer of the well known Delco automobile accessories, calling for an initial shipment of 12,500 meters. It is understood that the Delco company will undertake the manufacture of isolated farm-lighting equipments and the Sangamo meters will be used as part of this equipment.

Standard Underground Cable Company, Pittsburgh, Pa., announces the following changes in the locations of several of its branch offices: The office in Chicago, Ill., is now located in the Conway Building, having moved May 1 from The Rookery, where it was located for many years. The office in Detroit, Mich., has moved from the Free Press Building to the Whitney Building. A new office will shortly be opened in Minneapolis, Minn., in charge of W. J. Weld. In the Pacific Coast department the office in Portland, Ore., has been discontinued and a new office opened in the Newhouse Building, Salt Lake City, Utah, in charge of F. W. Wilson.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently sold the following large-capacity electrical equipment: To the Buffalo (N. Y.) General Electric Company, complete switching equipment to control three 20,000-kilowatt turbogenerators and auxiliary apparatus for its river station. To the Narragansett Electric & Lighting Company, South Providence, R. I., one 45,000-kilowatt turbogenerator with condensers and auxiliary apparatus, and one 2,500-kilowatt synchronous booster rotary converter with transformers and switchboard equipment. To the Commonwealth Edison Company, Chicago, Ill., two 4,000-kilowatt, 25-cycle rotary converters for railway work, two 4,400-kilowatt, 60-cycle synchronous booster rotary converters for lighting service and two 4,200-kilovolt-ampere, 3-phase transformers, 12,000 volts, high-tension, a combination of water and self-cooled, according to the design of the engineers of the Commonwealth Edison Company. On this order there were also one 2,000-kilowatt, 60-cycle, synchronous booster rotary converter, one 2,200-kilovolt-ampere transformer and current-limiting reactances for generator and feeder leads. To the Public Service Company of Northern Illinois, for their Branden Bridge power plant at Joliet, Ill., three 3,000-kilovolt-ampere, single-phase transformers, two 9,000-kilovolt-ampere, three-phase transformers and switchboard to control one 10,000-kilowatt turbogenerator unit, transformers and feeders. To the Chicago & Northwestern Railway, two 1,500-kilowatt, one 500-kilowatt and one 50-kilowatt turbogenerators with condensers for its new Calumet terminal elevator. To the Leckie Fire Coal Company, Bluefield, W. Va., 16 five-ton Baldwin-Westinghouse gathering locomotives equipped with special ball-bearing motors and motor-driven reels.

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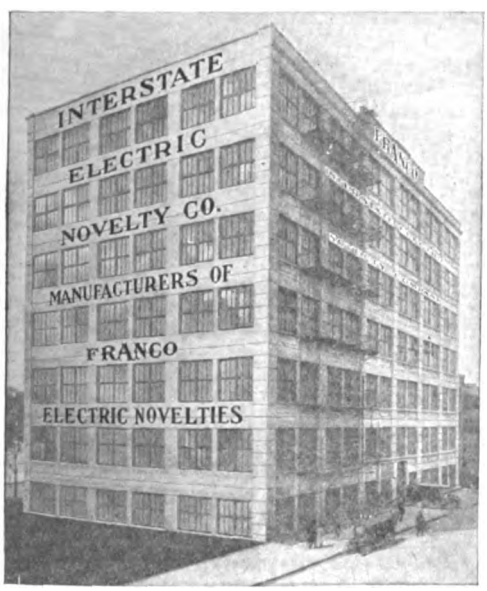
George Cutter Company, South Bend, Ind., manufacturer of electric-lighting fixtures and wiring devices, has issued its general catalog No. 14. In its 120 pages there are illustrated, described and priced the company's extensive lines of street-hoods and brackets, mastarms and pulleys, insulators and cross-arms, pole-line material, Mazda-arcs and pendants, ornamental posts and brackets, Sol-Lux reflectors and fixtures, panelboards and cabinets, metering panelboards, switchboards, cutout boxes and toggle bolts.

Reeps Manuafcturing Company, with offices at 50 Church Street, New York City, has recently been incorporated with a capital of $25,000. The company controls the patents on and manufactures Reeps dashboard oil and gasoline gages for automobiles; Reeps warning signal for bicycles and motorcycles, and several other electrical and mechanical devices. Charles S. Shuman, who at one time was connected with the Western Electric Company, at Philadelphia, and later sold Klaxon and Newtone horns throughout the country, is president and treasurer of the company.

The Interstate Electric Novelty Company has recently occupied its new factory building at 104 South Fourth Street, Brooklyn, N. Y. Within the past few years the flashlight



New Factory Building of Interstate Electric Novelty Company.

business has expanded so rapidly that the company's former factory space proved inadequate to take care of the demands for its products. The new seven-story factory contains nearly 100,000 square feet of floor space and is equipped with modern machinery devoted entirely to the manufacture of the company's Franco products. The new production facilities, which will permit of increased output, will also insure the continuance of the high quality of Franco flashlights, which were aawrded the highest honors at the Panama-Pacific Exposition. The company extends an invitation to dealers to call and inspect the new factory.

The C & C Electric & Manufacturing Company, Garwood, N. J., has designed and perfected a new line of direct-current motors known as type "IB." The new motors, which will be furnished in ratings up to 10 horsepower, are of the bipolar type, with commutating poles. They are built in open, semi-closed and totally inclosed types and are especially suitable for direct connection to machine tools, general industrial machinery, fans, and for other applications where a sturdy, reliable motor is required. It is said that C & C conservatism and principle of design incorporated in the new line has produced in a high degree the desirable characteristics of ruggedness and reliability. The new motors are described in advance bulletin No. 102-X, which is being distributed by the company.

M. B. Austin & Company, 700 West Jackson Boulevard, Chicago, Ill., has issued Bulletin C-F, a 32-page catalog of its line of conduit fittings, tools and wiring devices. The catalog is profusely illustrated and list prices given.

Electrical Apparatus Displayed at Boston Exposition.—Several electrical manufacturers exhibited at the Textile and Power Show, held at Boston, Mass., April 24 to 29. The exposition was one of the most complete ever held and attracted the interested attendance of thousands of mill owners and operators from all parts of the United States. Coincident with it was held the annual convention of the American Association of Cotton Manufacturers. The General Electric Company's exhibit contained a very complete line of textile motors and motor-controlling devices, such as are used in the most modern motor-driven mills in this country. There were shown, for the first time, several examples of textile motors of new design not yet on the market. One of these is a semi-inclosed motor, one end of which is closed and the upper half of the frame ventilated by means of a fine copper-wire screen over a perforated steel sheet, the object being to intercept the lint and dust. Air entering the screen is circulated around the rotor and comes out at the pulley end, which is open. In practice, it is found that lint accumulated on the screen acts as an effective filter to the fine dust of a weave room, and this is readily wiped off, at proper intervals. Another motor of interest to textile men is a 10-horsepower variable-speed, brush-shifting three-phase motor, with push-button control, for cloth printing, tenter frames and other machinery requiring a speed range of 3 to 1 or less, at approximately constant torque. The speed of the motor is changed by the shifting of the brushes by means of a fractional-horsepower motor, and in the larger motor gives 450 to 1,300 revolutions per minute. A single-phase motor of the same characteristics was also shown, this being with hand control, while the larger motor is equipped with push-button switches, designed to be mounted on the frame of the textile machine. The company's popular Universal four-frame motor was shown, mounted on a 4.5-foot shaft, with pulleys, the motor, a 20-horsepower, being unconnected with circuit. Ball bearings were installed in both motor and outboard bearing, and the slight friction and windage losses were demonstrated by a one-sixth-horsepower motor, belted to the shaft, which it drove at the rated speed. The General Electric Company's exhibit also included a two-horsepower induction motor with the top half of the stator cut away, so the entire internal construction could be seen. It was arranged to operate under its own power, at slow speed.

Several motor-starting compensators and a complete line of oil switches and inclosed air-break switches were shown. Safety to operator and complete protection to the apparatus were special features.

The Edison Storage Battery Company exhibited its newly developed Type G cells, especially adopted to vehicle use. A feature of these cells is that in one hour 50 per cent of the battery capacity can be put in. Normal charging time is 4.75, as compared with seven hours for other types. Another feature of the Edison exhibit was the new non-acid steel-encased motorcycle special alkaline storage battery for lighting and ignition.

The exhibit of the Westinghouse Electric & Manufacturing Company was mostly confined to apparatus on hand at the Boston office, the complete exhibit that had been planned having been detained owing to the strike. The partial exhibit included a graphic means of comparing the effective use of various types of incandescent lamps for mill lighting; approved mode of mounting motors from overhead, consisting of parallel channel irons giving adjustable facilities; special loom motors, both open and inclosed; small graphic recording meter for use in checking up the load on any given room in a factory; and bakelite micarta gears and pinions. The latter have as their mechanical base a heavy duck filled with a composition, and are noiseless in operation. Their wearing quality is said to be preferable to rawhide, and they will not swell, even when subjected to a test with hot oil.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ATTACHMENT PLUGS, Fuseless. —Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Separable and non-separable attachment plugs having porcelain or composition bases or caps.

C-H, 660 watts, 250 volts, catalog No. 7700.

Listed March 28, 1916.

CONDUIT OUTLET PLATES.—R. & R. Manufacturing Company, 5710 Hough Avenue, Cleveland, O.

Cast-iron outlet plates for straight electric and combination fixtures. Catalog Nos. 1, 3, 4.

Listed February, 29, 1916.

ELECTRIC-LIGHT BATH-CABINET.—Burdick Cabinet Company, Milton, Wis.

Metal cabinets for enclosing bodies of persons while being subjected to effects of heat and light of incandescent lamps mounted within cabinets. The cabinets are provided with special terminals for use with grounding wires. 3,000 watts or less, 125 volts.

Listed March 31, 1916.

ELEVATOR-CONTROL APPLIANCE. — American Safety Utilities Company, 1018 Peoples Gas Building, Chicago, Ill.

Elevator-control system consisting of mechanical door lock and gate mechanism at each shaft door and a double-throw switch, a solenoid and cam, and an emergency mechanism on the car.

Listed February 29, 1916.

ELEVATOR-CONTROL APPLIANCE. — Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Hatchway. Limit Type. Westinghouse, 10 amperes, 600 volts.

Listed February 29, 1916.

FUSES. Cartridge.—Commercial Enclosed Fuse Company, 1317 Willow Avenue. Hoboken, N. J.

Cartridge enclosed fuses. "Commercial." 0-200 amperes, 250 volts.

Listed March 30, 1916.

HEATERS, Electric. — Coin Machine Manufacturing Comapny, 984 East Seventeenth Street, Portland, Ore.

Induction electric water heaters, 600-5,000 watts.

Model Nos. 35, 35A-35D, 35F, 35K.

These heaters are judged to be less hazardous than stoves and heaters used for same purpose, which depend upon direct combustion of fuel for heat. Precautions such as apply to stoves in common use should be observed in installation and use of these devices.

Standard when connected by standard fittings to wiring circuits of suitable capacity for current required, but not for connections to ordinary lighting circuit, or to ordinary lamp sockets or receptacles.

Listed March 9, 1916.

HEATERS, Electric.—Majestic Electric Development Company, 428 O'Farrell Street, San Francisco, Calif.

Portable electric air heaters, consisting of one, two or three heating elements mounted on sheet metal reflectors and enclosed in sheet metal casing with screened opening at front and provided with four cast-iron legs.

4.4 amperes, 110 volts, type No. 4; 8.8 amperes, 110 volts, type No. 5; 13.2 amperes, 110 volts, type No. 6.

Listed March 9, 1916.

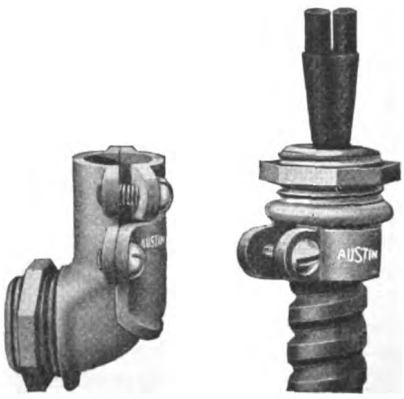
LIGHTNING RODS.—Arrow Conductor & Manufacturing Company, 1536 West Adams Street, Chicago, Ill.

Listed March 31, 1916.

OUTLET BUSHINGS AND FITTINGS.—M. B. Austin & Company, 700 Jackson Boulevard, Chicago, Ill.

Malleable-iron bushings and connectors.

Connectors for armored cables or flexible conduit, straight and 45-degree styles marked "A."



Malleable-Iron Connectors.—M. B. Austin & Company.

Listed February 10, 1916.

PICTURE MACHINES, Miniature Motion.—Adfilm Company, 521 First National Bank Building, Chicago, Ill.

Portable, automatic, motor-driven motion-picture machine, complete with metal housing and ground-glass screen. Projector mechanism reverses automatically and lenses shift to opposite series of negatives making operation continuous. The electrical parts of device comprise a gas-filled incandescent lamp, the necessary switches, wiring connections and a Westinghouse 1-ampere, 115-volt motor. 660 watts, 110 volts.

Listed March 9, 1916.

RECEPTACLES, For Attachment Plugs. — Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Edison type, 660 watts, 250 volts, catalog Nos. 546, and covers, 547-48.

Listed March 13, 1916.

RHEOSTATS. — General Electric Company, Schenectady, N. Y.

Push-button stations, type CR-2940.

Listed March 14, 1916.

SIGNS, Electric.—Moore Sign Company, 21 Romeyn Street, Schenectady, N. Y.

Four types. Moore's interchangeable, bulb, lens and transparency.

Listed February 23, 1916.

SIGNS, Electric.—Reflecto Electric Sign Company, Dallas, Tex.

Electric signs shown by tests and examinations to be in accordance with requirements of the National Board of Fire Underwriters have label attached.

Listed March 23, 1916.

SWITCH BOXES.—Electric Panelboard Company, Rochester, N. Y.

Pressed steel boxes in single units for use with rigid conduit. These boxes have removable sides and suitable plates with fastenings for assembly in gangs.

Listed March 7, 1916.

SWITCHES. Fixture.—Pass & Seymour, Solvay, N. Y.

Fixture switches with pull-chain mechanism.

P. & S. Single-pole; 3 amperes, 125 volts; 1 ampere, 250 volts; catalog Nos. 3003-05, 3007, 3030-39.

Listed March 1, 1916.

SWITCHES, Pendant Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. Single-button type.

Three-speed; 2 amperes, 250 volts; 5 amperes, 125 volts; catalog No. AT-30.

Listed March 13, 1916.

SWITCHES, Push Button Flush.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

Duplex switches. Catalog No. 2639, combination of two single-pole, 5 amperes, 250 volts; 10 amperes, 125 volts. Catalog No. 2640, combination of one single-pole, 5 amperes, 250 volts; 10 amperes, 125 volts; and one two-circuit electrolier, 2 amperes, 250 volts; 5 amperes, 125 volts.

Listed March 24, 1916.

SWITCHES. Surface Snap.—Manhattan Electrical Supply Company, 17 Park Place, New York, N. Y.

Single-pole, catalog Nos. 4931-34.

Listed March 16, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. T. A. ELDER, who has been general manager and operator of the electric-lighting plants of the Interstate Public Service Company, of Indianapolis, Ind., has been transferred to Columbus, Ind., and assumes the management of the company's plants at that city and at Seymour, Franklin and Greenwood. MR. V. C. SALSBURY has been manager of the Columbus and Seymour plants and MR. SAMUEL RENO manager of the Franklin and Greenwood plants.

MR. CHARLES L. EDGAR, who was appointed by the American Institute of Electrical Engineers as state director from Massachusetts on the Industrial Preparedness Committee of the Naval Consulting Board, is president and general manager of the Edison Electric Illuminating Company of Boston. Born in 1860, Mr. Edgar graduated from Rutgers College in 1882, after which he entered the employ of the Edison Company. He became superintendent of the Edison Electric Illuminating Company in 1887, general manager in 1889, a vice-president in 1890 and president in 1900. Mr. Edgar is affiliated with many electrical and other organizations and has done his full share in the advancement of the industry. His appointment as state director and his election to the chairmanship of the state committee is a tribute to his unqualified ability.

C. L. Edgar.

MR. F. E. SCOVILL has been appointed manager of the Lockhart (Tex.) Water Works. He formerly was secretary and manager of the Laredo (Tex.) Electric & Railway Company.

MR. P. LUND, electrical engineer, of Stockholm, Sweden, recently visited San Francisco, Cal., on a business tour he is making through the United States in behalf of one of the large Swedish electrical companies.

MR. J. W. BIVENS, JR., has been appointed manager of the Cordele (Ga.) Electric Company. He has been in the employ of the Southern Utilities Company since it purchased the property three years ago.

MR. A. H. GRIMSLEY, formerly chief engineer, has been appointed general manager of the Virginia-Western Power Company, Clifton Forge, Va. Mr. Grimsley formerly was with the West Virginia Water & Electric Company, Charleston, W. Va.

MR. E. B. GREENE resigned May 1 as general superintendent of the Penn Central Light & Power Company, Altoona, Pa. He will retire from central-station work, with which he has been identified in Altoona since 1887 when he became manager of the Edison Electric Illuminating Company. When that company was succeeded by the Penn Central Mr. Greene became superintendent and in 1912 he became general superintendent.

MR. D. C. GREEN, manager of the Salt Lake division of the Utah Power & Light Company, left Salt Lake City April 28 for Washington, D. C., to attend the National Conservation Congress, which convened there May 2-4. Mr. Green represented his company at this congress. While in the East he will spend some time at the New York office of the Electric Bond & Share Company and will later attend the N. E. L. A. convention at Chicago. Before returning to Salt Lake City he will spend a week at Indianapolis visiting his home.

MR. E. FEARS, who recently has been placed in charge of the electrical equipment on the Chicago, Milwaukee & St. Paul Railway, with headquarters at Deer Lodge, Mont., is a graduate of Purdue University. From 1905 until two years ago he was general foreman of electrical equipment for the New York Central Railroad, leaving at that time to accept a position in the maintenance department of the Portland, Eugene & Eastern Railway, at Portland, Ore. Mr. Fears will have charge of the operation of the electric locomotives of the Chicago, Milwaukee & St. Paul Railway in its electric zone.

MR. GEORGE H. HARRIES, president of the Louisville (Ky.) Gas & Electric Company, and of other Byllesby properties, returned to Louisville for a short stay and to attend the annual meeting of the company, at which he was re-elected to the presidency. In discussing present conditions with an interviewer, Mr. Harries said: "Germany cannot cross the Atlantic at the present time to fight us. Neither do I believe that there is any danger of Germany making peace with her present enemies and then declaring that a state of war exists between her and the United States, for if we break off diplomatic relations with Germany and join the Allies, with our military or naval forces or financial resources, she will have to make peace with us at the same time and that will end the trouble. In short, I do not think that the business of the country right now stands in any immediate danger."

MR. EDWIN CORR, an attorney of Bloomington, Ind., has been appointed a member of the Indiana Public Service Commission, succeeding MR. CHARLES J. MURPHY, resigned.

MR. W. L. BIRD, formerly manager of the Kain Power Company, Fort William, Ont., has been appointed manager of the Kaministiquia Power Company, of that city.

MR. J. C. FORD, formerly in the Chicago office of the General Electric Company, has been appointed assistant manager of the French Battery & Carbon Company, Madison, Wis.

MR. HOMER E. NIESZ, chairman of the Entertainment Committee of the National Electric Light Association, is busily engaged in completing plans for the forthcoming convention to be held in Chicago, May 22 to 26. Mr. Niesz, who is secretary of the Budget Committee of the Commonwealth Edison Company, has had a great deal of experience in similar work and promises that the entertainment features at the big Chicago convention will surpass anything ever before attempted, even eclipsing the famous "Feast of Jupiter" held in Chicago last October coincident with the Jovian convention.

H. E. Niesz.

OBITUARY.

MR. JAMES TRUMBULL, of the Connecticut Electric & Manufacturing Company, Bridgeport, Conn., died at Saranac Lake, N. Y., last week, after a prolonged illness.

MR. ENOS M. BARTON, chairman of the Board of Directors of the Western Electric Company, died on May 3 after an illness extending over several months. Mr. Barton was one of the pioneer manufacturers of electrical apparatus, having been connected with the Western Electric Company from its inception. He was elected secretary of this company in 1872 and was later made vice-president and president, respectively. Since 1908 Mr. Barton has been chairman of the Board of Directors. Mr. Barton was born at Lorraine, N. Y., on December 2, 1842, and was educated in public and private schools in that vicinity, later attending the University of Rochester. He has been a resident of Chicago since 1869 and was prominent in a number of civic and private organizations.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

SOUTH BREWER, ME.—The Eastern Chemical Company, a new Maine corporation, is building a $150,000 plant at South Brewer for the manufacture of electrolytic bleach, to be used by a paper mill manufacturing writing papers. It is expected that the plant will be in operation by August 1.

BOSTON, MASS.—The Boston & Worcester Street Railway Company has petitioned the Public Service Commission for authority to issue 600 additional preferred shares at $105 a share and $60,000 in 20-year 4.5-per-cent bonds. The money realized is to be used for property improvement.

BOYLSTON, MASS.—About $1,200 will be expended for extensions to the city electric-lighting system.

GREAT BARRINGTON, MASS.—C. D. Parker & Company, of Boston, which recently acquired control of the Lenox Electric Light Company, has purchased the holdings of the Great Barrington Electric Light Company, possession taking effect May 1. The plant will be operated under the same name as formerly and no immediate changes are contemplated.

HAMPDEN, MASS.—The Central Massachusetts Electric Company, of Palmer, is planning to extend its transmission lines to this place, and will furnish energy for street lighting.

HAVERHILL, MASS.—Mayor Bartlett has announced that plans are being made for extensions to the white-way system.

MIDDLEBORO, MASS.—The City Commissioners have signed a contract with the Plymouth Electric Light Company, which provides for electric lighting in this city for the period of five years. A transmission line will be erected by the city to the town of Carver.

WESTFIELD, MASS.—Bonds in the sum of $20,000 are being sold for the purpose of extending the transmission lines of the municipal electric-lighting plant and replacing an old cable in Elm Street.

AUBURN, N. Y.—The Empire Gas & Electric Company has practically completed plans for the construction of another large electric power plant, the largest in Central New York, on the new dam at Seneca Falls. Work of construction will begin within a few days. The estimated cost is $260,000, and 10,000 horsepower will be developed.

CROWN POINT, N. Y.—The Port Henry (N. Y.) Light, Heat & Power Company has been granted authority to exercise an electric-lighting franchise in this city, and will extend its transmission lines to furnish service here.

LONG BEACH, N. Y.—The Long Beach Power Company has petitioned the Public Service Commission for authority to erect an electric lighting plant here.

SODUS POINT, N. Y.—The Town Board is considering a petition for the creation of an electric-lighting district.

WATERTOWN, N. Y.—The Board of Public Works will order the installation of 23 additional three-light ornamental standards and several new arc lamps.

WATERVLIET, N. Y.—The North End Improvement Association has petitioned Mayor Foley for improvements and extensions to the street-lighting system.

JERSEY CITY, N. J.—In connection with the proposed new terminal of the Lehigh Valley Railroad in the Greenville section, the City Commission will negotiate with the company for the electrification of its local lines.

MORRISTOWN, N. J.—The Morris County Traction Company will install new rotary transformer equipment in its substation near Dover.

NEWARK, N. J.—The Roseville Improvement Association is negotiating with the Board of Works for the installation of new arc lamps on Roseville Avenue. Nitrogen-filled lamps of 600-candlepower are being considered.

NEWARK, N. J.—The Board of Works has awarded a contract for street lighting to the Public Lighting Service Corporation, New York; the award covers the installation of 2,034 incandescent lamps at a cost of operation of $10.60 per lamp a year. Heretofore this service has been rendered by the Public Service Corporation of New Jersey.

PAULSBORO, N. J.—Bonds in the sum of $10,000 have been voted for the installation of a municipal electric-lighting plant.

HAZLETON, PA.—The Harwood Electric Company, which operates a large power plant here and supplies 25 towns in this district, is planning to extend its transmission lines to Sunbury and Frackville.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company is planning to install a 1,150-kilowatt, gas-engine-driven generator in its central power plant.

M'BEE, S. C.—The McBee Electric Company has completed the installation of additional boiler equipment, and, besides serving this city, is now furnishing service to the town of Bethune.

WEBSTER, FLA.—The Dixie Food Products Company, B. L. Welborn, president, will install an electric-lighting plant in connection with its ice and canning plants.

NORTH CENTRAL STATES.

CANTON, O.—The city will begin advertising May 28 for bids for lighting the city streets. Proposals will be received both for electric and gas-lighting. The officials plan to have the lighting in the residence districts the same as that used in the business district.

CINCINNATI, O.—Voters here have approved a project to issue bonds to the amount of $6,000,000 for a belt-line railway around the city, and to erect a terminal station for the entrance of the interurban lines. Plans have been perfected for a new interurban line by the Dayton, Middletown & Cincinnati Traction Company which was incorporated at Columbus a few months ago. J. G. Miller, of Westchester, O., is chairman of the board of the traction company.

MT. CARMEL, O.—The Mt. Carmel Light & Power Company has been organized with a capital of $5,000 by Charles L. Ludlow and others.

RICHMOND, IND.—The Board of Public Works is considering a petition for an ornamental lighting system between Third and Fourth Streets on Main Street.

AURORA, ILL.—Automatic block signals, similar to those now operating between Aurora and Chicago, are to be installed between Aurora and Mendota by the Chicago, Burlington & Quincy railroad this summer. The cost of installing this system for the 42 miles is estimated at $90,000 and the installation of the system is expected to require about seven months for completion.

DAVIS, ILL.—J. M. Best and others have formed the Davis Electric Company, with a capital of $5,000 to furnish electric service here.

METCALF, ILL.—A proposition to establish a municipal electric-lighting plant is being considered by city officials.

OGDEN, ILL.—The City Council is planning to install an electric-lighting system to cost about $3,500.

GREENFIELD, MICH.—Property owners of Greenfield Township have granted a franchise to the Highland Park & Royal Oak Railway Company to build an electric railway from Highland Park through the township to Royal Oak. John L. Austin, Robert E. Barber and others are the promoters of the line.

HILLSDALE, MICH.—A. H. Lovell, of the University of Michigan, will make a survey of a waterpower site here in a few weeks, with a view to determining its availability for electric power. A plant probably will be erected if the report is satisfactory.

THREE RIVERS, MICH.—The Council has voted to engage an engineer to go over the plans and work on the new municipal electric-lighting plant before adjustments are made with the various contractors.

IXONIA, WIS.—The Ixonia Electric Company has been incorporated with a capital of $2,000 by J. G. Wittberner and others.

MARSHFIELD, WIS.—Superintendent Wayts, of the Electric Light & Power Company, has completed a transmission line for furnishing power and light to a new factory near here, and to a number of residences along the line.

MILWAUKEE, WIS.—The Wisconsin Power, Light & Heat Company has been incorporated with a capital of $1,000,000 by John I. Beggs, H. C. Mackay and C. J. Davidson for the purpose of marketing the power generated in two large Wisconsin River plants. The company proposes to acquire control of the electric power, lighting and heating plants in several Wisconsin cities, negotiations now being completed for the plants at Beaver Dam, Cambria and Portage.

SUPERIOR, WIS.—The street railway company will extend its lines to the fair grounds. Another improvement under consideration is the double-tracking of the East End line from the courthouse to the Nemadji River. W. R. Foley, First National Bank Building, is contract agent for the company.

ARGYLE, MINN.—The Council has appointed a committee, of which A. W. Headrick is a member, to make plans for a new electric-lighting plant. A hydroelectric development and a gas-engine plant are being considered.

GAYLORD, MINN.—The Northern States Power Company is planning to build transmission lines to furnish Henderson, Arlington, Gaylord, Winthrop and Gibbon with energy for light and power.

HENDRICKS, MINN.—The Hendricks Light & Power Company is planning improvements and extensions to its plant.

ADAIR, IOWA.—At a special election it was decided to sell the municipal electric-lighting plant to the Iowa Railway & Light Company, of Cedar Rapids. The plant will be turned over to the purchasing company in a few weeks, and 24-hour service will be inaugurated.

IOWA CITY, IOWA.—Additional lighting and heating facilities and a new water system are to be provided at the University of Iowa. Another engine and two generators will be installed in the power plant, and additional boilers will be purchased electric-lighting plant here.

LABELLE, MO.—H. W. Knight, of this city, promoter of an electric line between Keokuk, Iowa, and Jefferson, Mo., is preparing plans for the project.

BONNER SPRINGS, KANS.—The Bonner Springs Electric Light Company has made a contract to supply energy for municipal and domestic lighting to Eudora, 16 miles from Bonner Springs; the plant now supplies the towns of Forest Lake, Edwardsville, Wilder and Holliday, and is preparing to supply Basehor.

BEATRICE, NEB.—The question of issuing $20,000 electric light bonds will be submitted to vote. W. C. Andrews is city electrician.

GUIDE ROCK, NEB.—N. L. Ball has petitioned for a franchise to install an electric-lighting plant.

ALCESTER, S. D.—Local authorities have opened negotiations with the manager of the electric-lighting plant at Beresford for the purpose of securing service for this city. A transmission line connecting the two cities will be erected.

REDFIELD, S. D.—Voters here have approved a $60,000 bond issue for the erection of a new municipal electric-lighting plant. The new plant will cost $75,000, the difference to be made up from the earnings of the present plant. For further particulars see proposal columns.

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CASSELTON, N. D.—The General Utilities Company, of Fargo, has purchased the holdings of the Casselton Electric Company.

MINOT, S. D.—The City Council is contemplating an extension to the white-way system on Main Street.

NEW ROCKFORD, N. D.—The General Utilities Company is installing a new 100-kilowatt engine-driven generator in its plant here.

SOUTH CENTRAL STATES.

HAZARD, KY.—The Kentucky River Power Company, which recently announced plans for construction of a new power house, has purchased a five-acre site for the structure adjacent to the mine of the Kentucky Jewel Coal Company, with which company it has contracted for a 30 years' supply of coal for the power plant. The coal will be conveyed directly from the tipple of the mine to the boilers. The transmission lines of the company have been completed, and the company has been operating a temporary plant for several months. The new plant is to be completed by October 1.

LEXINGTON, KY.—Plans for increasing the capacity of the power plant of the Lexington Utilities Company have been announced by F. W. Bacon, vice-president and general manager of the company. The improvements contemplated include an addition to the boiler house, addition of a 500-horsepower boiler and other betterments, which will cost approximately $40,000. The additional boiler will be installed in anticipation of increased consumption next winter, the present electrical generators having capacity in excess of the steam power of the boilers.

PROVIDENCE, KY.—Machinery and material for the local municipal lighting plant, Western Electric equipment throughout, has arrived on the ground, and, with R. M. Nance, of the Board of Public Works, representatives of the Western Electric Company have begun construction work. Equipment includes two 75-kilowatt generators and two 120-horsepower engines.

WINGO, KY.—W. D. Mullins is chairman of the electric light committee, which is considering plans for the installation of a $10,000 electric-lighting plant.

BRISTOL, TENN.—The Electric Transmission Company, with a central plant in the Black Mountain coal fields, has purchased equipment to quadruple the capacity of its plant, and will, it is stated, run transmission wires through Kentucky into Cincinnati, O.

CHATTANOOGA, TENN.—The Cumberland Telephone & Telegraph Company proposes reconstruction of the Chattanooga plant at a cost of $850,000, and is asking the city for permission to increase rates.

KNOXVILLE, TENN.—Mayor McMillan is considering a five-year contract with the Knoxville Railway & Light Company, to furnish a minimum of 600 arc lamps of 2,000-candlepower, at $54 per year, and small arc lamps at $18 per year.

NIOTA, TENN.—The Niota Water Company is considering plans for installation of an electric-lighting plant.

ATTALIA, ALA.—The National Pipe & Foundry Company is planning to build a large soil-pipe plant here. The machinery will all be electrically driven and power will be furnished by the Alabama Power Company, of Birmingham.

BIRMINGHAM, ALA.—The Louisville & Nashville Railroad Company has begun active work installing a telephone dispatch system on its lines between Birmingham and adjacent mining districts.

JACKSONVILLE, ALA.—The Public Service Commission has granted authority to the Jacksonville Light & Power Company to dispose of its holdings to the Alabama Power Company, of Birmingham.

CORINTH, MISS.—The Cumberland Telephone Company will expend about $12,000 for improvements to their plant here. The improvements will include a large amount of cable construction and work will begin immediately.

MAGNOLIA, MISS.—A. S. Jones, general manager, and H. W. Bell, chief engineer, of the McComb & Magnolia Electric Railway & Power Company, are now engaged in surveying the route and obtaining right of way for an electric car line between Magnolia and Summit. It is expected the road will be in operation in a year.

NEWPORT, ARK.—The City Council has passed an ordinance granting a franchise to the Newport Water, Light & Power Company for the purpose of erecting and operating an electric-lighting plant here.

NEW ORLEANS, LA.—The Orleans-Kenner Electric Railway Company will construct a substation at Kenner costing about $10,000. Machinery for the substation and material for a distribution system in Kenner has been purchased.

WEST MONROE, LA.—An election will be held May 18 to vote on the question of issuing $45,000 in bonds for the purpose of extending the electric-lighting system.

HOWE, OKLA.—An election probably will be held soon for the purpose of voting on the issuance of $100,000 in bonds to construct an electric-lighting plant and waterworks system.

OKLAHOMA CITY, OKLA.—The Oklahoma Railway Company has purchased a 3,700-kilovolt-ampere Westinghouse turbo-generator and is planning to purchase a number of rotary converters in various sized units. The company will build two substations.

TULSA, OKLA.—John R. Rose, president of the Oklahoma & Electric Railway Company, has submitted to the Chamber of Commerce here a proposition for the construction of an interurban line to Tulsa with terminal and shops located in this city.

DALLAS, TEX.—The Texas Light & Power Company plans to build a large central power station at Austin. It will be a steam plant.

GONZALES, TEX.—The Gonzales Water Power Company has awarded the contract for enlarging its hydraulic plant and installing additional equipment to L. D. McKaughan, of Fort Worth, for $14,000.

SAN ANTONIO, TEX.—It is announced that the San Antonio, Gonzales & Houston Interurban Railway Company will begin the construction of its first division out of Gonzales on May 10. The proposed line will run between San Antonio and Houston, with a branch line from Victoria to Austin.

SHINER, TEX.—An issue of $12,000 bonds has been voted here, the proceeds to be used in constructing a municipal electric-lighting and power plant.

DATES AHEAD.

National Fire Protection Association. Annual convention, Chicago, Ill., May 9-11. Secretary, F. H. Wentworth, Boston, Mass.

American Association of Engineers. Annual convention, Chicago, Ill., May 9-11. Secretary, Arthur Kneisel, 29 South La Salle Street, Chicago, Ill.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thomson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

American Institute of Electrical Engineers. Annual meeting, New York City, May 16. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

National District Heating Association. Annual convention, New York City, May 16-19. Secretary, D. L. Gaskill, Electric Building, Greenville, O.

Southwestern Electric and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Electrical Contractors' Association of Texas. Annual meeting, Galveston, Tex., May 17-18. Secretary, Charles W. Graham, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Rochester*, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

WESTERN STATES.

WOLF POINT, MONT.—The City Council has granted a franchise to John Listerud to furnish electric and gas lights and power to Wolf Point for a period of 25 years. According to reports, a plant will be installed this summer.

PUEBLO, COLO.—Plans are being made for an extension of the white-way system on Main Street.

MAGDALENA, N. M.—The K. W. Light & Power Company has been incorporated with a capital stock of $50,000 by George Keith, J. E. Wayne and H. H. Lisle for the purpose of erecting an electric light and power plant here.

CASA GRANDE, ARIZ.—The City Engineer has completed plans for the proposed municipal light, power, ice and water systems, for the construction of which bonds in the sum of $30,000 have been voted.

PHOENIX, ARIZ.—The Water Users' Association has taken preliminary steps looking to the construction of a storage dam and reservoir on the Verde River near here, and the building of a hydro-electric plant.

PRESCOTT, ARIZ.—The Arizona Power Company has just finished the construction of a second unit to its hydroelectric plant on Fossil Creek. The new unit is of 2,500-horsepower capacity, bringing the total capacity of the plant up to 10,000 horsepower.

GARDNERVILLE, NEV.—Arrangements have been made for the enlargement of the power plant of the Douglas Milling & Power Company on the Carson River.

LOVELOCK, NEV.—The Nevada Valleys Power Company contemplates the extension of its high-tension transmission line northward from Lovelock.

TONOPAH, NEV.—The City Council has authorized the Reno Power, Light & Water Company to proceed with the installation of 400-candlepower incandescent street lights in the residence section.

POCATELLO, IDAHO.—The City Council has granted the Pocatello Traction & Interurban Railway Company a 50-year franchise.

EVERETT, WASH.—The city has entered into an agreement with Robert Howes, of Seattle, whereby the latter will gather data on the power possibilities of Sultan Basin.

LA CROSSE, WASH.—H. G. Wilson has begun the construction of an electric plant on Crystal Street, having been recently granted a lighting franchise.

NORTH YAKIMA, WASH.—Application has been made to the Commissioners of Yakima County by the Pacific Power & Light Company for a 50-year franchise to maintain power lines along the country roads.

NORTH YAKIMA, WASH.—The local office of the United States Reclamation Service reports that $204,000 has been appropriated for the construction of a 125-horsepower hydroelectric pumping plant near Grandview, and a 175-horsepower pumping plant at the head of the Mabton Canal, near Mabton. A portion of the appropriation will be utilized in the construction of pipe lines and laterals and for watering 4,000 acres. Local officials estimate the cost of the two power plants at about $109,000.

SNOHOMISH, WASH.—Plans for a municipal electric-lighting plant are being considered here.

SPOKANE, WASH.—D. K. May, of this city has announced that he will install a 200-horsepower electric plant at Gibson mine in British Columbia.

DALLAS, ORE.—The Oregon Power Company plans improvements in Dallas, Springfied and Albany of considerable magnitude this summer, according to reports. Among the improvements will be electric transmission lines between Dallas and Springfield. It is also proposed to connect the Polk County system at Independence with the wires from the Albany power plant, making the systems a complete unit. The Springfield unit is to be re-equipped to furnish 5,000 kilowatts in place

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of 3,500 kilowatts, as at present. The plant at Dallas, which now develops 600 kilowatts, will be increased to 2,100 kilowatts. The erection of new wires between Independence and Albany and the replacing of the line between Independent and Dallas is also included in the improvements. It is stated active construction will be instituted at an early date, in order to complete the improvements before winter.

HAMMOND, ORE.—The Town Council has granted the Pacific Power & Light company a franchise to install, maintain and operate an electric-lighting system here, and the installation will be made at once, under the direction of W. H. Galvani, engineer for the company.

MYRTLE CREEK, ORE.—Engineer M. B. Germond, of Roseburg, has made a report on the proposed municipal power plant proposition. The site chosen involves the construction of a dam in the Umpqua approximately 240 feet long, a wooden flume 3,200 feet long, and a power house at the end of the canal. The estimated cost is $29,094.

RICHLAND, ORE.—The Dry Gulch Ditch Company has been granted a 20-year franchise by the Town Council to construct, maintain and operate an electric lighting system in Richland. Power will be developed on Eagle River. According to reports, the town of Richland and a portion of Eagle Valley will be served with current by October of this year.

ROSEBURG, ORE.—A brick office building on Jackson Street will be constructed in this city immediately by the Douglas County Water & Light Company.

LAKEPORT, CAL.—Authority has been asked of the Railroad Commission for the construction of a monorail transportation line, 24 miles long, between Hopland, Mendocino County, and Lakeport, Lake County. The application was made by the Clear Lake Suspended Monorail Company, which is incorporated for $50,000. The directors of the company are L. H. Boggs, Kelseyville; Andrew Smith, Finley; M. S. Sayre, Lakeport, and others.

LIVERMORE, CAL.—A new electric-lighting system will be installed in the residential section. E. W. D'Ombrain, local agent of the Pacific Gas & Electric Company, has submitted two propositions to the Town Trustees.

RIALTO, CAL.—Articles of incorporation have been filed for the Fontana Power Company, with a capital stock of $250,000, by A. B. Miller, J. C. Jones, R. H. Bassler, C. A. Stone and A. Wilson.

SACRAMENTO, CAL.—A movement is under way among residents of the Oak Park section to have electroliers similar to those in use on the main thoroughfares up town installed along Thirty-fifth Street and Sacramento Avenue.

STOCKTON, CAL.—The Stockton Electric Railroad Company has opened negotiations for the sale of its properties to the city.

Proposals

LAMP POSTS.—Bids will be received until 2 p. m., May 10, by the Purchasing Officer, District Building, Washington, D. C., for six bronze lamp posts.

ELECTRIC TRAVELING CRANES.—Bids will be received until noon of May 10 by E. E. Sands, City Engineer, Houston, Tex., for one electric traveling crane for wharf, and four traveling cranes for sewerage disposal plant. The total estimated cost is $15,000.

LAMP FIXTURES.—Sealed proposals will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., May 8, for furnishing and delivering approximately 225 lamp fixtures with compensators and glassware complete, to be used with 20-ampere, 1,000-candlepower, type C lamps. W. G. Keith, Commissioner of Gas and Electricity.

POWER PLANT.—Sealed bids will be received by C. J. Mariner, City Auditor, Redfield, S. D., until May 18, for the construction of a new municipal power plant building and furnishing and installing the power plant equipment, including generators, engines, boilers, stokers, coal-handling apparatus, underground steam mains, etc., in accordance with plans and specifications furnished by Charles L. Pillsbury, consulting engineer, Metropolitan Life Building, Minneapolis, Minn.

ELECTRICAL APPARATUS. — Sealed proposals will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., May 11, for furnishing and delivering to the Department of Gas and Electricity, electrical apparatus, in accordance with specifications and drawings on file in the office of said commissioner, approximately as follows: One main switchboard with supporting frame, two lighting panels, four sub-panels, together with inclosing cabinets and other apparatus, as specified. W. G. Keith, Commissioner of Gas and Electricity.

POWER-PLANT EQUIPMENT.—Sealed bids will be received May 10 for power-plant equipment for the electric-lighting plant at Blue Earth, Minn. The work, which is under one contract, consists of furnishing and erecting one 200-kilovolt-ampere alternating-current engine-generator unit, one 100-kilovolt-ampere direct-connected generator for present engine, removing present direct-current generator, installing alternating-current switchboard, etc., and furnishing, but not erecting, one feedwater heater, oil separator and boiler feed pump. Easton Floe, City Clerk.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9577, Ostrich Bay, Puget Sound, one electric locomotive. Schedule 9583, Norfolk, Va., two engine-order telegraphs. Schedule 9584, Mare Island, Cal., one motor truck. Schedule 9590, Brooklyn, N. Y., miscellaneous cartridge-type, inclosed fuses; 6,000 lamp sockets. Schedule 9591, Norfolk, Va., Miscellaneous switches. Schedule 9598, Mare Island, Cal., miscellaneous renewable, inclosed fuses; 86 electric soldering irons; miscellaneous attachment plugs; miscellaneous hard-rubber rods. Schedule 9598, Puget Sound, Wash., 60 pounds uncut mica; five 0.25-horsepower ventilating sets; 20,000 glass-tube fuses. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

New Incorporations

ONEONTA, N. Y.—Oneonta Light & Power Company has increased its capital from $175,000 to $500,000.

CEDAR RAPIDS, IOWA.—Crescent Gas & Electric Store. Capital, $40,000. Incorporators: C. E. Leigh and others.

RENO, NEV.—Union Gas & Electric Company. Capital, $15,000. Incorporators: G. L. Fish, E. R. Dodge and J. R. Harrison.

DES MOINES, IOWA.—Electric Farm Lighting Company. Capital, $10,000. Incorporators: G. W. Jones and S. J. Penberthy.

EL PASO, TEX.—El Paso Auto & Battery Company. Capital, $3,000. Incorporators: P. C. Morey, C. K. Jameson and F. H. Terrell.

CHICAGO, ILL.—Hartford Electric Novelty Company. Capital, $20,000. Incorporators: W. P. Hartford, G. A. Hubert and S. N. Bisbee.

OAK PARK, ILL.—Dean Electric Construction Company. Capital, $5,000. Incorporators: William Dean, E. C. Grimes and W. Stevens Lewis.

HOUSTON, TEX.—Houston Chandelier & Electric Company. Capital, $15,000. Incorporators: J. W. Bentley, M. T. Dorsett and L. A. Buchanan.

BOSTON, MASS. — Idaho - Washington Water, Light & Power Company. Capital, $1,200,000. Incorporators: B. T. Stevenson, L. B. Hardwick and B. C. Ulman.

DES MOINES, IOWA.—B. & B. Battery Company. Capital, $10,000. Deal in electrical equipment and appliances. Incorporators: O. E. Brownell and F. E. Bent.

Financial Notes

Santa Barbara Gas & Electric Company, a subsidiary of the Southern California Edison Company, has sold to E. H. Rollins & Sons $1,000,000 first-mortgage five-per-cent serial and sinking-fund gold bonds. Proceeds will be used to provide for construction work planned for the immediate future and to call for payment on July 1 at 105, $844,000 first-mortgage six-per-cent bonds, due 1941.

Northern Mississippi River Power Company, a subsidiary of Northern States Power Company of Minnesota, has called for payment June 1 at 102.5 and interest, the $2,195,000 twenty-five-year five-per-cent first mortgage bonds, due June 1, 1938. The calling of these bonds is one of the last steps in the consolidation and readjustment of the funded debts of Northern States Power Company of Delaware and its subsidiaries.

American Gas & Electric Company at a special meeting approved an increase in the common stock of the company from $4,000,000 to $7,500,000 and in the six-per-cent preferred stock from $3,500,000 to $7,500,000. None of the newly authorized common stock will be issued in the immediate future, but the company will offer a part of the new preferred stock to stockholders at par, the proceeds to be used in construction of the new generating station of the Central Power Company, a subsidiary, at Windsor, W. Va.

Commonwealth Power, Railway & Light Company, five-year, six-per-cent convertible bonds will be convertible after May 1, and until their maturity, May 1, 1918, into ten shares of preferred and three shares of common stock for each $1,000 bond. It is probable that substantially all the bonds will be converted before maturity, and with their conversion Commonwealth Power, Railway & Light will have outstanding $21,000,000 common and $26,000,000 six-per-cent preferred stock, as $10,000,000 of the convertible bonds have been issued.

A sale of $3,750,000 of six-per-cent coupon gold notes, due October 1, 1935, redeemable on any interest-paying date on 90 days' notice at 103 and accrued interest, is announced by the Standard Gas & Electric Company, the holding corporation of the Tacoma (Wash.) Gas Company, the Oregon Power Company and subsidiary companies, serving 275 communities throughout the Northwest, the public utility properties being managed by H. M. Byllesby & Company. The notes are in denominations of $50 to $1,000, and the price is 92 and accrued interest, netting buyers 6.75 per cent. The U. S. National Bank of Portland, Ore., is fiscal agent for the company. The portion of these notes allotted for Oregon and Washington investors is $250,000. The proceeds of the note issue will be used for redeeming about $1,500,000 of short-term notes, due June 1, leaving funds for working capital.

With the proceeds so far received from the sale of the debenture bonds recently offered for subscription to its stockholders, American Power & Light Company has anticipated payment of the $3,000,000 one-year six-per-cent notes, due July 13, and has liquidated all other floating indebtedness. The additional proceeds from the sale of the bonds will be used for working capital. As of March 31, 1916, American Power & Light had current assets of $1,841,113, of which $288,212 was cash, with current liabilities of but $193,930. On the basis of the earnings of the company for the twelve months ended March 31, the income applicable to payment of interest on the new bonds was more than three and one-half times the requirements on the $3,120,700 outstanding

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 1	April 24
American Tel. & Tel. (New York)	127⅞	127½
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	237	235
Electric Storage Battery, common (Philadelphia)	59	—
Electric Storage Battery, preferred (Philadelphia)	59	—
General Electric (New York)	163	162¼
Kings County Electric (New York)	129	128½
Massachusetts Electric, common (Boston)	6¼	6⅝
Massachusetts Electric, preferred (Boston)	33	34½
National Carbon, common (Chicago)	—	—
National Carbon, preferred (Chicago)	—	—
New England Telephone (Boston)	132	133
Philadelphia Electric (Philadelphia)	27⅞	28
Postal Telegraph and Cables, common (New York)	78¼	78
Postal Telegraph and Cables, preferred (New York)	66	67½
Western Union (New York)	90¼	89⅝
Westinghouse, common (New York)	58	57¾
Westinghouse, preferred (New York)	70	70

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March 31. All floating indebtedness of the subsidiary companies, except usual current accounts, is owing to the parent company.

The Great Western Power Company, the City Electric Company and the Consolidated Electric Company have filed with the California Railroad Commission a joint application for approval of an agreement for the operation of the properties of the last-named corporation. The Great Western serves electricity and steam in Oakland and elsewhere in California. The City Electric is in the same business in San Francisco. The Consolidated Electric last October bought the electric and steam properties of the United Light & Power Company and its subsidiary companies in Oakland and San Francisco, subject to the lien of the underlying bonds of $243,000 in consideration of $2,024,500 of Consolidated Electric Company's mortgage five-per-cent bonds. The Great Western owns all the stock of the Consolidated. Since the taking over of the United Company's properties and those of its subsidiary concerns, the City Electric has operated these propertes in San Francisco, receiving all the revenue and paying all expenses as well as the interest and sinking fund accruals on $100,000 of underlying bonds and $1,320,000 Consolidated bonds, and also taxes assessed on the properties in San Francisco. The Great Western has operated the properties of the Consolidated in Oakland, paying, besides the expenses, the interest and sinking fund accruals of $145,000 in underlying bonds and $704,500 of Consolidated bonds, with taxes in Oakland It is this plan of operation that the companies ask the commission to approve.

Dividends.

	Term	Rate	Payable
Am. Dist. Teleg., N. J.	Q	1 %	Apr. 29
Am. Rys., pf	Q	1.75%	May 15
Automatic Elec	Q	1 %	May 1
Bos. Elec. Asso., pf	Q	1.5 %	May 10
Boston Elevated	Q	0.5 %	May 15
Cumb. Co. Pw. & Lt., pf.	Q	1.5 %	May 1
Detroit United Ry	Q	1.75%	June 1
Grand Rap. Ry., pf	Q	1.25%	May 1
Lehigh Val. Tran., pf	Q	1.25%	May 1
Middle West. Util., pf	Q	1.5 %	June 1
National Carbon, pf	Q	1.75%	May 15
Rio de J. Tr., Lt. & Pw.	Q	1.25%	May 1
So. Cal. Edison, com	Q	$1.50	May 15
Sao Paulo Tr., Lt. & Pw.	—	2.5 %	May 1
West Penn. Pw., pf	Q	1.75%	May 15

Reports of Earnings.

DAYTON POWER & LIGHT.

Dayton Power & Light Company reports for the three months ending March 31, 1916, compared as follows:

	1916	1915
Gross earnings	$406,298	$276,726
Operating expenses (including depr. and taxes)	207,757	147,509
Net earnings	198,541	129,217
Non-operating revenue	826	2,779
Total income	199,367	131,996
Interest on bonds	45,788	45,990
Other int. and sink. fund	5,830	7,854
Total deductions	51,618	53,844
Net income	147,749	78,152
Dividend on pfd. stock	42,626	31,070
Surplus	105,123	47,082

MONTANA POWER.

The Montana Power Company reports earnings for three months and twelve months ended March 31, 1916, as follows:

	1916	1915
Three months' gross	$1,426,319	$ 933,775
Net after taxes	1,082,804	652,047
Surplus after charges	747,577	389,616
Twelve months' gross	4,860,282	3,733,895
Net after taxes	3,606,799	2,598,517
Surplus after charges	2,344,841	1,557,697

MASSACHUSETTS ELECTRIC.

Massachusetts Electric Company reports earnings for three months ended March 31, 1916, as follows:

	1916	1915
Gross	$2,286,005	$2,055,164
Net	471,899	485,299
Surplus after charges	66,907	*1,139
Nine months' gross	7,505,997	7,257,245
Net	1,972,190	2,240,907
Surplus after charges	555,288	720,587

*Deficit.

CALGARY POWER.

Calgary Power Company reported earnings for fiscal year ended Dec. 31, 1915, as follows:

	1915	1914
Gross earnings	$289,613	$231,185
Net after taxes	237,158	180,206
Surplus after charges	80,192	24,727

In the annual report the directors state that they have not considered the payment of a dividend nor will they do so until the floating indebtedness of the company is fully paid. The company has accounts payable of $11,793 and a bank loan of $90,500. For 1915 the directors charged $158,029 out of surplus for depreciation, leaving the profit and loss surplus January 1, 1916, $102,526 as compared with $180,382 January 1, 1915.

UNITED LIGHT & RAILWAYS.

For year ended December 31, 1915, United Light & Railways Company subsidiaries report earnings as follows:

	1915	1914
Gross earnings	$6,308,777	$6,166,959
Net earnings	2,481,514	2,369,425

The income account of United Light & Railways Company for the year showed:

Earnings received of subsidiaries	$1,079,565	$1,039,783
Dividends and interest	424,116	344,294
Miscellaneous	122,511	123,155
Total gross income	1,626,192	1,507,232
Expenses and taxes	127,316	114,615
Interest and bond discount	520,136	455,833
Balance for depreciation and dividends	978,741	936,784
Special charges or credits	3,932	*34,896
Preferred dividends	557,419	526,073
Common dividends	.....	275,245
Discount on notes	31,632	.....
Depreciation reserve	260,235	165,993
Surplus	125,522	†30,527
Previous surplus	387,539	383,171
Total surplus, December 31	513,061	387,539

*Credit. †Deficit.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

A citizen of Southern Spain recently asked the consulate at Seville to place him in communication with exporters of electrical goods in the United States. He wishes to receive immediate quotations for a supply of 12,000 kilos of 16 mm. (approximately No. 5 B. & S. gage) electric copper wire for transmission of current, prices to be c. i. f. Seville. He desires information as to conditions of payment and probable date of delivery. He states that there are three towns near Seville that are to have electricity installed and he will require various materials, for which he desires prices, terms, etc., c. i. f. Seville. The articles desired are: Edison sockets, key and keyless; fuses, 0.5 to 5 amperes; single-pole and double-pole Edison plug cutouts; flexible cord (cotton and silk), No. 15 to 19, B. & S. gage; double and triple cotton-covered wire, No. 9 to 20, B. & S. gage; rubber-covered wire, No. 0 to 10, B. & S. gage; insulating tape; materials for high voltage—insulators for 15,000 volts (tested to 40,000); choke coils for 15,000 volts; disconnecting switches for 15,0000 volts; lightning arrestors for 15,000 volts, liquid resistances; fuse holders for 15,000 volts, and all other materials for high-voltage installations; three-phase transformers for 15,000 volts; 1 horsepower motor, direct current, 220 volts; motors from 1 horsepower up for alternating current from 115 to 500 volts; incandescent lamps, 0.5 watt per candlepower and 1 watt per candlepower, 110 and 120 volts. Refer to file No. 74,861.

New Publications

NICKEL-STEELS.—Bureau of Standards Circular No. 58, entitled "Invar and Related Nickel-Steels" gives the magnetic and electrical properties of these alloys, as well as their mechanical properties and distinctive thermal expansion.

TESTING OF STEEL.—Scientific Paper No. 272 of the Bureau of Standards is entitled "Correlation of the Magnetic and Mechanical Properties of Steel," by Charles W. Burrows. A review is given of the subject with the object of indicating to what extent magnetic tests may be utilized in determining mechanical properties. Curves are given to illustrate this.

GALVANOMETERS.—Scientific Paper No. 273 of the Bureau of Standards, Washington, D. C., is entitled "General Design of Critically Damped Galvanometers," by Frank Wenner. It gives the theory of the instrument and its application in current, voltage and ballistic measurements, with the procedure for finding the construction constants to meet definite performance specifications.

Electrical Patents Issued April 25, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,180,278. Speed-Limit Indicator for Automobiles, Motorcycles and Other Vehicles. A. A. Austin, Denver, Colo. Details of contact device operated by vehicle wheels on exceeding a certain speed.

1,180,286. Telephone Trunking System. E. D. Fales, assignor to Automatic Electric Co., Chicago, Ill. Automatic.

1,180,293. Selective Signaling System and Apparatus Therefor. J. A. Hulit, assignor to Automatic Electric Co., Chicago, Ill. Structure and circuits of station selector.

1,180,300. Signal System for Elevators. D. E. Kilroy and W. A. Braden, Chicago, Ill. Has high-potential lamp circuit and low-potential controlling circuit.

1,180,328. Insulated Electric Conductor. W. F. Smith, assignor to Western Electric Co., New York, N. Y. For cables: has spiral fibrous tape covering, giving smooth exterior.

1,180,329. Rectifying Apparatus. H. C. Snook, Cynwyd, Pa. High-potential polyphase rectifying switch comprising arcs.

1,180,348. Burglar-Alarm System. J. M. Watkins, Buffalo, N. Y. Combined watchman's circuit and fire and burglar alarms.

1,180,372. Apparatus for Treating Oils, Liquefied Greases and Fats or Any Other Liquids with Nascent Ozone. A. Breydel, Brussels, Belgium. Comprises an ozonizer.

1,180,414. Rectifier of Electric Currents. T. J. Murphy, Rochester, N. Y., assignor of one-half to J. P. B. Duffy, Rochester, N. Y. Arrangement of arc gaps, condenser and inductance.

1,180,420. Time Switch. G. A. Parker, assignor to the Chicago Electric Time Switch Co., Chicago, Ill. Controlled by clock work.

1,180,426. Magneto Machine. E. Podelsak and B. R. Beckwith, assignors to Webster Electric Co., Racine, Wis. Inductor type.

1,180,444. Electrically Operated Sound Producer. C. J. Schwarze, assignor to Schwarze Electric Co., Adrian, Mich. Diaphragm horn; details of magnetically operated striker.

1,180,445. Electromagnetically Operated Bell. C. J. Schwarze, assignor to Schwarze Electric Co. Details of magnetically operated striker.

1,180,457. Magnetic Chuck. O. S. Walker, assignor to O. S. Walker Co., Worcester, Mass. Has face with series of sections of alternating polarity separated by unpolarized sections with air gaps interposed.

1,180,460. Combined Car-Checker's Lamp and Book Holder. F. J. Whitney and F. Shurden Hall, Bredenbury, Saskatchewan, Canada. Casing for book has battery lamps controlled by lid.

1,180,462. Telephone Receiver. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Direct-battery type.

1,180,489. Magneto Machine. H. F. Geist, assignor to Webster Electric Co., Racine, Wis. Modification of No. 1,180,426.

1,180,493 and 1,180,494. Electric Switch. G. H. Hart, West Hartford, Conn. First patent: Two push-button, cam and spring snap. Second patent: modification.

1,180,510. Apparatus for Receiving Electrical Energy. C. D. Lanning, Dorchester, Mass. Coherer.

1,180,515. Signal Relay. J. F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Co. Details of relay structure including resistance for magnet circuit.

1,180,528. Automobile-Lamp Attachment. S. B. Potter, Asbury Park, N. J. For mounting on mud guards.

1,180,549. Remote-Control Switch. L. Siebenhauer, San Francisco, Cal. Magnetically tripped, spring-opened knife switch.

1,180,555. Recording Counter for Telephonic Conversations and Similar Purposes. A. C. Viardot, assignor to Association Des Ouvriers en Instruments de Precision,

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Paris, France. Recorder operated by door of casing.

1,180,558. Mechanical Movement. B. A. Adler, Chicago, Ill., assignor of one-half to P. A. Lorenz, Chicago, Ill. Details of magnetically operated pawl and ratchet wheel mechanism.

1,180,559. Secrecy Intercommunicating Telephone System. W. P. Andrick, assignor to General Acoustic Co., New York, N. Y. Has relay arrangement for establishing exclusive talking circuits between desired stations.

1,180,571. Automatically Controlled Electric-Cooking Apparatus. L. G. Copeman, assignor to The Copeman Electric Stove Co., Flint, Mich. Heater circuit closed at certain time and thermostatically opened.

1,180,582. Regulator Employed in Temperature-Regulating Systems Controlled by Thermostats. H. Emerson, Charlestown, Mass. For motor-driven dampers.

1,180,628. Ignition Device for Gas Engines. F. R. Allen, Passaic, N. J. Co-operating sparking contacts carried by piston and cylinder head.

1,180,635. Fusible Element for Electric Cutouts. R. C. Cole, assignor to the Johns-Pratt Co., Hartford, Conn. Thin strip has fold to reduce radiating surface at that point. (See cut.)

1,180,638. Gas-Pressure Regulator. J. Fabian, Wilmersdorf, Germany. Heat of gas heater thermoelectrically controls pressure of gas reservoir.

1,180,642. Mechanical Movement. D. D. Gordon, assignor to Central West Electric Co., Chicago, Ill. For snap action of lamp-socket switches.

1,180,644. Circuit-Interrupter. F. W. Harris, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, P. Details of operating levers and trip of circuit-breaker.

1,180,645. Stop-Motion for Stencil-Card-Feed Addressing Machines. J. Hergesheimer, assignor to the Curtis Publishing Co., Philadelphia, Pa. Driving-motor circuit controlled by stencil card.

1,180,648. Attachment Plug. H. Hubbell, Bridgeport, Conn. Separable plug having practically simultaneous break on both sides.

1,180,658. Electric-Lamp Fixture. F. Kratz, assignor to R. Bosch, Stuttgart, Germany. Unitary structure comprising lamp-supporting frame, and longitudinal switch for connection to concentric cable.

1,180,659. Junction Box for Electric Circuits. F. Kratz, assignor to Robert Bosch. Combined fuse receptacle and junction box for connecting concentric cable.

1,180,680. Apparatus for Controlling Magnetic Chucks. O. S. Walker, assignor to O. S. Walker Co., Worcester, Mass. Current is induced through chuck coil in reverse direction on breaking circuit.

1,180,686. Illuminated Razor. K. E. Allport, Chicago, Ill. Safety razor carries battery lamp adjustable to throw light on either side of razor.

1,180,688. Jump Spark Timer. C. H. Ashmead, Jr., Fort Lauderdale, Fla. Structural details.

1,180,692. Telephone Drop. C. C. Bradbury, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Details of coil mounting, armature, etc.

1,180,713. Coin-Testing Mechanism for Coin-Controlled Vending Machines. A. D. Grover and E. E. Barber, assignor to Auto-sales Gum & Chocolate Co., New York, N. Y. Detects checks of magnetic material.

1,180,719. Three-Position Direct-Current Relay. W. K. Howe and O. A. Ross, assignors to General Railway Signal Co., Gates, N. Y. Details of motor-moved contact and torque-compensating devices.

1,180,720. Circuit-Controller. W. K. Howe, assignor to General Railway Signal Co. Three-position without closure on intermediate position on continuous movement between extreme positions.

1,180,729. Lineman's Shield. H. E. Marshall, Detroit, Mich. Insulating envelope for placing about live wires to protect lineman.

1,180,743. Electric Winding Mechanism for Clocks and the Like. F. J. Seabolt, Schenectady, N. Y. Two springs are wound respectively by opposite directions of rotation of field-controlled motor.

1,180,746. Automobile Lamp. M. Vatter, Brooklyn, N. Y. Structure and mounting of shade on front headlight casing.

1,180,748. Lamp. H. A. Williamson, Chicago, Ill. Structure of lense and reflector in headlight.

1,180,751. Electric Switch. G. Wolff, assignor to General Electric Co., Schenectady, N. Y. Automatic circuit-breaker with circuits and switches for tripping or closing at will.

1,180,755. Locomotive. A. F. Batchelder, assignor to General Electric Co. Structure of frame, cab mounting, etc., on symmetrical and unsymmetrical trucks.

1,180,767. Cartridge Fuse. A. L. Eustice, assignor to Economy Fuse & Mfg. Co., Chicago, Ill. Structure of casing and fuse-retaining devices.

1,180,776. System of Distribution. H. A. Laycock, assignor to General Electric Co. Automatic regulation of system comprising storage battery and generator supplying voltage greater than the battery.

1,180,780. Electric Signaling Attachment for Clocks. J. A. McDole, Chicago, Ill. Contact controlled by hand-actuating contact member in spiral groove in insulating disc on dial.

1,180,787. Mechanically Operated Electrically Controlled Train-Control System. W. B. Murray, assignor to Miller Train Control Corporation, Staunton, Va. Ramp operates vehicle-carried bar, which is operatively connected when ramp is energized.

1,180,789. Train-Control Circuit. W. B. Murray, assignor to Miller Train Control Corporation. Related to above; track circuits for block system.

1,180,790. Track-Control Circuit. W. B. Murray, assignor to Miller Train Control

No. 1,180,635.—Fusible Element for Electric Cutouts.

Corporation. Related to above; track circuits for block system.

1,180,794. Electric Meter. W. H. Pratt and P. C. Morgenthaler, assignors to General Electric Co. Single unitary laminated structure forming magnetic circuit of alternating-current-motor meter.

1,180,795. Electric Meter. W. H. Pratt assignor to General Electric Co. Combined friction, compensating and phase-lagging device for induction-motor meter.

1,180,799. Spark-Plug. R. A. Stranahans, assignor to Champion Spark Plug Co., Toledo, O. Structural details.

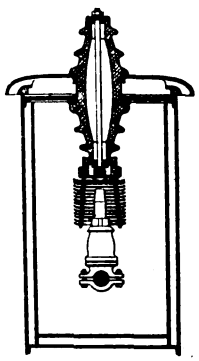
1,180,800. Means for Changing the Frequency of Alternating Currents. A. M. Taylor, King's Heath, England. Combination of choke coils and transformers for three-phase circuit.

1,180,805. Oil Switch. R. Troger, assignor to General Electric Co. Upper contact in downward-break switch in bell having restricted vents permitting slow escape of arc gases and cooling them. (See cut.)

1,180,819. Printing Machine. W. W. Briggs, Kalamazoo, Mich. Details of mechanism.

1,180,836. Electric Telegraph Apparatus. E. J. Galyean, Detroit, Mich. Details of sending and receiving machines.

1,180,838. Electric-Conduit Fitting. D. C. Gidley, assignor to Crouse-Hinds Co., Syracuse, N. Y. For connecting in lamp or other appliance.



No. 1,180,805.—Oil Switch.

1,180,840. Process of Producing Aluminum Nitrid. A. Giulini, Lazzago, near Como, Italy. Reactions effected below temperature of electric arc.

1,180,843. Automatic Telephone System. C. L. Goodrum, assignor to Western Electric Co., New York, N. Y. Circuits and magnets for operating selecting switch.

1,180,851. Electric Heating System. L. P. Hynes, assignor to Railway Utility Co., Chicago, Ill. Thermostatically controlled, for railway cars, etc.

1,180,860. Signal Device for Motor Vehicles. W. M. Loving, Richmond, Va. Semaphore arms carrying signals selectively connected with motor mechanism which moves them adjacent light and rapidly oscillates them.

1,180,908. Variable Lighting Device for Vehicles. A. R. Colgin, New York, N. Y. Lamp moved forward and back in special structure of casing, reflector, etc., to dim and intensify the light.

1,180,914. Solenoid Switch. E. Gengenbach, New York, N. Y. Structure of frame, magnetic housing and contacts.

1,180,917. Thermotelephone. O. Graetzer, Berlin-Lichterfelde, Germany. Structure of heating body comprising Wollaston wires.

1,180,997. Electric-Lamp Socket. F. P. Gates, assignor to Arrow Electric Co., Hartford, Conn. Structure of porcelain thumb-piece for switch-spindle.

1,180,998. X-Ray Tube. J. D. Gibson, Denver, Colo. Special tube structure comprising anti-cathode with circulating system for cooling same.

1,180,011. Electric-Lamp Support. W. C. Hummell, Hornell, N. Y. For suspended drop lamp; adjustable to raise and lower lamp.

1,180,046. Electric-Lamp Switch. A. J. Tizley, assignor to Bryant Electric Co., Bridgeport, Conn. Candelabra switch.

1,180,066. Crossarm for Electric or Signal Wires. S. S. Cornelius, Corinth, Miss. Has rounded top and under side is inset forming hood over insulators.

1,180,076. Attachable and Detachable Electric Light for Batteries. J. G. Hobson, St. Louis, Mo. Simple device for attachment to terminals of dry cell.

1,180,077. Process of Treating Ores Bearing Precious Metals. E. R. Holden, Los Angeles, Cal. Special electrolytic treatment.

1,180,092. Common-Battery Rotary-Connector System. W. L. Campbell, assignor to First Trust and Savings Bank, Chicago, Ill. Automatic telephone system.

1,180,093. Telephone Party-Line System. J. Erickson, assignor to First Trust and Savings Bank, Chicago, Ill. Common battery, automatic exchange system.

Reissue 14,120. Motor-Car Drive System. H. F. Hitner, Mount Vernon, O. Original No. 1,139,678, dated May 18, 1915. Mixed drive.

PATENTS EXPIRED.

The following United States electrical patents expired May 2, 1916:

623,968. Pneumatic Transmission System. B. C. Batcheller, Philadelphia, Pa.

623,989. Electric Motor. H. W. Corse, Melrose, Mass.

624,041. Process of Manufacturing Soluble Barium, Compounds. C. B. Jacobs, East Orange, N. J.

624,075. Telephone Switchboard. J. M. Overshiner, Elwood, Ind.

624,095. Telephone Register. H. T. Richards, New York, N. Y.

624,124. Electric Line Conductor. D. G. Stoughton, Hartford, Conn.

624,128. Permanently Adjusted Telephone. E. H. Thielscher, Brookline, Mass.

624,141. Electric Meter. R. S. White, New York, N. Y.

624,142. Means for Reducing Friction in Rotating Shafts of Electric Meters. R. S. White, New York, N. Y.

624,154. Electrical Warp Stop-Motion for Looms. W. H. Baker, Central Falls, R. I., and R. E. Kip, Montclair, N. J.

624,155. Warp Stop-Motion for Looms. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

624,218. Electric Cigar-Lighter. W. F. Kessler, Auburn, Ind.

624,230. Secondary Battery Plate and Method of Producing Same. A. J. Marquand, Cardiff, England.

624,250. Controller for Electrically Propelled Vehicles. E. B. W. Reichel, Berlin, Germany.

624,272. Automatic Circuit-Closer. G. A. Wall, Providence, R. I.

624,277. Electropneumatic Controlling System. G. Westinghouse, Pittsburgh, Pa.

624,299. Electromagnetic Actuating Device. B. E. Chollar, St. Louis, Mo.

624,300. Testing Apparatus for Electric Signal Circuits. A. Coleman, Taunton, Mass.

624,304. Electric Railway. H. B. Cox, New York, N. Y.

624,306. Electric Water-Boiler. J. C. Cramer, Los Angeles, Cal.

624,382. Electric Piano. G. Schrade and H. W. Shonnard, New York, N. Y.

624,386. Electrical Rosette. A. P. Seymour, Syracuse, N. Y.

624,390. Electric Signaling System. E. S. Simms, Denver, Colo.

624,396. Controller for Electrical Train-Signaling Apparatus. W. A. Stambaugh, Effingham, Ill.

624,409. Controller for Electrical Elevators. B. C. Van Emon, San Francisco, Cal.

624,413. Watchman's Clock. A. E. Waggoner, Muskegon, Mich.

30,686. Electric Arc-Lamp Casing. C. E. Harthan, Lynn, Mass.

30,687. Storage-Battery Electrode. T. A. Willard, Cleveland, O.

30,688 to 30,690. Converter Box. F. Schwedtmann, St. Louis, Mo.

30,694. Manhole-Cover Frame. T. P. Greger, Philadelphia, Pa.

30,695 to 30,697. Manhole-Cover. T. P. Greger, Philadelphia, Pa.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

THE ORIGIN OF LIGHTNING.

Since the time of Benjamin Franklin man has known that lightning consisted of an electrical discharge, very similar to those which may be made to take place in the laboratory. Lightning discharges may take place between a cloud and the ground, or between two clouds. Such an electrical discharge involves the combination of positive and negative charges which previously existed separately upon the two bodies between which the discharge takes place. After the discharge the two bodies will be electrically neutral, or at least more nearly neutral than they were initially. The mechanism by which bodies in the laboratory are given an electrical charge is well known, but what is the mechanism by which clouds are charged to millions of volts? For the electromotive forces which produce lightning discharges must be of colossal magnitude.

Various theories have been presented from time to time to account for the electrical charges which are accumulated by clouds, many of which have been widely discussed. Lightning phenomena are usually accompanied by heavy downpours of rain. It is well understood how the voltage of a cloud may be enormously raised by the combination of many fine charged particles of moisture into drops which are large enough to be precipitated to the earth. The large drop carries the combined charges of all the small drops which go to make it up, but its surface is very much less than the combined surfaces of the component droplets; hence the surface density of the electrical charge is very much greater. When the drop is large enough to fall and approaches the earth, the voltage may be high enough to cause an electrical discharge across the intervening space. But how are the original charges upon the tiny moisture particles produced?

The most plausible explanation for this has been advanced by Dr. George Simpson, who proved that when drops of water are broken up they become charged positively, while the surrounding air receives a negative charge. A thunder cloud is known to form in a rapidly ascending current of air, and if the velocity is as great as 26 feet per second the smaller drops will be carried upward, while even the largest drops will be unable to progress against the current. The larger drops break up in the air and become electrified, according to Dr. Simpson. If the ascending current spreads out laterally near the top of the cloud, the vertical velocity is diminished, the drops will grow and fall, but only to break again and repeat the process. Sufficient electricity might thus be accumulated to account for observed effects.

The rain which reaches the earth is sometimes charged positively and sometimes negatively, but more often positively, which is in accord with the above idea. This does not account for the fact that the earth, as a whole, is negatively charged, although local portions are at times positively electrified. There is still a great deal to be learned in connection with atmospheric electricity, but Dr. Simpson's hypothesis seems to offer an adequate explanation for the existence of thunder clouds and to be free from objections of a theoretical nature.

ORGANIZING BUSINESS.

The success of an electrical enterprise, whether it consist of merchandising, of installation work, or of running a central station, depends, just as in the case of any other kind of a business, largely upon an appropriate organization. To secure this organization is the function of the manager. Successful managers have been those who could pick out the best men for each part of the work and help them to develop to the point of greatest efficiency in carrying it out. Careful hiring makes less firing. Employees need to be encouraged and inspired, to have their initiative and resourcefulness cultivated, and to be properly rewarded for their efforts in order to develop an organization which will give the best results.

An organization, as well as individual ability and effort, is necessary. The head of each department must thoroughly understand what are his duties and what is to be done by each of the other departments, in order to have their separate activities properly gear together in the fullest measure of co-operation. One would often be surprised to find to what extent this element is lacking and to what extent the different departments are ignorant of what is expected of them and what they should expect of others. A great help in making this matter plain is the preparation of a chart or diagram showing the relation of each department to the others and listing their several duties and activities. An accompanying chart should show similar relations between the employees, indicating to whom each is responsible and under what head he is supposed to be operating. Instructions in writing as to the responsibilities of each head of a department, in regard to those general

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matters which may be regarded as permanent disposals of business, are very desirable and occasional reference to them is of benefit. Where such matters have not been arranged systematically it would often be a cause for surprise if different heads were asked to make a statement as to exactly what matters come under their own jurisdiction and exactly what come under the jurisdiction of each other. And not infrequently the causes would be unearthed which have been leading to friction and misunderstanding between those who should be giving each other the fullest measure of assistance and support.

BRITISH MANUFACTURERS AND INDUSTRIAL RESEARCH.

Among the various schemes which have been suggested in England for securing more effective co-operation between manufacturing industries and scientific research, is one which has been laid before the Manchester Committee for the Organization of British Engineering Industry, by Mr. A. P. M. Fleming, after a visit to the United States. Mr. Fleming is connected with the British Westinghouse Electric Company, for which he has organized apprentice schools and systems at Trafford Park, Manchester; and he has paid a visit of inspection, observing research operations in large American private industrial establishments, where allocations for such work frequently amount to $125,000, $250,000 or even $500,000. He has advised British manufacturers to supplement their present or enlarged specialized laboratory efforts by setting up a large centralized institution where all can co-operatively concentrate upon advanced research from which large consequences may be expected to emerge. In such an institution there should be separate laboratories for each of the great industries, such as engineering, mining, shipbuilding, soap-making, dyeing, rubber, paper, metal, textile manufacturing and so on, all being centrally housed together, and much of the research there conducted would be along lines of pure-science investigation, with a view to securing priority of new applications to industry. Mr. Fleming suggests the taking out of patents on behalf of the British Government, British or colonial manufacturers being licensed at a nominal fee, to manufacture. The advantages to be secured by such a scheme, as compared with a system of isolated laboratories in different centers, were stated thus:

(1) Work would be done without the overlapping which inevitably occurs among a number of different institutions, and which results in great lack of economy.

(2) The administrative expenses would be at a minimum.

(3) As one research frequently leads to others quite unsuspected originally, if all the work were done in one building fresh investigations could be carried out with the least loss of time and the greatest possible efficiency.

(4) The difficulty of collecting information on problems considered would be reduced to a minimum by housing copies of all matter required in one library.

(5) The problem of distribution of information would in the same way give as little trouble as possible if handled by a bureau attached to the institution.

(6) It is of the greatest possible value to have a number of men engaged in research problems housed in one building, where opportunities arise for frequent meetings. The stimulus arising from intercourse in this way can scarcely be overestimated; in a system of isolated laboratories this is very largely lost.

Mr. Fleming reiterated the advice which has been urged upon British manufacturers many times during recent years, to boldly vote funds for industrial research, because such allocations form an excellent investment. Funds so voted pay for themselves, and a percentage of gross profits should be set apart to establish and maintain such a research laboratory.

When such suggestions have been made on former occasions the reply from some directions has been that British manufacturers, at any rate in the electrical industry, did not operate on a sufficiently large or profitable scale to enable them to spare large funds for such a purpose. This answer will not be tendered with the same credence attaching to it today, after 21 months of heavy work with extended factories and war profits. Indeed it may be said that such a scheme stands a better chance of acceptance today than it did before the war, though it was generally recognized long ago that whatever was being done separately and in a disconnected way in England, co-operative centralization and its benefits were lacking.

ANOTHER NEW ELECTRICAL-EXPORT RECORD.

Indicative of the exceptional prosperity prevailing in this country in the electrical industry as well as in nearly all other lines is the surpassing of a monthly output record which has but recently been established. On another page of this issue is given a summary of the electrical exports for last February, which shows that the foreign shipments approached quite close to $3,000,000 and exceeded by over six per cent the record made last November. As compared with February of 1915 the total was nearly 75 per cent greater. Another interesting fact disclosed is that for the first eight months of the present fiscal year the total electrical shipments have already exceeded those of the corresponding period in the fiscal year 1913-1914, thus indicating that a new twelvemonth total will be recorded before the close of June. With this gratifying showing it is desirable that redoubled efforts be made to maintain the standing that American electrical products are attaining abroad.

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RECENT IMPROVEMENTS IN MOTOR DRIVING.

Increased specialization is an interesting and valuable feature of recent electric motor driving, notably in the textile field. The tendency is away from rigidity of connections, and the problem of reducing friction to the minimum is receiving deserved attention. A refinement which means not a little to the spinning-mill owner is the provision in a four-frame drive of a shaft of sufficient length to permit the horizontal adjustment of the pulleys to meet different widths of aisle between frames. By the use of ball bearings such a shaft with a direct-connected 20-horsepower motor can be driven by a motor of only one-sixth-horsepower rating, a feat which was greatly appreciated by visitors to the recent exhibition at the Boston convention of the National Association of Cotton Manufacturers. This means that the friction load, with the motor and shafting running at normal speed, but exclusive of the belts between shafting and frames, totals less than one per cent of the motor rating, and this represents a high degree of efficiency when applied to a large number of spinning frames. Even small savings in power per driving unit mount up when multiplied through a textile mill of the capacity now frequently found in this country.

The polyphase, brush-shifting type of motor is another comparatively new development, enabling the machine owner to enjoy the benefits of approximately constant torque over a considerable speed range. A novel feature of an equipment of this type consists of a pilot motor of nominal power which is mounted on the frame of the main motor and employed merely in shifting the brushes either automatically or in response to a push-button control arranged conveniently for the machine operator. Developments in the single-phase, brush-shifting motor are also interesting at present, a 2-to-1 speed variation being secured by gradual adjustment of brush position through hand or foot-operated control. The value of variable-speed characteristics for certain classes of work is not easily exaggerated, and the almost universal employment of alternating current for power supply over wide areas apart from city centers has long called for practicable equipment of this kind. Increased precision of service is now being realized in many cases through the employment of an ammeter installed integrally with the starting switch of the motor, such an instrument giving the mill superintendent a continuous and relatively inexpensive check upon the loading of the power unit, and hence throwing constant light upon the general productive efficiency of the major machinery.

It might perhaps be assumed that increasing specialization in motor drives militates against standardization and consequent low cost of power units. The field of motor application is so broad, however, that every step toward more accurate service benefits the industry as a whole. The electrical manufacturer has nothing to fear from any improvement in driving which enables motors of smaller power to perform the service of former units rated in higher figures. Increased popularization of the electric drive is bound to follow every improvement in efficiency, the parallel being clear from experience with modern incandescent-lamp evolution.

When the tungsten lamp was first introduced, great fears were expressed that the reduced consumption thereby made sufficient for the original amount of lighting would ruin the business of the central stations. In isolated cases a considerable falling off in output was experienced, but in the large majority of cases the new use created by the higher efficiency was more than enough to offset this.

ELECTROPLATING WITH NICKEL.

Nickel plating has been widely used to give a finished surface to articles made from other metals and to protect them from oxidation. It has been widely utilized for many years, and little change in the original methods of operation have been noted until recently. A few years ago other salts began to be used in place of the established double sulphate for plating baths and on account of their greater solubility permitted more concentrated electrolytes and more rapid plating. In the issue of May 8, 1915, we pointed out the advantages which cobalt might possess as a substitute for nickel in this work, and among them was the more rapid rate of deposition possible with that metal.

At the recent convention of the American Electrochemical Society two papers were presented dealing with the best conditions for electroplating with nickel, and one of them had to do principally with the rate of deposit. It was shown that the use of a hot solution permitted an increase of two fold or three fold in the current-density used. At the same time the resistance of the electrolyte is decreased and the actual deposit brought closer to that computed from the electrochemical equivalent. The deposit produced is tougher than one obtained in a cold solution, and is less likely to peel off, a fault all too frequent in commercial nickel-plating.

Commercial nickel plating usually contains several per cent of iron, which is evidenced by a dark color. This may be avoided, and the bath kept in better condition, by the use of purer nickel anodes. Such anodes cost no more than the 95-per-cent alloy commonly used. Defects in the deposit may be avoided by surrounding the anodes with bags, since loosened solid particles from the anodes frequently cause pitting when they come in contact with the cathodes.

Greater care in the working with nickel and greater speed in its deposit, as here shown to be possible, will help to prevent it from being displaced by cobalt or some other substitute in commercial work. Nickel is cheaper than cobalt, but requires more power, and to hold its place must be able to show at least equal facility in operation and equally good results.

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Happenings in the Industry

Conference Between Engineers and Bureau of Standards at Atlanta on Proposed National Electrical Safety Code—Notable Flood-Lighting of a Columbus Department Store—Electrical Exports for February Establish a New Record—Summer Program for University of Wisconsin—Miscellaneous News Notes

Conference Between Engineers and Bureau of Standards at Atlanta.

The affiliated technical societies of Atlanta, Ga., arranged a conference in that city with the Bureau of Standards, which took place on May 2, 3 and 4. The meeting was opened at 10:00 a. m., on May 2 by Allen M. Schoen, of Atlanta, acting at chairman, who stated that the conference was primarily intended to give the engineers of the South an opportunity to present their views on the proposed National Electrical Safety Code, which had been prepared by the Bureau of Standards. He introduced E. B. Rosa, chief physicist of the bureau.

Dr. Rosa stated that the bureau had become interested in the National Electrical Safety Code by being requested by operating electrical companies to assist in reducing the large number of preventable accidents. An appropriation was made for a study of the subject, which should take practical conditions into consideration. The National Electric Light Association appointed a safety committee to work with the bureau. After making a collection of the safety rules already in existence, it was decided that the bureau should prepare a National Safety Code. A tentative code was prepared and discussed with the representatives of the various organizations of light and power, telephone, telegraph and railway companies, and also some of the labor unions. It did not prove an easy task to prepare a code which would meet the views of all these interests, but after detailed criticism by them, a final conference was organized by the Bureau of Standards, at which a very careful study of the proposed code was made by committees of the conference. The code was then printed, but several questions were left unsettled. These are being studied by the Bureau of Standards and will be published as appendices to the code.

It is expected that when the code is printed it will be adopted tentatively by the operating companies and also made a part of the official rules of public service commissions or municipalities, and the fact that it was prepared by an entirely disinterested body will facilitate its adoption. It is hoped that it will not be legislated into effect, since that would make it difficult to revise it as may become necessary. The bureau intends to follow it up, noting the difficulties in carrying it out, and invites criticism at all times.

The code proposed consists of four parts, dealing respectively with electric supply stations, overhead and underground lines, utilization equipment, and electrical operation. It goes into great detail as to methods of construction and operation. The code was read and discussion invited.

The discussion brought out several features which had been misunderstood, but no radical changes were suggested. It was explained that the provisions covering construction were expected to apply only to future work, except where existing plants could be modified at reasonable expense. The rules could be waived by proper authority whenever the expense appeared to be excessive.

The provision for the use of medium hard-drawn copper provoked much discussion, as the engineers did not seem entirely familiar with its properties. W. J. Canada, of the Bureau of Standards, explained that the companies themselves were adopting it, on account of its greater stability and the possibility of avoiding excessive sags. He pointed out that the soft copper really became medium hard after being weathered some time, and the slack pulled up, and it was more economical to start with medium copper, which cost no more than soft, and would be kept in stock by manufacturers when generally used. The question of joints in medium copper was discussed, and tests made by the bureau were explained. Attention was called to the fact that there was a difference between the melting temperature of solder and the annealing point of copper, and if soldering was done at temperatures between these limits, a safe joint could be obtained.

The amount of sag specified for overhead construction were criticised as excessive. Mr. Canada explained that an economic balance had been figured, taking into consideration the strength and cost of supports, and the amount of separation, and also the interest of the public, which demands a reasonable clearance.

Mr. Schoen suggested that a rule be included to prohibit high-tension lines crossing over buildings, or being within 25 feet of a building. The engineers present felt that such a rule could not be enforced in all cases, but this practice was now avoided when possible.

After the close of the day's session the members were taken to one of the substations of the Georgia Railway & Power Company, where they witnessed a demonstration of the methods of replacing defective insulators in working high-tension lines, whose potential was 110,000 volts. The methods employed permitted this to be done with absolute safety.

Night Session.

At the evening session Dr. Rosa lectured on the work of the Bureau of Standards to an audience composed of the members of the conference and a number of invited guests. He traced the history of its development from a mere Bureau of Weights and Measures to its present position, which is similar to that of the research department of a great national university. He described the operations of the various departments of the bureau in detail, illustrating his remarks with a number of motion pictures. The audience was much impressed with the wide scope of activities of the bureau, which included the testing of nearly all the materials of construction used by the government, from paper to cement and steel, and all of the instruments used in the industries, as well as by the federal departments. Some of the more recent developments were departments for testing radioactivity of radium salts, and for the standardizing wireless apparatus.

Dr. Rosa pointed out in conclusion that this was the only branch of the Federal Government provided to assist the manufacturers of the United States, whose annual product amounts to twenty-one billion dollars, and that the annual appropriation for its maintenance was only $600,000. The Department of Agriculture receives an appropriation of twenty-five millions, while the value of our farm products totals but nine billions. He suggested therefore, that the American people should assist with their influence to obtain further appropriations for the work of the bureau.

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Electrolysis.

The session of May 3 was devoted to a study of methods of mitigation of electrolysis. Dr. Rosa explained that the Bureau of Standards had received many requests for information on this subject, and had made very detailed studies, beginning with the effects of corrosion of iron in soils, then investigating earth resistance, the protection obtained from various paints and coverings, prevention of leakage from rails, manner of making rail bonds, and the methods of making electrolysis surveys. Field studies were then made on practical problems at St. Louis, Mo., Elyria, O., Springfield, O., and Springfield, Mass., at the request of the public service corporations. In all cases the companies affected accepted and carried out the recommendations of the bureau. Detailed reports of all these studies have been published.

Burton McCollum, of the Bureau of Standards, then read a paper on "The Mitigation of Electrolysis." He described electrolysis and called attention to the fact that electrolysis was frequently charged with the effects of self-corrosion. He also outlined the conditions under which electrolysis may occur, and the damage and dangerous conditions in underground pipe or cable systems which may result therefrom. Many methods of mitigation have been proposed, which may be divided into two classes:

(1) Methods which seek to remove the effects without reference to the cause.

(2) Methods of preventing leakage.

In the first class are included many coverings and paints, none of which were found useful. The results of tests of these are to be found in the publications of the Bureau.

Pipe-drainage systems have been used extensively, but are very expensive under severe conditions, and where more than one underground system exists, they merely transfer the danger to another system, as one is improved. For cable systems this method is of considerable value, but there is always a possibility that some dangerous places may be overlooked.

The second class is applicable to the railway return-feeder systems, with a view of reducing the amount of fall of potential in the negative return, and consequently the leakage to pipes. The proper number and location of power houses is the first consideration. Next the track conditions and bonding must be investigated. The use of the Nicholls joint (using melted zinc) and cross-bonding have been found very effective. If electrolysis continues after these items have been properly adjusted, further improvements may be obtained by a system of properly designed negative feeders. These may be arranged with resistance in the shorter ones, so that a uniform and reasonable potential-gradient is obtained.

Where traffic conditions are heavy, good results may be obtained with a three-wire system, alternate sections of overhead feeders being made positive and negative, while the track is neutral. This system has been found very satisfactory abroad.

Concluding, the speaker recommended that a careful survey of each particular case should be made, having reference to all the systems involved, and then applying one or all of the methods in class 2. Sometimes a limited amount of pipe drainage or insulating joints as an auxiliary remedy may be advisable. It has been found that the operating economies obtained by the use of these methods will pay all or a large part of the annual charges on the additional investment in copper.

The paper was highly commended by those present, as providing a basis for co-operation of the interests involved. E. M. Miller, of the American Telephone & Telegraph Company, George J. Yundt, of the Southern Bell Telephone & Telegraph Company, and A. F. Ganz, of the Stevens Institute of Technology, spoke at length, endorsing the proposed methods, and giving examples of practical cases bearing on the subject.

The general discussion which followed brought out various practical details. The difference between an insulating joint and a high-resistance joint in a pipe was shown to be important. An effort was made to decide as to a safe limit for the potential differences between pipes and tracks, but it was explained that no limit could be set, and the amount of current flow was the important factor, a large current with very small potential difference being dangerous. Reversing the polarity of the power plant was shown to be useful only as a very temporary expedient, in special cases, since the dangerous conditions are merely transferred to other parts of the system.

As a result of this paper and discussion, it is probable that in the future satisfactory co-operation between the railway companies and the owners of underground properties may be expected.

Grounding.

The session of May 4 was devoted to the subject of grounding of electrical conductors, rules for which are to be made a part of the proposed National Safety Code. Dr. Rosa explained that a ground connection is a safety device intended to keep the difference of potential between electrical conductors and the earth within reasonably safe limits, for the protection of life and property. It must be of low resistance, and permanent, and the studies made by the Bureau of Standards were for the purpose of obtaining these conditions.

Mr. McCollum read a paper showing the necessity for such grounds, with especial reference to their application to secondary distribution systems fed by high-tension alternating currents. He showed that dangerous conditions arose principally through the breaking down of transformers, and from crosses between primary and secondary wires. The grounds not only reduced the possible potential difference between secondary conductors and the earth, but also assisted the operation of circuit-breakers. Investigations of methods of obtaining grounds proved that water pipes are most effective, and that driven pipes should be used where no water pipes are available. The objections to the use of water pipes by the owners are based chiefly on the danger from electrolysis, which is negligible with alternating currents, but the ground connections should be limited to a single system of pipes, which should be continuous. The approved methods of making grounds were described in detail.

It was recommended that the practice of connecting low-tension, alternating-current secondaries to water pipes be made universal, and that the periodical inspection and resistance measurements of grounds be provided for.

Mr. Canada then read the rules and specifications for grounding proposed in the National Safety Code. The subject was then discussed in detail, the principal criticism being that the specifications for making grounds were not rigid enough, though in some cases the sizes of ground wire proposed were too large. It was explained that the code was intended for universal application, and that in some localities more rigid specifications could not be followed. It was expected that the proposed code should be the minimum of safety provision for all the operating companies, and further, that it should agree with the requirements of the fire underwriters, who were adjusting their rules to conform to the proposed National Code.

After the discussion, the representatives of the operating companies accepted all of the recommendations of the Bureau on the subject, and promised their co-operation in carrying them out.

Resolutions were passed, commending the Bureau of Standards for its interest and assistance in the practical problems which had been discussed.

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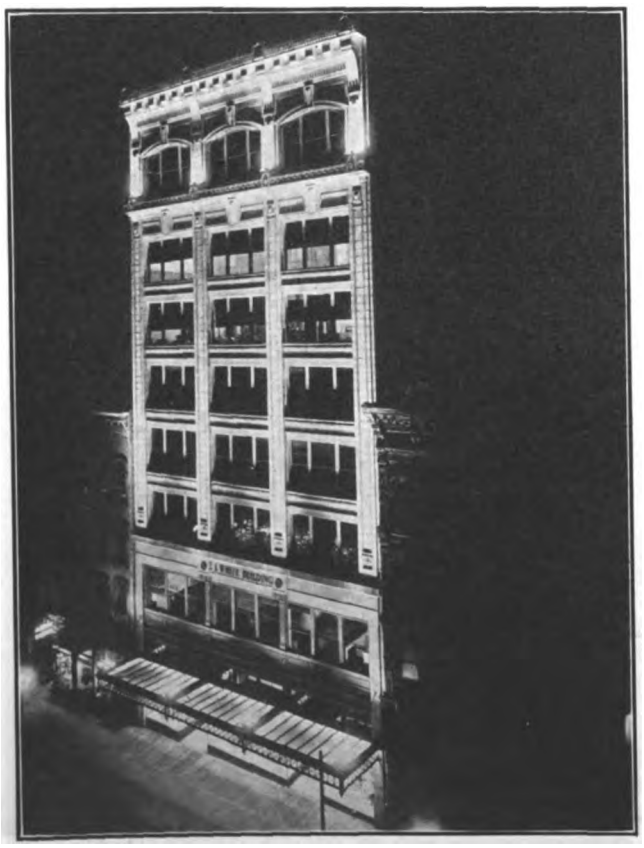
Among those present, who took an active part in the discussions, were, besides those named in the foregoing: H. C. Sutton, representing Charleston Consolidated Railway, Light & Power Company; G. K. Selden, Southern Bell Telephone Company, Atlanta, Ga.; H. L. Cornelison, superintendent of Municipal Lighting Plant, Jacksonville, Fla.; E. P. Peck, Georgia Railway & Power Company, Atlanta, Ga.; P. A. Tillery, Carolina Railway, Light & Power Company, Raleigh, N. C.; H. S. Badger, Nashville Railway & Light Company, Nashville, Tenn.; W. G. Clayton, American Railways Company, Roanoke, Va.; H. R. Palmer, Virginia Railway & Power Company, Norfolk, Va.; K. L. Wilkinson, American Telephone & Telegraph Company, New York; E. J. Nash, Butte Electric Railway, Butte, Mont.; J. C. Stevens, Virginia Railway & Power Company, Norfolk, Va.; S. T. Cummings, Albama Power Company, Birmingham, Ala., and Mr. Strong, Louisiana Fire Prevention Bureau, New Orleans, La.

Notable Flood-Lighting Installation in Columbus.

The first building in Columbus, O., to be permanently flood-lighted is equipped with a unique installation, in that the lamps and projectors are all located on the premises, making the lighting entirely independent of any other location. Of the 20 units used, 16 are concealed in the marquee, which projects the width of the sidewalk, just above the first story. The Z. L. White Company has just completed the building for its department store, at a cost of nearly $500,000. Of rather massive construction, with front of white marble and terra cotta, it is well adapted to this form of illumination. Situated at the outer edge of the marquee, the units throw an egg-shaped ray at an angle of about 70 degrees. This is helped out at the top



Flood Lighting of a Columbus Department Store.

of the building by four additional units concealed in the belt cornice at the base of the eighth floor, one unit at each pilaster. A bright and uniform effect is thus secured over the whole illuminated field. At the same time the interior of the building is free from the glare that would result if the rays were thrown upon it direct from across the street. Work can be carried on after night without inconvenience on any or all floors.

Absolute safety has been secured against the lighting construction being torn loose by wind. The projectors not sunk in the marquee are secured to the steel window frames. The installation was effected without disturbing the terra cotta. Over a million candlepower is thrown upon the face of the building, causing it to stand out with great attractiveness from any point within range of vision. Projectors of X-Ray make, with 250-watt lamps, stereopticon type C, form the installation.

The cost of the installation was $300, and the energy cost, on a schedule of five hours a day, amounts to $15 a month. An inducement which led the owners of the building to adopt this system of lighting was that it would emphasize at night the company's name of "White," in the sense that the light material of the building does in daytime.

Electrical Exports for February.

The monthly summary of the foreign commerce of the United States for last February, which has just been issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., makes the interesting disclosure that the electrical exports for that month have established a new record. The previous record of last November has been exceeded by nearly $168,000. An increase of over $1,259,000 occurred as compared with February of a year ago.

For the four electrical classes for which numbers of articles exported are given in the official reports, there were shipped in February the following: Electric fans, 1,872; arc lamps, 112; carbon-filament lamps, 86,471; metal-filament lamps, 580,667.

In the following table are given the detailed figures for last February and for the corresponding month of a year ago.

Articles.	Feb., 1916.	Feb., 1915.
Batteries	$ 104,712	$ 109,214
Dynamos or generators	112,965	127,565
Fans	30,637	10,206
Insulated wire and cable	217,764	95,641
Interior wiring supplies, etc. (including fixtures)	133,500	67,648
Lamps—		
Arc	1,761	8,031
Carbon-filament	12,898	9,862
Metal-filament	107,715	51,373
Meters and other measuring instruments	59,170	22,807
Motors	439,769	326,224
Telegraph instruments (including wireless apparatus)	2,542	5,589
Telephones	105,176	101,957
Transformers	86,414	46,646
All other	1,527,588	700,804
Total	$2,942,611	$1,683,567

In February there were also shipped 19 electric locomotives, valued at $134,405; these are not included in the above table.

For the eight months ended February 29, 1916, the total value of electrical exports was $18,581,180; for the corresponding period ended February 28, 1915, the total was $12,205,421; for the corresponding eight months of 1913-1914, it was $17,723,804.

University of Wisconsin College of Engineering Announces Summer Session.

The eighteenth annual summer session of the college of engineering of the University of Wisconsin will be held at Madison during the six weeks' period beginning June 26. Special courses will be given in chemistry, electrical, steam and hydraulic engineering, gas engines, machine design, mechanical drawing, mechanics, shopwork and surveying. All courses given in the University summer session are open to engineering students. For information address F. E. Turneaure, Dean, Madison, Wis.

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Miscellaneous NEWS NOTES

Tacoma to Effect Economy by Combining City Departments.—If plans of the City Council are put into operation the city of Tacoma will save between $30,000 and $50,000 per year by placing the municipal light and water departments as part of the engineering department, with the city engineer in charge.

Montana Town to Revert to Candles.—Malta, Mont., with a population of more than 1,000 people, may be compelled to resort to the use of candles and kerosene lamps. The Malta Electric Company, which has furnished electric service in the town, will retire from business. The company made application for a franchise, but it was not granted, and the City Council also declined to purchase the plant.

Electric Vehicle Boosting Committee Formed.—Chairman W. H. Johnson, of the Electric Vehicle Section of the National Electric Light Association, has appointed a committee for the purpose of making the electric vehicle prominent at the coming Chicago convention. As this will be the first N. E. L. A. convention in which the Electric Vehicle Section will participate, the committee will take the opportunity of impressing on the other members of the Association the value of the electric vehicle and this method of transportation.

Cincinnati Electric Show Dates Announced.—The electric show committee of the Cincinnati Chamber of Commerce has set dates for the 1916 electric show, the event of last fall having been so successful the show has been made an annual affair. November 18 to 25 are the 1916 dates, and Music Hall, where the 1915 show was held, has been reserved in entirety for the display. With so much time in which to arrange for the various details of the show and to enlist the interest of prospective exhibitors, it is anticipated that it will be even more comprehensive and interesting that that of last year.

New Orleans Holds Very Successful Electric Show.—The first New Orleans Electric Show was held during the week of April 24-29 under the auspices of the New Orleans Jovian League. The show occupied the entire second floor of the Hippodrome Building, and besides the many exhibits there were many amusement features and special events on the program. A representation of an electrically operated steel barge was given. The attendance during the week was 10,000 people, and Chairman W. E. Clement of the executive committee reports the show a big success.

Preparedness Lecture on the Flying Machine to Be Given in New York.—The fifth of a series of lectures on preparedness will be given before the New York Electrical Society on May 18 at the Engineering Societies Building, 29 West Thirty-ninth Street, New York City, by Henry Woodhouse, managing editor of *Fly*, on "The Flying Machine in War and in Peace." Besides outlining recent development in aviation, Mr. Woodhouse will indicate what this country must do if it is to have adequate preparedness and will discuss the impression now rapidly growing in Europe that the war will be decided in the air. The lecture will be graphically illustrated by a unique series of slides.

Large Power Units Are Described.—At a meeting of the American Society of Mechanical Engineers, held in the Engineering Societies Building, 29 West Thirty-ninth Street, New York City, May 9, H. G. Stott, superintendent of motive power of the Interborough Rapid Transit Company and of the New York Railways Company, and W. S. Finlay, also with the Interborough Company, discussed the large steam turbine and described in particular the three 30,000-kilowatt steam turbines installed at the Seventy-fourth Street Power Station of the Interborough company. With the aid of slides they showed the mechanical features of these high-capacity, comparatively small-sized power producers and gave figures on their coal and steam consumption and efficiency.

Tungsten Being Mined in Connecticut.—A tungsten mine is being successfuly worked in Trumbull, Fairfield County, Conn., it is reported. Attention was first called to the deposit in 1895, when scheelite was the mineral mined. Later the property was acquired by the American Mining & Tungsten Company and tungsten and wolfram were taken out. At the present time the owner is the American Electric Equipment Company, and it is said $2,000 to $4,000 worth of tungsten is being mined daily.

Electrical Operation of Large Draw Bridge.—At a meeting of the Western Society of Engineers held in Chicago on May 8, a paper entitled "The Operating Machinery of the Willamette River Draw Bridge, Near Portland, Oregon," was presented by Byron B. Carter. This bridge has a span of 521 feet and is operated entirely by electric power. The machinery and method of operation were described, also certain improvements therein that were suggested by extended experience.

Lighting Contract for Massachusetts Company.—The Greenfield (Mass.) Electric Light & Power Company has contracted with the Deerfield River Electric Light Company, Conway, Mass., to supply electricity and to rebuild and extend the local lines at a cost of about $25,000. A number of 100-candlepower street lights will be installed. Heretofore the local company has bought its energy from the Conway Street Railway Company, which finds it needs all the energy available.

Mount Wilson Solar Observatory Described.—Dr. Arthur S. King, superintendent of the physical laboratory of the Mount Wilson Observatory, was the principal speaker at the luncheon of the Los Angeles Jovian League held May 3. His subject was "The Equipment and Method of Work at the Mount Wilson Solar Observatory." He described the new 100-inch telescope now under construction. This telescope, the largest instrument in the world, has moving parts which weigh 100 tons, the lense alone weighing five tons. He described the many ingenious electrical devices used in connection with the various instruments, and stated that 50 and 25-horsepower units with remote control were used in connection with the telescopes.

New Haven Power Plant Supplies Factories.—The Housatonic Power Company, operating hydroelectric plants in Connecticut, is controlled by the New York, New Haven & Hartford Railroad Company. The Massachusetts Public Service Commission, in its general recommendation for the divorcing of utilities, not strictly railroad in character, from the New Haven company, urges that the holdings in the Housatonic company be disposed of. The railroad, however, opposes the measure, pointing out that the properties of the hydroelectric company would be adversely affected by their separation from the New Haven system, which utilizes the power for operating its trains. The peak load occurs before and after factory hours, and the surplus energy generated is sold to manufacturing plants in the neighborhood.

Newark to Hold Industrial Exposition.—An anniversary industrial exposition will be held in Newark, N. J., during the week starting May 13 and which promises to be the largest industrial exposition ever held in this country in which the manufactured products of a single community make up the exhibits. Among the exhibitors will be the Crocker-Wheeler Company, the Edison Lamp Works of the General Electric Company, the Westinghouse Electric & Manufacturing Company, the Star Fan & Motor Works, the Splitdorf Electrical Company, the I. R. Nelson Electrical Repairing & Manufacturing Company, the Public Service Electric Company, Ludlow & Squire and Gould & Eberhardt. Many of the exhibits will be of an educational nature and will make their appeal to the public through this medium. Special attention will be given at the exposition to the industrial preparedness movement.

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Electricity in Cotton-Goods Manufacture

A Description of the Processes Involved in the Manufacture of Cotton Goods from the Raw Cotton to the Woven Goods

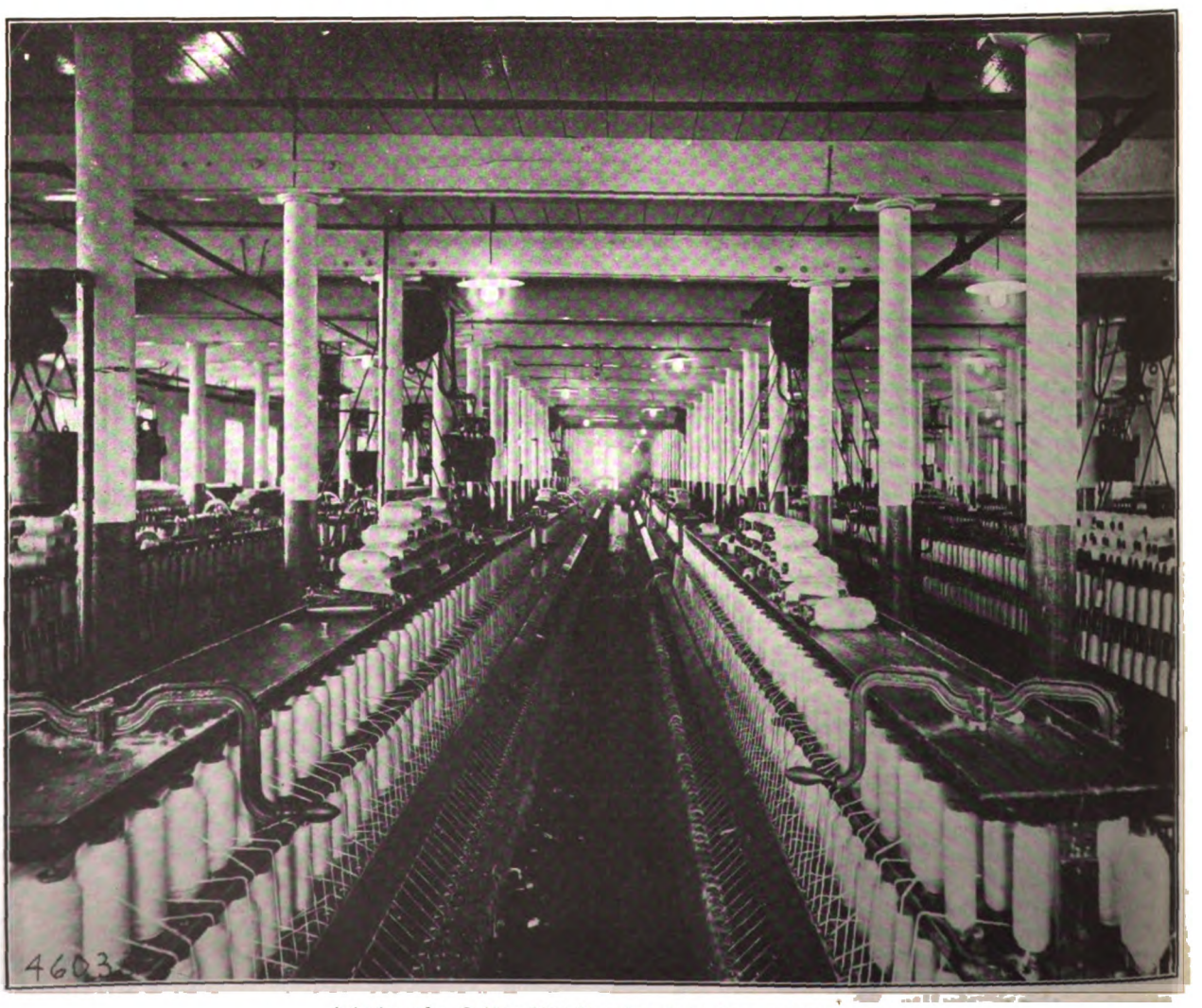
Industrial Power Series—Article No. 164.

There is probably no industry where electric motor drive has been adopted to a greater extent than in the manufacture of cotton products. The transition has been gradual, starting from the change from central steam or water-power plants to large motors, then to group and later to individual drive. The cotton industry is standardized to a large extent, with practically uniform prices for the finished product. It is, therefore, apparent that mills with the most modern equipment and the greatest production per unit of equipment are in a position to make larger profits than the mills with antiquated power facilities. The overhead charges remain the same whether the machines are turning out 75 per cent, 90 per cent or 100 per cent of their rated capacity, and the nearer the maximum is reached the more economical the operation of the mill. Electric drive has done much to bring production up to the maximum, largely owing to the uniformity and higher speeds obtained, both of which also improve the quality of the product.

Where electric drive is used the location of the machines and buildings is independent of the power supply and additions to the buildings and the power equipment can be easily made. It frequently happens that the work in hand makes it desirable to operate a portion of the mills overtime and this can be done profitably where central-station service and electric drive are used. With mechanical drive from a central source of power, there is a large friction loss and speed variation, as it is impossible to prevent the whipping of shafting where great lengths are used. Where individual drive for the machines is used it is possible to check accurately the exact power requirements and thus keep an accurate record of power costs. Although the cost of power is but a small percentage of the cost of production, the increase in output where electric drive is used introduces a factor of unusual importance. In some instances production has been increased 5 per cent by using motor drive.

Process of Manufacture.

This article is intended to outline the preliminary processes and to describe the principal machines used in the manufacture of cotton. Cellulose is the principal component of cotton and in this it is in common with all other vegetable fibers. A small amount of oily and waxy matter is, however, associated with the cellulose when cotton is in the natural condition, which appears on the sur-



Interior of a Cotton Mill Showing Four-Frame Motor Drive.

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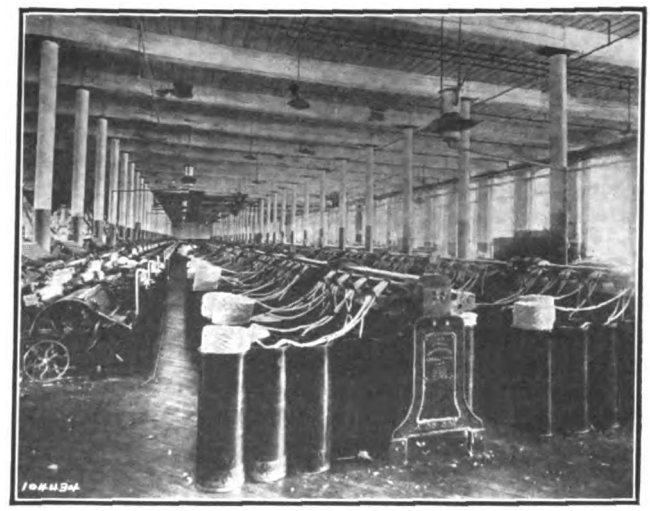
Group of Motor-Driven Looms.



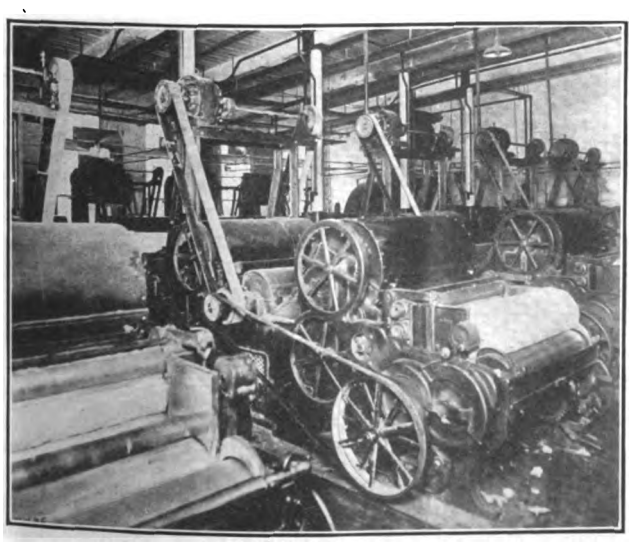
Motor-Driven Slubbers.

face of the fiber and it is thought to act as a protective layer. It is difficult to impregnate the raw fiber with solutions, as the coating of the waxy material causes it to be water repellent. Before dyeing or bleaching, cotton must be boiled out which is accomplished by boiling in a solution of dilute caustic soda, soda ash, soap, or other alkailine solutions. Cotton wax can also be removed by the use of certain oils. The fact is that the wax makes the fiber more coherent and plastic which aids materially in the spinning of the cotton, and from this it will be seen that bleached cotton and dyed cotton are not spun so satisfactorily as the raw cotton.

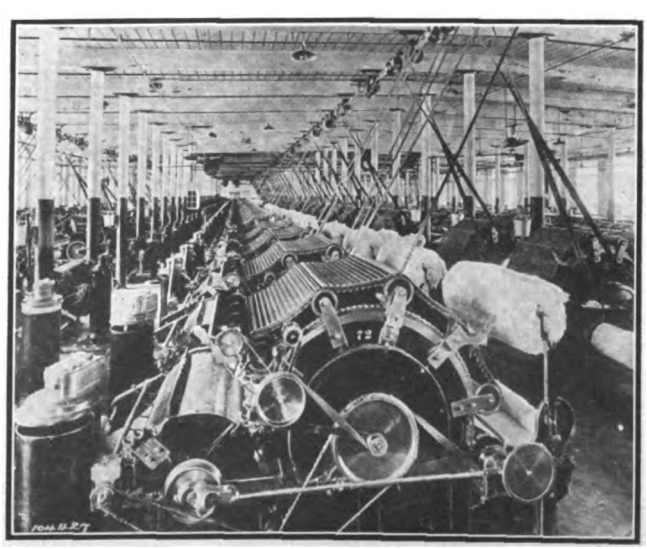
To fit cotton for manufacturing purposes scouring is not necessary as there is but a small amount of impurities in the raw fiber. The waxy coating must be removed, however, before dyeing, in order that it may absorb the dyes. Cotton may be bleached in any form of its manufacture and it is occasionally bleached in its loose state before spinning, by means of special machines. It is essential that the liquor be circulated thoroughly through the goods in the boiling-out process, which is best accomplished in a bleaching machine where it may be automatically worked in the solution. From three-quarters of an hour to an hour is the usual time required for the bleaching liquor treatment. Another process of bleaching which may be used with skein yarns, is to link the skeins together in the form of a long chain and run it continuously through squeeze rollers. There are also special machines for the bleaching of cotton slubbing and yarn in the form of cops and tubes, the yarn or slubbing being wound on perforated tubes and so arranged on the machine that the bleaching liquors are forced through the cotton either by means of vacuum suction or pumps.

The principal method of bleaching cotton is in the shape of cloth and the form this bleaching takes depends upon the use for which the cloth is intended. Market bleach is used when the cloth is to be sold as white muslin, and Turkey red or bottom bleach is given when the cloth is to be dyed. Madder bleach is given if the cloth is to be printed. When the cotton pieces come from the loom they are stitched together and marked for further identification. Then to burn off the loose fibers and lint from the surface of the cloth it is singed by passing rapidly over a series of gas flames or passed over curved plates heated to redness, or over a revolving copper roller that is kept at a high temperature. The goods next go through a process known as boiling out similar to the process used for cotton yarn and then thoroughly washed to remove the solutions previously used.

Having passed briefly over the bleaching process the various manufacturing processes next demand attention. Mixing the cotton is the first process after it has been received at the mill. This is for the purpose of allowing the cotton to assume its normal condition, and to establish an average quality of grade in the lot. A machine known as a bale breaker is sometimes used for mixing cotton. Its object is to separate the matted masses of cotton as they come from the bale and to deliver the cotton in an open state to the mixing bins. The principle of the bale breaker is three or four pairs of rolls, each



Individual Motor Drive in Picker Room.



Motor-Driven Cards in Cotton Mill.

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revolving at a higher rate of speed than the preceding pair. The cotton fed to the pair that is revolving at slow speed, is pulled apart when it comes under the action of the pair revolving at a higher speed. The room containing the machinery through which the cotton passes during its first stages of manufacture is known as the picker room, and its equipment for medium counts generally consists of an automatic feeder, opener, breaker picker, intermediate picker, and finishing picker.

Where the bale breaker is used, that also may be found in this room, although it is usually in the mixing room. Other machines in some cases may also be found in this room, such as waste openers and waste breakers. In the mills using long-stapled cotton and producing fine yarns, either the intermediate, or the intermediate and finisher pickers would be omitted from this list in order to lessen the beating action. In large mills, usually two rooms at least are devoted to the mixing and picking, the mixing, feeding and opening being generally carried on in one room, while the intermediate breaker, intermediate and finishing pickers are located in another room. The usual procedure is to open the cotton on the first floor and then feed it to the automatic feeder from which it passes to the opener and then to the breaker picker located on the second floor. From the breaker picker the cotton passes to the intermediate picker, while the finishing picker takes the cotton from the latter. Where a bale breaker is used it is usually located in the opening room and aprons are so arranged that the cotton is carried from the bale breaker to the mixing bins situated in such a position behind the automatic feeders that the cotton can be conveniently handled.

Automatic feeders are used for the purpose of feeding other machines and receive the cotton after it has been mixed. Larger quantities of cotton than are actually required are carried away from the mass by an apron with projecting spikes and the supply to the next machine is limited to the actual requirements. Openers are not used in all mills as the breaker picker and automatic feeder are connected directly to the breaker picker. Eliminating heavy impurities from the cotton, and disintegrating the cotton into small tufts are the objects of the opener. A beater that has a speed of from 1,200 to 1,800 revolutions per minute and having two blades, delivers two blows for each revolution to a fringe of cotton which knocks any foreign substance through grid bars. The tufts of cotton will also be removed from the fringe as soon as they are released from the bite of the feed rolls and will be light enough to be carried to the next machine by an air current.

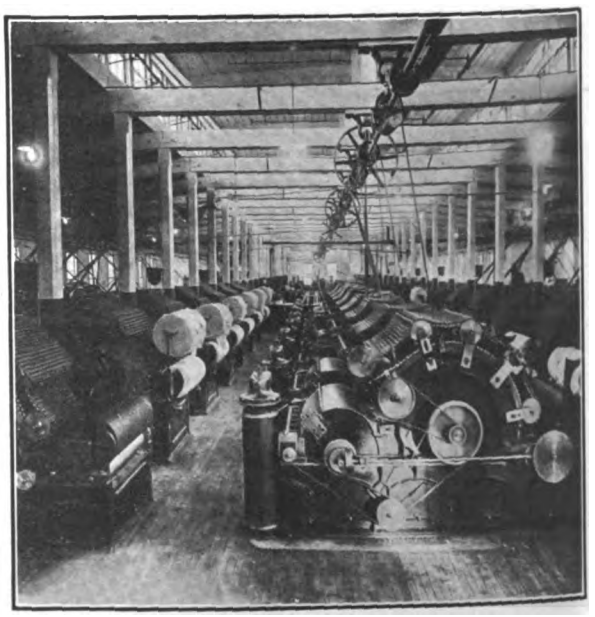
By means of an air current the cotton from the opener is carried to the next machine by what is known as a trunk. A fan exhausts the air from the trunk which draws the cotton from the opener. A circular tube of sheet metal, from 10 to 13 inches in diameter, constitutes a plain conducting trunk. Wood construction is also used for horizontal cleaning trunks and are provided with doors for removing the dirt accumulation, also grids which allow the dirt to drop through them. The same general construction is used for inclined cleaning trunks, the only difference being that the latter are constructed in an inclined position. After the cotton leaves the opener it is transferred to a breaker picker either by an automatic feeder or by a trunk. Breaker pickers have for their object the removal of foreign matter, separating the tufts of cotton to obtain easier manipulation, and to wind the cotton on a roll of cylindrical form in a layer, the resultant being known as a lap.

To secure a lap of more uniform weight per yard the intermediate and finishing pickers are used and are similar in construction to the breaker picker. The lap of cotton as it leaves the picker consists of cotton fibers crossed in all directions, together with a small amount of foreign matter. Machinery of an entirely different character to that described is necessary to remove this foreign matter which is done by the cotton card and the process is called carding. The carding process is employed in all cotton mills. Disintegrating the cotton, removal of the smaller and lighter impurities, and changing the form of the cotton from a lap to a sliver are the principal objects of the card machine. The sliver consists of a loose strand of cotton, round in section, which after the carding, drawing and combing process is generally coiled in a can. For new cotton mills the card in common use is called the revolving-top flat card and sometimes known as the English card.

One of the most important features in the production of good yarn by paralleling and attenuating machinery is accomplished on the drawing rolls. There are two kinds of drawing rolls, common and metallic, placed one above the other in pairs, the lower ones being driven positively by means of gears and the upper ones by friction when common.

Combing and incidental processes are customary for fine yarns, high-grade yarns or even for coarse yarns. Picking and carding processes are generally considered sufficient for the purpose of cleaning the fiber for yarns of the lower qualities. Short fibers should be removed from the stock in the manufacture of fine yarns which is accomplished by the combing process. Three kinds of machines generally compose a combing equipment, the sliver-lap machine for making a lap from a number of card slivers; the ribbon lap machine for combing several laps from the sliver lap machine into a firm and even lap, and the comber which has already been mentioned. The combing equipment generally consists of drawing frames, sliver-lap machines and combers when the drawing frame is used. The latter machines have for their objects, reducing the thickness of the sliver, evening the product, twisting the roving and winding the latter on a bobbin.

Spinning is the next operation as the roving produced



Cards Driven by 75-Horsepower Motor.

by the fly frame used in the previous process is in a condition suitable to be converted into yarn. Four kinds of spinning machines are used for the production of cotton yarn, the ring frame, the throtle frame, self-acting mule, and the so-called hand mule. The use of spinning machinery accomplishes several objects; it completes the roving of the yarn to form a thread or yarn, gives the yarn

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required strength by twisting, and winds or builds the yarn into suitable form for the following process.

Three principal operations are preformed by the mule, including the reduction of the roving, giving the yarn sufficient strength by twisting it, and winding the yarn into a suitable form for transportation or for use in the next process. Next in order comes twisting machinery of various types, the selection depending upon the condition of the yarn and method of twisting.

Spooling follows next, but has no effect upon the stock in its manufacture, the principal object being to put the yarn into assembled shape suitable for the next process. In most cases the yarn goes to the spooler from the spinning frame. One important feature of the ordinary method of cotton warp preparation is warping which follows the spooling. The object of the warper is to unwind the yarn from a large number of spools and place it suitably in an even sheet for future operations. The slasher treats the warp yarn as it comes from the warper and coats each thread of warp with a size which is followed by drying. The desired number of threads are then run on a loom beam in an even manner so that they will unwind without obstruction in the loom.

Where yarn mills produce warps for sale, and in those mills where yarn is both spun and woven, but where it is the practice to bleach, dye, print, or otherwise treat the warp yarn, an entirely different system of making warps is generally used, known as chain warping. A large number of ends of yarn, either single or ply, gathered together so as to form a loose, untwisted rope of yarn of considerable length, constitutes a chain. In this form the yarn is in better shape for transportation, bleaching, dyeing, etc. Chains may be packed in bags or they may be balled or linked. Chains are generally put through a process that changes the appearance of the yarn depending upon the kind of treatment. The next process depends on whether the chain is a short chain or a long chain and whether it is to be used for warp or filling. In the case of warp yarn in a short chain the process following converting is dressing, or beaming to the loom beam; warp yarn in a long chain is dressed or beamed on the section beam. For filling yarn the next process is quilling, which is the last process of the long chain system for filling yarns in which the yarn forming the chain is wound on filling bobbins, or quills ready for the shuttle.

POWER DATA FOR COTTON MACHINERY.

Application	Horsepower
Braher cotton picker	10
Cotton carding machine	20
Small cotton carding machine	2
Finishing picker	15
Cotton washer	7.5
Cotton tumbling barrel	2
Cotton dryer	20

Average load-factor for group drive, 62.4 per cent. Average kilowatt-hours per month per horsepower, 162.2. Load-factor here signifies the ratio of the actual energy used in kilowatt-hours to the maximum kilowatt-hours which would be used were the motors to run at full load for 350 hours a month.

Examination to Be Held for Investigation Agent.

An examination will be held in various cities of the United States May 19 by the Bureau of Foreign and Domestic Commerce, Washington, D. C., for a special agent to investigate the market for electrical goods in China, India, East Indies, Africa and Australasia. The examination will consist of practical questions on the subject of investigation, thesis on investigation methods and a statement of the candidate's knowledge and experience. Applicants must be male citizens of the United States, have good address and appearance and be able to address public gatherings. The salary will not exceed $10 per day, and transportation and living expenses (the latter not to exceed $5 per day) will be paid. Applications should be made directly to the Bureau with a statement of applicant's education and experience in investigation work and an unmounted photograph taken within two years preceding application.

Regulation of Telephone Utilities in Utah.

The first step toward the regulation of public utility corporations in the state of Utah has been taken by the Board of County Commissioners of Salt Lake County, within which county Utah's chief city is located. The Commission has enacted an ordinance providing that all charges for telephone service shall be just and reasonable and every unjust or unreasonable charge made shall be prohibited and declared unlawful. Service, equipment, and facilities shall be furnished by every telephone company to promote the safety, health, comfort and convenience of its patrons, employees and the public. Every telephone company operating within the county must file with the board of county commissioners within 60 days of its passage, a schedule of all rates together with all rules and regulations pertaining to rates. The rules and regulations made by any telephone company must be just and fair.

The passage of this ordinance is the outcome of a controversy between the Mountain States Telephone & Telegraph Company and its patrons over the matter of toll charges between exchanges, in Salt Lake County.

It will be noted that the ordinance above referred to applies only to telephone companies as it is not the intention of the commissioners at the present time to regulate the charges and service of other public utilities within the county, no objection having been made by their patrons as to either.

Life-Testing of Incandescent Lamps at Bureau of Standards.

The lamps purchased by the Federal Government, amounting to about 1,250,000 annually, are inspected and tested by the Bureau of Standards, Washington, D. C. The specifications under which these lamps are tested are published by the bureau and are recognized as standard by the manufacturers as well as by the government. They are used also by many other purchasers of lamps.

The lamps are first inspected for mechanical and physical defects, this being done at the factory by bureau inspectors. Representative samples are selected and sent to the bureau where they are burned on life-test at a specified efficiency at which they must give a certain number of hours life, depending upon the kind of lamp. About 5,000 lamps are thus burned on test each year.

For this test great care must be taken in the measurement of the lamps and in the adjustment and regulation of the life-test voltage.

Scientific Paper No. 265, just issued by the bureau, gives a complete description of the special apparatus and of the methods used in these inspections and tests. Copies of the publication may be obtained free upon application to the Bureau of Standards, Washington, D. C.

Practice of Boston Company in Lamp Trimming.

Boston Edison Company practice with respect to the care of street lights was set forth in a memorandum presented to the Electric Light Commissioners at a recent hearing on the Boston street-lighting contract, as follows:

All arc-lamp trimmers are provided with one-horse teams and trim an average of 95 lamps per day, ranging from 70 to a maximum of 100. Arc-lamp patrolmen in the heart of the city travel on foot, covering about 600 lamps. All lights are seen every night, the more important ones twice or thrice.

Outside the city proper, horse or automobile transportation is used, and the patrolmen cover 800 to 1,200 lamps, seeing each lamp at least every other night and many lamps nightly.

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Final Plans for N. E. L. A. Chicago Convention

Condensed Program of Sections and Further Particulars Regarding Entertainment Features of Big Meeting

Subject to some possible slight changes, the program of events—work and play—for the annual convention of the National Electric Light Association, to be held in the Auditorium and Congress Hotels, Chicago, on May 22 to 26, inclusive, is as follows:

Monday, May 22, 1916.

Arrival of special trains, which will be met by members of the Chicago Convention Committee, with automobiles.

Registration at convention headquarters, second floor foyer, Auditorium Theater, Congress Street near Wabash Avenue.

9:00 P. M.—Formal presidential reception in Gold Room, Congress Hotel (Michigan Boulevard and Congress Street), followed by dancing in Elizabethan Room, Congress Hotel. Music by two orchestras.

Tuesday, May 23.

10:00 A. M.—First General Session.

Noon.—Automobile drive through parks and boulevards for out-of-town visiting ladies. The party will take luncheon at the South Shore Country Club, which overlooks Lake Michigan at East Seventieth Street. Other entertainment will be provided.

12:30 P. M. (at conclusion of first general session)—Service-installation prize contest between three squads of linemen employed by the Commonwealth Edison Company. This contest will take place in Grant Park at the east end of Van Buren Street viaduct. While it is in progress there will be music by the full Commonwealth Edison band.

2:30 P. M.—First Technical and Hydroelectric Session.

2:30 P. M.—First Accounting Session.

2:30 P. M.—First Commercial Session.

2:30 P. M.—First Company-Section Session.

8:30 P. M.—Second General and Executive Session.

Wednesday, May 24.

10:00 A.M.—Second Accounting Session.

10:00 A. M.—Second Commercial Session.

10:00 A. M.—Third General and Executive Session.

10:00 A. M.—First Electric Vehicle Session.

2:30 P. M.—Second Technical and Hyroelectric Session.

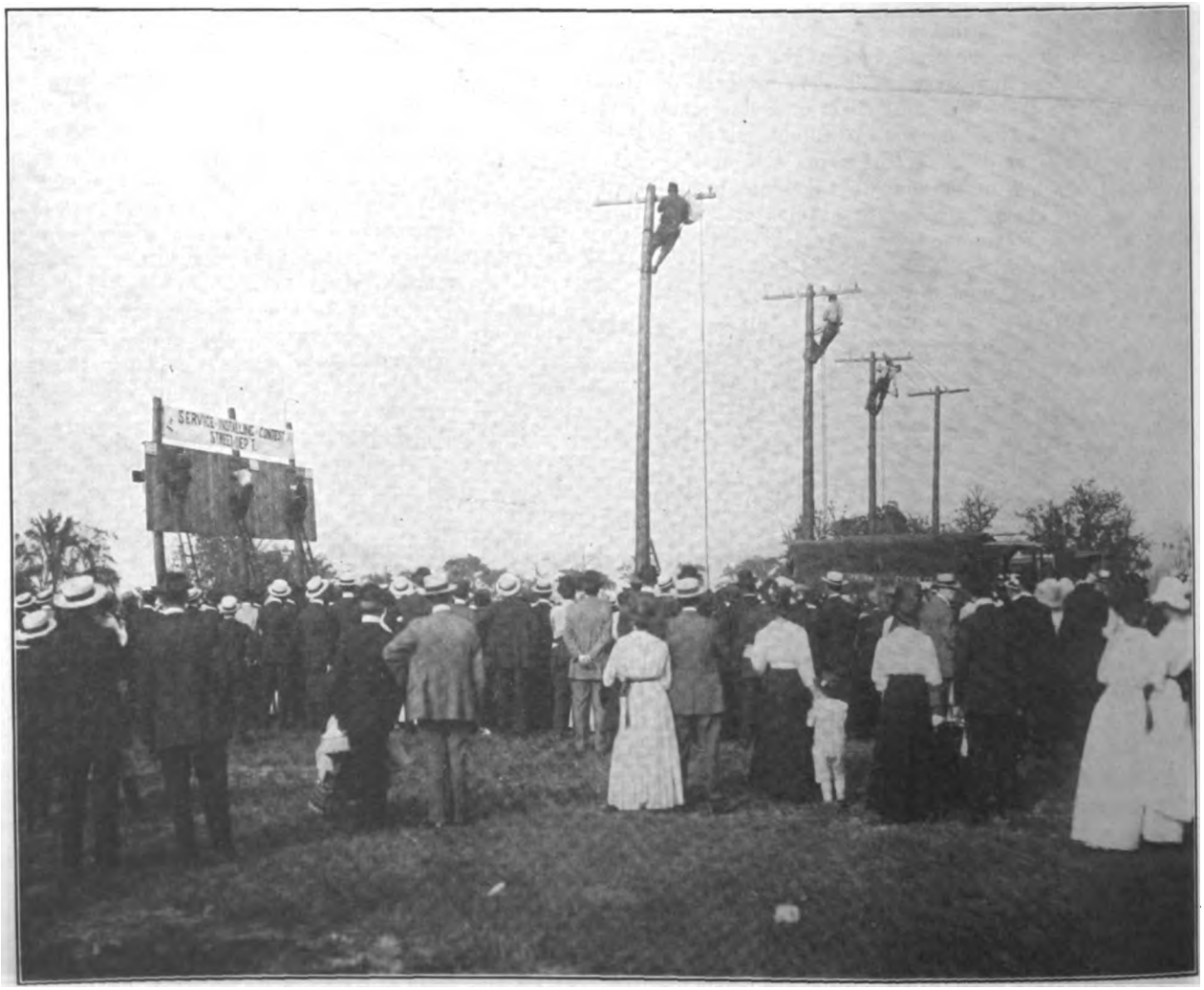
2:30 P. M.—Third Commercial Session.

2:30 P. M.—Second Electric Vehicle Session.

5:30 P. M.—Rejuvenation of the Jovian Order at the Palais de Danse, Bismarck Garden, 817 Grace Street.

6:00 to 8:00 P. M.—Dinner for those who wish at the Bismarck Garden at $2 a plate.

7:30 P. M.—Big frolic at Bismarck Garden. This is the principal feature of the entertainment program. It is cor-



Service Installation Contest Such as Will Be Held by Commonwealth Edison Employees During N. E. L. A. Convention.

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rectly described as a "Mammoth Entertainment and Carnival," with features literally "too numerous for description." The "acts" of the professional performers and the dancing of all who care to dance will continue throughout the evening. Informal dress. Performance rain or shine, as both open spaces and covered enclosures will be available.

Thursday, May 25.

10:00 A. M.—Third Technical and Hydroelectric Session.

10:00 A. M.—Third Accounting Session.

10:00 A. M.—Fourth Commercial Session.

10:00 A. M.—Third Electric Vehicle Session.

2:30 P. M.—Fourth Technical and Hydroelectric Session.

2:30 P. M.—Fifth Commercial Session—Power Sales Bureau.

2:30 P. M.—Second Company-Section Session.

3:30 P. M.—Musicale at the Blackstone Hotel for out-of-town visiting ladies. Singers and instrumentalists from the Chicago Grand Opera Company.

Friday, May 26.

10:00 A. M.—Fourth General and Executive Session. Adjournment.

10:00 A. M.—Sixth Commercial Session—Lighting Sales Bureau. Adjournment.

Convention sessions will be held in the Gold Room and the Florentine Room of the Congress Hotel and the new ball room and Masonic Room of the Auditorium Hotel. Both hotels face on Michigan Boulevard and Congress Street and are connected by a tunnel under Congress Street.

In relation to the service-installation contest of May 23, it may be noted that the test will consist in setting a transformer on a pole, making the connections, making the "service drop," fastening a bracket to a brick wall about 80 feet away representing the rear of a building, and making the connection to an outlet on the brick wall. Connected to this outlet and conspicuously placed on top of the wall will be an incandescent lamp. The first lighting of a lamp on a wall will show which gang of men did the work in the shortest time. The successful squad will receive a cash prize, and in addition a bonus for every second of elapsed time less than 15 minutes. This bonus will consist of 15 cents for the foreman and 10 cents for each man for each second under the 15 minutes. There will be three poles and three sections of brick wall.

One feature of the convention that will possess particular interest to a large proportion of the visitors will be the exhibit of the Committee on Company Sections, of which Forest J. Arnold, of the Commonwealth Edison Company, Chicago, is chairman. This exhibit will embrace publications, photographs and other material illustrating the activities of the various company sections of the National Electric Light Association. It will be found in the second tier of boxes on the north side of the Auditorium Theater.

During the convention arrangements have been made by which visitors wearing the convention badge may inspect industrial establishments and other points of interest in Chicago. No special trips have been planned, and no specific time has been set aside for the visits. In general, the establishments mentioned below will welcome delegates at any time during convention week, and will accept the convention badge as sufficient identification. The Commonwealth Edison Company will welcome visitors to its principal generating stations, typical substations, and the Edison Building, 72 West Adams Street. The Chicago Telephone Company, Peoples Gas Light & Coke Company, and Chicago Tunnel Company will also keep open house for N. E. L. A. visitors. The last named company operates the interesting electrically operated freight tunnels 40 feet beneath the surface of the streets of Chicago. The Western Electric Company will "receive" at its Hawthorne works. Elsewhere, a Pen Dell automatic substation may be inspected. The electric furnace of the Electric Steel Company, the Fashion electric automobile garage and the electrically operated ice plants of the Consumers Company and the Lincoln Ice Company may be visited. Arrangements have also been made for visiting typical electrically operated grain elevators and electrically operated draw bridges. Trips may be arranged, also, to overhead and underground electrical installations and to the Underwriters' Laboratories. Factories of the Pullman Company and the International Harvester Company may be visited as well as the manufacturing establishment of Pettibone, Mulliken & Company and the assembly plant of the Ford Motor Company. The Union Stock Yards will no doubt attract many visitors, as will, also, the great mail order house of Sears, Roebuck & Company. Visits may also be arranged to State Street department stores, prominent office buildings, and the new Municipal Pier on the North Side.

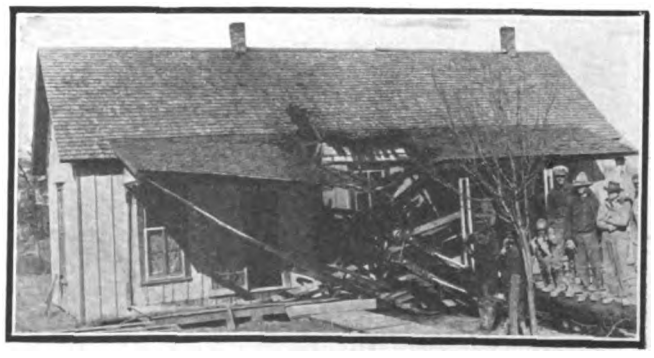
Samuel Insull is chairman of the general convention committee. Louis A. Ferguson is vice-chairman. Sub-committee chairmen are as follows: Finance, John H. Gulick; reception, Louis A. Ferguson; local industries, William L. Abbott; hotels, Ernest A. Edkins; entertainment, Homer E. Niesz; ladies' auxiliary, Mrs. Edward W. Lloyd; local registration, Oliver R. Hogue; local transportation, Gaylord A. Freeman.

Convention Dates and Series of Lectures Announced by Illuminating Engineering Society.

The tenth annual convention of the Illuminating Engineering Society will be held in Philadelphia, September 18, 19 and 20, 1916. Immediately following the convention there will be given at the University of Pennsylvania under the joint auspices of the University and the Society a course of 20 lectures on the theoretical and practical aspects of illuminating engineering. The lectures will be given by eminent authorities in the lighting world and will take approximately eight days. Detailed announcements regarding the course will be made in a subsequent issue.

Falling Pole Demolishes House.

The accompanying illustrations show a peculiar accident which occurred recently on a transmission line which was being constructed in the South. A 55-foot creosoted pole was being raised by means of a "gin" wagon and "A" frame when



Cottage After Fall of Pole.

the men lost control of the pole and it fell, striking the roof of a nearby cottage. As will be seen from the illustration, the heavy pole crushed through the house like it was paper. There were five persons sitting on the front porch when the accident happened and the most remarkable part of the occurrence is that not one of them was injured.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Ellensburg Municipal Plant Forced to Increase Rates.

The city of Ellensburg, Wash., has recently adopted a new schedule for lighting and power service at the municipal electric plant. These revised rates represent an average increase of about 10 per cent over the charges formerly in force, and are as follows:

Lighting: First 60 kilowatt-hours, 10 cents per kilowatt-hour; next 90 kilowatt-hours, 9 cents per kilowatt-hour; next 120 kilowatt-hours, 8 cents per kilowatt-hour; and so graded down until a rate of 2 cents per kilowatt-hour applies on all consumption over 1,000 kilowatt-hours per month. Minimum, $1 per month. Service outside of city limits, 2 cents additional per kilowatt-hour.

Power: First 100 kilowatt-hours, 6 cents per kilowatt-hour; next 175 kilowatt-hours, 4 cents per kilowatt-hour; next 300 kilowatt-hours, 3 cents per kilowatt-hour; next 500 kilowatt-hours, 2 cents per kilowatt-hour, and so graded until a rate of one cent per kilowatt-hour applies on all consumption over 1,075 kilowatt-hours per month. Minimum, $1 per month per horsepower connected.

Cooking: Net flat rate of 3 cents per kilowatt-hour. Minimum charge, $1 per month.

Meter Deposits: Business lighting, $10; power, $10; residence service, $5; cooking, $5. A 10-per-cent penalty is enforced when bills are not paid within 10 days of date.

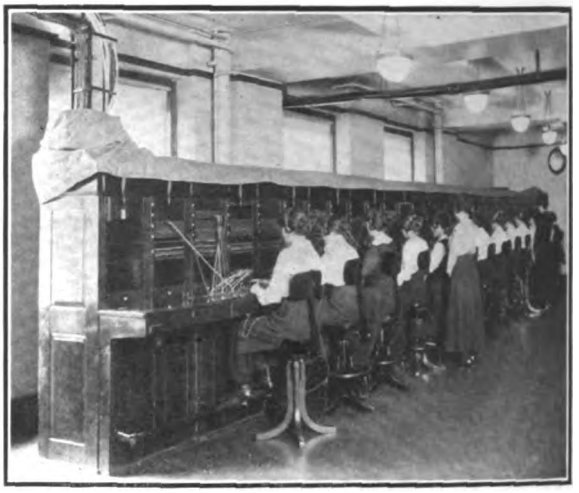
This general increase is said to be due to the inability of the plant to meet expenses at the former rates, and to cover the large number of lighting warrants outstanding, some for periods of more than three years. In commenting upon this action, a paper of one of the neighboring communities says:

"After furnishing cheap lights until they had buried the plant under a mountain of debt, Ellensburg's public benefactors awakened to the unpleasant knowledge that hereafter they would either have to charge monopoly prices for light service or let the town go dark. That sort of public welfare work which drags the public into business requiring all the care and ingenuity of skilled management to make it a success is generally nothing but plain foolishness."

Efficiency in Telephone Conversations the Trend of Utility Companies.

The crisp telephonic salutation, "hello," but which is not always courteous or dignified, is fast disappearing as a result of the general trend toward efficient telephoning. Corporations transacting thousands of dollars' worth of business through the medium of the telephone are fostering this general movement, and the work being done in that field by the New York Edison Company is a conspicuous example. Here the "hello" has gone forever, and in its place has been adopted a new form of response in which the person answering the call states first the name of the bureau or office in which the call is received, following which the name of the individual is announced. The person calling then knows immediately whether the call has reached the proper destination.

To insure telephone efficiency the New York Edison Company has undertaken a certain amount of educational work in the form of a series of lectures. The necessity of courtesy and accuracy in answering questions or referring calls to the proper individuals is emphasized. The matter of voice is also touched upon, and a pleasant easy conversational tone with a rising inflection, although not of too much volume, is urged.



Courtesy Over the Telephone.

One of the principal rules governing the conduct of employees of the New York Edison Company having intercourse with the public over the telephone is to be as courteous as in a personal conversation. Herewith is a view of the company's main switchboard.

The fact is pointed out that it is far more difficult to transact business by means of the telephone than by a direct interview, and consequently it is more difficult to show real courtesy. Moreover, during telephone conversations people are far more apt to become impatient. Such being the case the Edison company employees are urged to be courteous under every condition. The company will not countenance sharp tones, abrupt manners and other faults that are often developed in telephone conversations. The fundamental principles of using a telephone instrument are also emphasized.

Municipal Plant Conducts Electric Range Campaign.

Instances of municipal electric plants engaging in appliance campaigns of any great magnitude are so rare that when such an example is found it is worthy of special mention. The case of the municipal electric light plant at Portland, Ind., has already been mentioned in these columns. The municipal light department at Reading, Mass., is another company which is operating a successful range campaign. Full-page newspaper advertisements are being used and customers are permitted to purchase ranges at cost, on a basis of $5 down and $5 per month. Electric ranges manufactured by the Globe Stove & Range Company, of Kokomo, Ind., are used in the campaign. The special offer to sell ranges at cost on the installment plan is made for the month of May only.

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Record-Breaking Campaign in Minneapolis

During "Wire-Your-Home" Month Local Central Station Secured Contracts for Wiring 595 Old Houses at a Comparatively Low Cost

There was little or nothing in the official news from the sales manager's office of the Minneapolis General Electric Company prior to March 15 to indicate any great change in the old house-wiring situation. Most of the reports indeed were thoroughly non-commital, and only the fact that "Wire-Your-Home Month" was to be held from March 15 to April 15 had perhaps been mentioned once or twice by an already busy force of salesmen. Certain events, however, seemed to have some significance; but in general similar campaigns conducted throughout the country have little altered the general situation in Minneapolis, so nothing phenomenal was expected.

The Plan of Attack.

Immediately upon receipt of word from headquarters of the Society of Electrical Development that preparations would be made for the battle of "Wire-Your-Home Month" and which reached Minneapolis about January, 1916, a little force of men in that city started to lay out a line of attack that was designed to add to the number of residence customers.

The forces of the Minneapolis General Electric Company consisted of six men, well trained, well armed, everyone having been through the battle of electricity versus gas, and the force as a whole working under directions from a man situated well back from the line of action, but who planned every line of attack, even to the day, the hour and the minute. In other words, the plan of action and the seat of battle were all so carefully arranged that the battle was practically won even before it had been commenced.

The line of attack was this: As soon as "Wire-Your-Home Month" was announced, each of these six men was directed to hand in at least two names of home owners every day, whose homes were situated right on the company's lines. Several of the men, however, listed more than two names per day. This gave the man, at the base of action, excellent material and the exact spot into which to shoot a series of circular letters especially designed for the occasion. About 250 names were secured in this way, every one of which received three circular letters, and in addition a very attractive little booklet on house wiring; all of this before a word had been mentioned regarding "Wire-Your-Home Month," and incidentally the whole series was so arranged that each one of these 250 prospects received the last letter two days before the battle commenced.

The first feature of the campaign was a 40-inch advertisement, as shown in Fig. 1 This $50 offer with the pictures of the fixtures appealed so strongly to every class of people and every size of house that the decision was instantly reached to continue this line of attack throughout the whole campaign, and the results most certainly proved that somewhere in that advertisement was something that "gets under the skin." Over 50 customers were secured from the first publication.

The post card, shown in Fig. 3, was next sent to all prospects, and as a result five per cent of all remaining on the special list were secured as customers.

WHAT MINNEAPOLIS DID

During a period of 30 days secured 595 residence customers at a comparatively low cost per customer.

Divided the city into six districts with a man to each district.

Followed personal calls with letters and newspaper advertisements, featuring a $50 plan. The average contract, however, called for a $75 installation.

Turned over all wiring contracts to local contractors, who co-operated in the campaign.

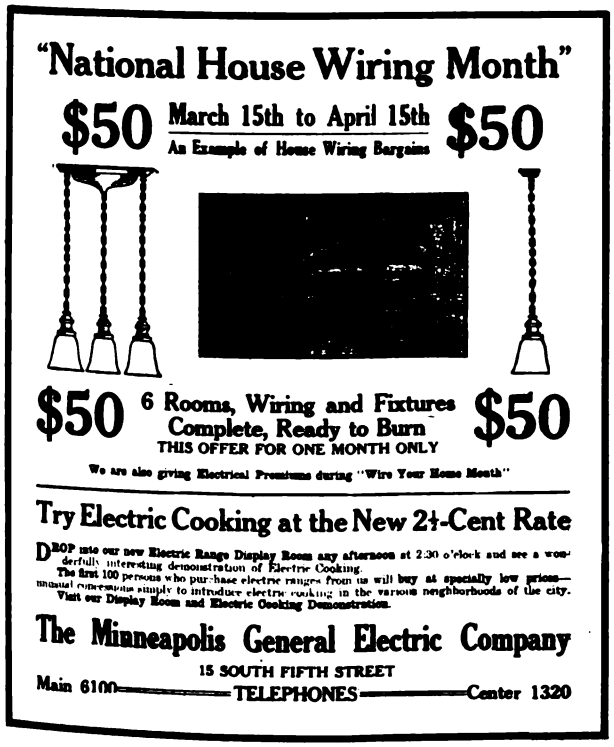

Fig. 1.—Initial Newspaper Advertisement of Minneapolis Company.

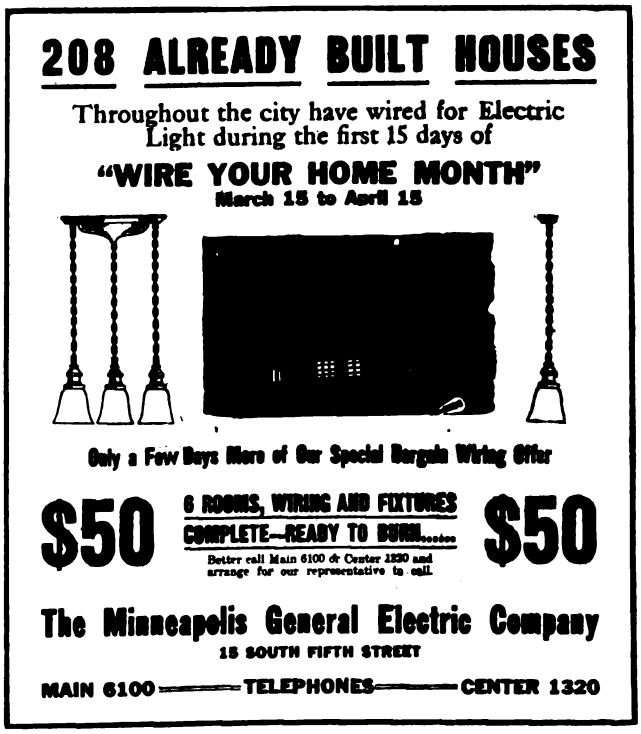

Fig. 2.—A 40-Inch Advertisement Used During the Campaign.

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The persistence of the 40-inch advertisement which was being used once a week in each of the three English dailies created a condition that became a serious sales problem. In the words of the director of the campaign: "The company's original attack was successful and although many customers

A Complete Modern Electric Equipment in Your Home at a Price You Can Afford to Pay!

$50 Wires a Six Room House Complete with Fixtures, ready to light. **$50**

Phone us or send the attached card NOW.

Center 1320——Telephones——Main 6100

*Date*_____*191*__

Please have your representative call and inform me fully as to your housewiring plan, without any obligation on my part, of course.

Name _____

Address _____

Best time to call _____

Fig. 3.—Mailing Card Sent to All Prospects.

had been secured within the first few days, the importance of our continuing was perfectly clear. The situation, however, upon the insertion of the second advertisement entirely changed matters, for it was at once plain that our inability to care for the business would not only tax our capacity but mean the complete abandonment of many good prospects if something was not done at once. However, this proved of little consequence, for the man directing the forces had made ample preparation for such a contingency.

"What he did was to arrange a neutral territory between each salesman's district, declare this a neutral zone and instructed the salesmen on each side of this particular zone to shoot to kill, and from the results secured each man liked shooting in a foreign territory.

"By this time it had been demonstrated that in this campaign arguments why a man should use electricity were far less important than they used to be. The gas company's line of defense as regards cost, for example, which has withstood so many attacks, is now supported by scarcely a single regular argument. Other contentions, supposed to be almost impregnable, gave our salesmen no great trouble and it is really significant that the greatest portion of the victims collapsed almost at the outset, while many of those who resisted at first literally begged for mercy after the last shot, shown in Fig. 4, had been fired.

"Under such circumstances, it must be assumed that the gas company was acutely conscious of the moral effect of admitting such a terrible loss in the battle of 'Wire-Your-Home Month' and that they were ready to sacrifice almost any number of lives rather than publish such an admission was well supported by the fact that they advertised gas ranges during the whole of the campaign.

"In summary, the month's fighting cost the gas company 595 lives and has given impetus to a movement which will be felt for many months to come. The occupation of 595 homes represents a definite success for the Minneapolis General Electric Company, but it will be of inestimable value if followed up by a similar number in the fall, and then again in the spring.

"While the residential fighters were pressing the attack in the outskirts, the down-town salesman likewise directed an assault against the gas mains, a special drive being made on individual locations, using both gas and electricity. The ammunition in this campaign, which, by the way, we called "Wire-Your-Store Month," consisted of a very personal letter from the sales manager, followed by a personal call from the salesman on the following day."

Details of the Campaign.

The actual part played by the local central station was to produce the inquiries, have the district salesman give expert advice as to the best layout, suggest the best type of fixtures, and then turn the job over to the contractors; in other words, the central-station salesmen merely acted in an advisory capacity and saw to it that each applicant secured what he should have, what was good for him and what he really needed in the way of both wiring and fixtures, rather than what he thought he ought to have while under the influence of the $50 offer. That it pays to encourage people to give expression to their individual tastes and pays to cater to their various hobbies was proven by the results of the campaign.

Indeed, although the specific sales device throughout the whole campaign, was "Wire Your Six-Room Home for $50," including fixtures, by far the greater number of homes wired were of the larger and better class, while the average price per contract was slightly greater than $75.

Table 1 gives a condensed report of the actual results, 539 being the total number of individual inquiries, resulting in 595 new customers on account of the number of owners of other than single dwellings answering the advertisement.

RECORD OF SALESMEN IN CAMPAIGN.

Salesman	Contracts Closed and Wired	Contracts Closed to be Wired	Total
Hogan	94	33	127
Dahl	92	33	125
C. W. Loring	110	15	125
Frizzell	48	33	81
Nelson	59	12	71
Pelletier	60	6	66
Totals	463	132	595

Fig. 4.—Final Advertisement in Campaign.

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Operating Costs of Boston Incandescent Street Lamps.

Interesting data on the cost of operating incandescent street lamps of various sizes in Boston are contained in an exhibit presented by the Edison Company in the investigation of prices now being made by the Massachusetts Gas and Electric Light Commission.

Yearly maintenance and operating expenses for 2,299 series and 1,784 multiple lamps are as follows:

Series Incandescent Lamps:			
1,517	40-cp., 48.8 watts, @ $6.63		$10,057.71
781	60-cp., 67.2 watts, @ 6.63		5,178.03
1	100-cp., 100 watts		7.07
			$15,242.81
Multiple Incandescent Lamps:			
1,393	40-cp., 60 watts, @ $11.65		$16,228.45
376	60-cp., 80 watts, @ 12.46		4,684.96
10	100-cp., 100 watts, @ 12.19		121.90
2	250-cp., 250 watts, @ 14.20		28.40
3	320-cp., 400 watts, @ 17.29		51.87
			$21,115.58

Note.—In several instances, the next larger standard size of lamp than that called for in the city contract was used.

Stock room, record and billing expenses added $1,520.75 to each group of lamps, giving an average maintenance and operating cost, for the series lamps, of $7.29; and for the multiples, $12.69, Improved Gem lamps being installed.

Detailed costs were as follows:

	40-cp. Series		40-cp. Multiple
Labor	$1.80		$ 9.51
Transportation	1.37		.....
Lamps, 3.55 @ $0.65	2.31	3 @ $0.30	.90
Miscellaneous material	.15		1.00
Fixture	1.00		1.00
	$6.63		$11.65

	60-cp. Multiple
Labor	$ 9.51
Lamps, 3 @ $0.57	1.71
Miscellaneous material	.24
Fixture	1.00
	$12.46

	80 and 100-cp. Series		100-cp. Multiple
Labor	$1.80		$9.51
Transportation	1.37		.....
Lamps, 3.55 @ $0.775	2.75	3 @ $0.48	1.44
Miscellaneous material	.15		.24
Fixture	1.00		1.00
	$7.07		$12.19

	250-cp. Series		250-cp. Multiple
Labor	$1.80		$ 9.51
Transportation	1.37		.....
Lamps, 3.55 @ $1.50	5.33	3 @ $1.15	3.45
Miscellaneous material	.15		.24
Fixture	1.00		1.00
	$9.65		$14.20

	400-cp. Series		400-cp. Multiple
Labor	$ 1.80		$ 9.51
Transportation	1.37		.....
Lamps, 3.55 @ $2.65	9.40	3 @ $2.18	6.54
Miscellaneous material	.15		.24
Fixture	1.00		1.00
	13.72		$17.29

Labor costs are as follows:

Series Lamps:	
Part time, 6 patrolmen, 1 troubleman, 4 clerks	$3,950
Transportation, full time, 1 auto; part, 6 single teams	3,006
Average number lamps in service	2,197
Average labor cost per series lamp, all sizes	$1.80
Average transportation cost per lamp, all sizes	1.37
Multiple Lamps:	
Full time, 14 switchmen; part time, 26 switchmen and 1 foreman	$16,931
Average number lamps in service	1,780
Average labor cost per multiple lamp, all sizes	$9.51

No tungsten lamps are installed on the Boston street lighting system. Type C Mazdas are not recommended for direct-current series service with arcs and the smaller sized Mazda lamps are not considered as desirable for street lighting service in multiple as the lamps installed.

Central Station Advertises Community in Booklet.

"Industrial Opportunities in Sandusky, Ohio," is the title of a pamphlet just issued by W. S. Barstow & Company, managers of the Sandusky Gas & Electric Company.

The pamphlet contains every item of information concerning the Ohio city which would be of value to an investor seeking a location for a new industry.

The information is compiled under the following headings: Population, Natural Resources, Agricultural Resources, Transportation Features, Public Utilities, Financial Resources, Existing Industries, Factory Buildings and Sites, Educational Institutions, Health Conditions, Religieuos Institutions, Civic Improvements, Labor Conditions, Commercial and Industrial Organizations, Secret and Social Organizations, Amusements and General Information.

The pamphlet is issued in pursuance of the Barstow policy of assisting in all possible ways the industrial development of communities in which the company operates public utilities. Similar pamphlets are in course of preparation for the other cities whose utilities are controlled by the General Gas & Electric Company, the Barstow holding corporation.

Louisville Company Arranges With Banks to Pay Customers' Bills.

Current statements of the Louisville Gas & Electric Company, in the interest of expediting collections, contain slip-ins suggesting that by signing the form on the back the consumer can always get his discount and save himself trouble by paying his bills through his bank. The proposition is stated as follows:

"Many hundreds of the customers of this company never see their bills for gas and electricity until their banks return them along with their checks at the end of each month. Customers who do this always get their discounts, and are saved the trouble of remembering to pay their bills. They do not lose any of their right to have a bill corrected.

"If you desire to avail yourself of this convenience, fill out and sign the form printed on the back of this slip, and this company will make arrangements with your bank, and will in future present the bills to the bank, and you will receive the receipted bill along with your checks."

The form is as follows:

Louisville, Ky., ... (date) .....

To Blank Bank: Please pay the Louisville Gas & Electric Company the net amount of its bills for gas and electric service rendered to me at Blank Number and Street upon their presentation, and return the receipted portion of the bill to me with the paid checks drawn on my account. Yours very truly, etc.

War Effect on Waste-Heat Stations.

The quantity of electrical energy generated in the waste-heat stations of the Cleveland & Durham Electric Power, Limited, of England, has been seriously reduced by the fact that hematite iron has been largely substituted for Cleveland iron, and the result has been that the gases available for the waste-heat stations have been much reduced. Last year the volume of energy delivered to the company from waste-heat stations was reduced by about fifteen million units as compared with the previous year. Energy has therefore had to be supplied from coal fires at Grangetown station, so that the coal bill which in 1913 was only $4,225 rose in 1915 to $82,020. Charges to consumers will be raised and it has been resolved that future policy shall insist upon a graduated scale of prices varying with the price of coal.

Campaign for Motor-Driven Pump Business.

The planting season is taken advantage of by the Boston Edison Company in promoting the adoption of water pumping with electric motors, by farmers, market gardeners and owners of estates in the outlying regions of its territory. The company is co-operating with the manufacturers of electrically driven pumps in making a thorough canvass of such prospects.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

Savings Effected by Pumping Oil Wells by Electricity.

In most oil fields, particularly in California, the necessity for variable pumping speeds is marked, on account of the variation in the flow of oil, and in the amount of sand accompanying it, also in the amount of gas or water in the oil, the viscosity of the fluid and the condition of the pump. It is also desirable to shake up the well, which is substantially the operation of the walking beam, at a high speed for a few moments, in order that the sand may be dislodged from the pump valves, which it has a tendency to clog up. The great variation in the flow of wells, and even in the flow of the individual well at different times is well illustrated in the accompanying table of power required for pumping 213 oil wells in California:

	Barrels per Well per Day	Depth of Wells	Kilowatt-Hours per Well per Day	Kilowatt-Hours per Barrel Pumped
Maximum	230	3,110	123.4	5.843
Minimum	10	900	27.7	0.414
Average	122	1,430	80.8	0.683

The method of drilling oil and gas wells by the cable-tool or rotary process, or a combination of the two, is well known, but the fact that electric power has been applied in the operation of drilling plants is not a matter of such general knowledge. The cable drilling tools are suspended from a walking beam by a steel wire or manila rope; practice varies with drilling conditions as regarding the kind of rope used, but it is customary in localities where steel wire rope is used to drill the first few hundred feet of a well with manila rope before changing to steel wire. The reciprocating motion of the walking beam attached to the drill by means of the cable constitutes the essential portion of the drilling process. Drillings are mixed with water in the hole and are removed by the bailer. In rotary drilling a rotating column of pipe has mounted upon its lower extremity a cutting bit, which is lowered into the well and operated in much the same manner as in diamond drilling. The drillings are washed out of the hole by forcing muddy water or thin mud through the pipe. This flows up on the outside, bringing the drillings to the surface, filling up the interstices in the soil or rock through which the well is drilled. The power required for drilling is not only dependent upon the difficulty with which the ground is penetrated, but also upon the amount of trouble experienced in handling casing and in fishing for lost tools, and, is, therefore, extremely variable, but some representative figures can be given.

The cost of electric power for pumping wells on several properties in the California oil fields, which properties comprise 197 wells, varying from 750 to 2,700 feet in depth, varied from $0.65 to $1.21 per day, with current at $.01 and $.015 per kilowatt-hour, and the average cost of pumping 8 wells, depth 1,000 to 2,800 feet, amounted to $5.41 per day by steam power, but by changing to electric power the average cost was cut to $3.49 per day.

Twelve wells having an average depth of 1,100 feet pumping oil of 15.5 degrees Baume, show a saving by electricity over steam of $1.24 per well per day, and 107 others, pumping oil at 13.5 degrees Baume, from an average depth of 800 feet, show a saving by electricity over steam of $1.32 per well per day.

The cost of electric power for drilling in California oil fields, with a power rate of 1.5 cents per kilowatt-hour is, for depths of 735 feet, $0.1074 per foot drilled: for 1,493 feet, $0.1025; 945 feet, $0.0915; 1,356 feet, $0.1060; 824 feet, $0.0570; 732 feet, $0.1040, and for 1,175 feet, $0.0848. Electric power does away with much of the danger from fire, which is present when a steam boiler is kept in operation in close proximity to the well, and thus reduces the insurance rates. Where water is scarce the motor also has the advantage of not requiring water for the generation of its power; the condition of the well may also be determined, for the measuring instruments indicate slight differences in power requirements, and thus give warning of unusual conditions affecting the work.

Government To Construct Water-Power Plants for Manufacture of Nitrogen.

If the House of Representatives concurs in what is known as the Smith amendment to the Chamberlain army reorganization bill, the United States Government will build and operate one or more water-power plants for the manufacture of atmospheric nitrogen. This product, in turn, will be utilized by the Government primarily in the manufacture of explosives for the army and the navy, and any surplus not required for this purpose may be disposed of as the Secretary of War may direct.

The Smith amendment first made its appearance in Congress as a bill designed to build and equip a government plant for the manufacture of nitrogen fertilizer, any surplus product to be used for the production of explosives for the army and navy. As a fertilizer bill, it was referred to, and reported by the Committee on Agriculture, but as it emerged from that committee, it provided primarily for the manufacture of atmospheric nitrogen for war and navy uses, the fertilizer product being incidental.

Senator Smith then offered his bill, as reported, as an amendment to the army reorganization bill; it was referred to the Military Committee, and by that committee, referred back to the Senate without recommendation. After days of discussion, the amendment was further altered, and finally adopted by a vote of 43 to 22.

As adopted, the Smith amendment authorizes the President to set aside, for the exclusive use of the United States Government, not to exceed five water-power sites upon navigable streams, the selection to be made by the Secretary of War.

An appropriation of $15,000,000 is made to enable the Secretary of War to build dams, power houses and purchase equipment necessary for the generation of electrical power, and for the production of nitrates and other products needed for munitions of war, and useful in the manufacture of fertilizer. He further is empowered to purchase, or acquire by condemnation, any patented processes by which atmospheric nitrogen, explosives and fertilizer are produced, and any other property necessary for the construction and operation of the proposed government plant or plants.

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Talks to Central-Station Power Salesmen

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

This is the sixth and last of a series of articles by Mr. Stevens, dealing with the salient features of power sales work. Preceding installments have dealt with the equipment and qualifications of the salesman, arguments and talking points for central-station power and functions of a power bureau. The present article concludes the description of the various forms and records used so successfully by the Power Engineering Bureau of the Brooklyn Company.

Factory Bulletin File.

In addition to soliciting business in Brooklyn, it has been found both feasible and profitable to solict business from distant localities by following leads which are obtained from various trade journals, papers and clipping bureaus. Form letters are sent those to whom it is thought Brooklyn can show special inducements in the way of labor costs, railway rates, sites for building or renting. All of the various advantages of Brooklyn for manufacturers are brought to the attention of the company considering the change, and, of course, the advantages of Edison power are also dwelt upon. In connection with this a card system is used to follow the various leads and show the final disposition of each proposition. On these cards are noted the origin of the lead, the name of the firm and the business engaged in. Also the forms of letters, data and advertising matter sent. These are followed until a definite decision has been made by the manufacturer as to his location. Fig. 1 shows a card used to keep a record of the activity.

Loft Building Record.

As there are many inquiries both from local manufacturers and from out-of-town prospects regarding available buildings and sites for manufacturing, a file of loft buildings and factory sites is kept for reference. The cards contain information such as location, type of building, kind of power supplied, if there is a railroad siding or docking facilities, space available, cost of space, height of ceiling and if for light or heavy manufacturing purposes. By referring to this file inquiries can be answered immediately and any prospective user of power is impressed when he finds how able and willing the Edison Company is to help him in finding a suitable location. When an inquiry of this kind is received, location of lofts which most nearly meet the requirements are given and the loft building owners are notified so that they may start negotiations with the prospect. This encourages both manufacturer and loft building owner to use electric service. Loft building record cards are shown in Figs. 2 and 3. Fig 3 is the reverse side of the card and provides space for complete follow-up data.

Electric Vehicle Record.

Due to the growth of the electric vehicle it is found advisable to keep a garage-record file similar to the plant-record file (described in April 29 issue) for all garages, both public and private, in Brooklyn. This record gives the owner's name, location, number and size of cars in garage, also the number of charging outlets and their capacity. The record of electric vehicles in Brooklyn is kept up to date by referring to the state record of vehicle licenses. The electric-vehicle engineer by referring to the garage-plant record can determine the number of cars in Brooklyn, the depots at which they may be charged and in general keep pace with this new branch of the central-station industry. He may also gather many valuable talking points and show the many applications of the

FACTORY BULLETIN FILE — Serial No. E-96

NAME: X Typewriter Company

ADDRESS: 1044 Greenidge St., Detroit, Mich. — SOURCE: Luce

Mich. Detroit. -- The X Typewriter Co. of 1044 Greenidge Street, this city has outgrown present plant and facilities in this city and is desirous of securing a suitable site in the New England or middle Atlantic section for the establishment of a modern new plant where excellent shipping facilities can be secured. Good and sufficient help will also be considered

LETTERS SENT		ANSWERS RECEIVED	
Date	Form No	Date	Remarks
2-7-15	E	2/12/15	No definite plans for moving at present time.
2/15/15	Ans.S	2/15/15	Want accurate figures on labor costs and factory sites.
2/19/15	Spec.Letter		Want power rates and suitable lofts.
2/23/15	" "	2/28/15	Advised that Mr. Brown, V.P. will be in city the 1st. to look over situation.

OVER

Fig. 1.—Factory Bulletin File Used by Brooklyn Edison Company.

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LOFT BUILDING RECORD Serial No B-142

	NAME	ADDRESS	TEL. NO
BUILDING	Lane Building No.2 Inc.	231 Broad St.	000 Main
OWNER	Est. of J. G. Lane		
AGENT	American Realty Co.		

KIND OF CONSTRUCTION: MILL / CONCRETE — HEAVY MFG. yes / LIGHT MFG. — FIREPROOF yes

DIMENSIONS (lot) 130 x 200 — HEIGHT OF CEILINGS 12 ft. — NO OF FLOORS 10

SPACE AVAILABLE thru entire floors and basement

COST PER SQ. FT. $ .28 — INCLUDING: HEAT yes — PASSENGER ELEVATOR / FREIGHT ELEVATOR Both

KIND OF POWER STEAM no. — ELECTRIC yes — A.C. / D.C. yes — EDISON SERVICE yes

LIVE STEAM AVAILABLE FOR MFG yes — COST .45 per 1000 lbs.

LOCATED ON: SIDING yes — NEAR DOCKS yes

REMARKS

DATE 4/20/14 — REPORTED BY A. B. C.

Fig. 2.—Loft-Building Record.

DATE	INQUIRIES	RESULTS
3/2/15	Apex Cloak Corp.	Not suited for clothing manufacturing.
4/6/15	Union Stamping Co.	Building to far from labor required.
5/7/15	X Typewriter Co.	Leases signed for two floors with year's option on basement and additional floor.

Fig. 3.—Reverse of Loft-Building Card.

electric vehicle. This record is also valuable to the central-station management as statistics may be gathered on probable growth, revenue received, and rates which should be charged for this class of business. Fig. 4 shows a garage record card. On the reverse side space is provided for tabulating results of calls, etc.

Service Inspection.

It is, of course, as necessary to keep present customers as it is to obtain new ones, and it is particularly necessary to have customers satisfied. They are the company's best advertisement and from them come the repeat orders or orders for additional business.

After a salesman has succeeded in obtaining the signature on a contract he should not feel that his relations with that particular customer have ended, rather he should feel and the customer should be made to feel that there still exists a personal interest in him and his business by the central-station company. It is obviously impossible for a power salesman to keep in touch with all those whose business he has obtained, but he should or rather his company should have a system to supervise from a power selling standpoint the service of all customers from whom the revenue derived places them in a class which warrants such supervision. At the present time fully 30 per cent of all new business contracted for is additional business. Many times, however, the customer who is using central-station power in conjunction with a power plant will, when the time arrives for an installation of additional equipment, consider driving this additional load from his plant, rather than connect it to the mains of the central station. Again, a customer considering a large increase in his power equipment may take recourse to a private-plant installation because he is not thoroughly familiar with the power rates, believing that an increased consumption would be paid for at the same rates at which he is at present buying power, and knowing that for such amounts as he will use it can be generated very much more cheaply than his present units costs.

If such customers are not lost sight of through the regular routine of the company, but are supervised by some system which we will call "Service Inspection," it is safe to say that the power bureau will be acquainted with any proposed changes and be prepared to meet them with attractive rates and thus obtain the additional business. It was with this in mind that the Brooklyn company organized a Service Inspection Bureau, whose function it is to keep in direct touch with all large customers. All customers whose annual bills total over a certain amount are included in this file. Their bills are checked by an assistant power engineer and entered on the service inspection card before being sent to the customer. This prevents mistakes which might creep in through bills being handled in the regular routine methods. An unusual change in current consumption, maximum demand or bill is immediately questioned and an investigation started to determine its reason.

Periodic calls are made by a power salesman who tactfully inquires as to the satisfaction of the customer with the service, and if there is any prospect for additional business. Frequently a customer may have some simple grievance against the company, which, if brought to the attention of the one in charge of service inspection can readily be adjusted. This prevents small grievances from becoming serious, and has proved very efficient in keeping in touch with the customer's power requirements and in more than one instance has forestalled the installation of private-plant apparatus. It also is the duty of the men in charge of service inspection to keep the customers acquainted with all new developments in electric consuming devices, and advise the installation of newer and more efficient apparatus to replace that of older type, thus keeping the consumer abreast of the electrical times.

Customers have many times shown their appreciation of the interest taken in them, and this has established a closer relationship between the customer and company.

PLANT RECORD (Garage) Serial No D-12

NAME Electric Garage Co.

ADDRESS 123 Spruce Street

PRIVATE GARAGE / PUBLIC Public

	Number of	Min	750	1,000	3,000	4,000	7,000	10,000
1 HORSE DRIVEN								
2 GASOLINE								
3 COMMERCIAL ELEC			4	16	2	4		
4 PLEASURE ELEC	12							
TOTAL								

NO OF CHARGING OUTLETS 15 — SIZES 3-40, 5-60, 4-75, 2-100 Amp.

MIN BOOSTING CHARGE $.50 — CHARGE PER KW HR 5¢

MOTORS 1-15 1-5 — LIGHTS 75-50w

REMARKS 4 - 2 ton trucks equipped with Edison batteries.

DATE 4/27/15 — REPORTED BY B. I.

Fig. 4.—Garage Record.

NAME — ADDRESS

BUSINESS Philip Wagner Packing Co. — INTERVIEW Mr Geo. Wagner, — POSITION Supt.

Meat Packers

DATE OF CALL	RESULT OF CALLS	CALL NUMBER
Feb.3/15	Saw Mr. Wagner re change in contract and service. Advised as to how the maximum demand might be lowered on the lighting installation by using tungsten lamps. Mr. Wagner spoke of additional equipment which might be put in within the next few months.	1
Apr.15/15	Service Inspection Call. Mr. Wagner states they are considering the installation of additional refrigerating apparatus and will probably drive it by steam engines as they can profitably use the exhaust steam for cooking.	2
Apr.29/15	Submitted figures to Mr. Wagner on cost of operating the additional 100 ton compressor on Edison Service. Find that rate of approximately 1.25¢ can be earned. Says that they will go into the matter very carefully before buying steam equipment.	
May1/15	Mr. Wagner states that Edison Service will be used on compressor.	

Fig. 5.—Inspection Record.

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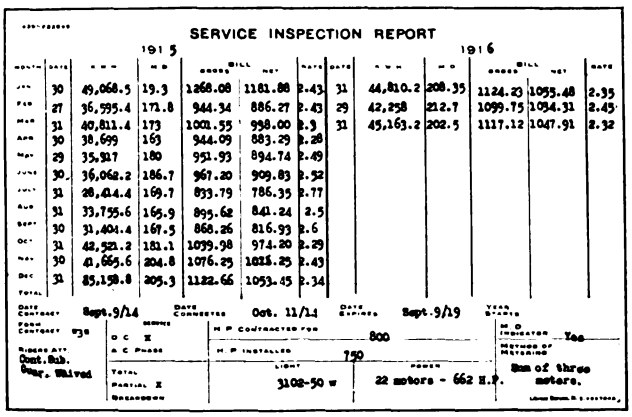
Figs. 5 and 6 show both sides of the service inspection card used by the Brooklyn Edison Company.

In concluding it must be remembered that the success of any central station or other public-service company depends very largely upon its sales force and its public policy. With this in mind the Edison company has made every effort to gather into its power bureau and service inspection department men of real sales ability and sound engineering and business experience. They are aided and encouraged by efficient systems for locating power prospects and materializing such into customers by arguments based on their own knowledge of power engineering, supplemented by information and data available in the bureau files.



SERVICE INSPECTION REPORT

1915							1916				
Month	Date	K W	K W	Bill	Net	Date	Date	K W	K W	Bill	Net	Date
Jan	30	49,068.5	19.3	1268.08	1181.88	2.43	31	44,810.2	208.35	1124.23	1055.48	2.35
Feb	27	36,595.4	172.8	944.34	886.27	2.43	29	42,258	212.7	1099.75	1034.31	2.45
Mar	31	40,811.4	173	1001.55	958.00	2.3	31	45,163.2	202.5	1117.12	1047.91	2.32
Apr	30	38,699	163	944.09	883.29	2.28						
May	29	35,917	180	951.93	894.74	2.49						
June	30	36,062.2	186.7	967.20	909.83	2.52						
July	31	28,414.4	169.7	833.79	786.35	2.77						
Aug	31	33,755.6	165.9	895.62	841.24	2.5						
Sept	30	31,404.4	167.5	868.26	816.93	2.6						
Oct	31	42,521.2	181.1	1039.98	974.20	2.29						
Nov	30	41,665.6	204.8	1076.25	1025.25	2.43						
Dec	31	85,158.8	205.3	1122.66	1053.45	2.34						
Total												

Date Contract Sept. 9/14 Date Connected Oct. 11/14 Date Expired Sept. 9/19 Year Expired

Rider Att. Cont. Sub. Dear. Waived

Meters: D C X; A C Phase

H P Connected for 800

H P Installed 750

Total X; Partial X; Unmetered

Light 3102-50 w Power 22 motors - 662 H.P.

H.P. Installed Yes

Method of Metering 8m of three motors.

Fig. 6.—Service Inspection Report by Means of Which Customer's Bills Are Checked Monthly.

It is especially impressed upon them that the future of the company depends on the impression made by them upon the public.

Electrically Operated Ice-Making and Cold-Storage Plant for Panama Canal Zone Nearly Ready.

The ice-making and cold-storage plant at Balboa, Panama Canal Zone, will probably be ready for occupancy about May 15. It has a capacity of 200 tons of refrigeration each 24 hours. The building which houses this plant is situated behind the Balboa commissary, and is 237 feet 6 inches long, 73 feet 4 inches wide, and one story high. In the middle of the building is the compressor room occupying the full width and 40 feet 4 inches long.

Two ammonia compressors of the De La Vergne horizontal double-acting type, with accessories, constitute the mechanical part of the equipment. Each compressor is driven by a 200-horsepower motor running on 2,200-volt, three-phase current. A pump-out machine is belt driven by a 15-horsepower motor.

Two freezing tanks made of steel occupy the tank room, which is 68 by 73 feet 4 inches. In this room are four agitators in pairs driven by 15-horsepower motors, three air blowers belt driven by 7.5-horsepower motors, one reciprocating floor pump driven by a two-horsepower motor, and electric cranes and hoists for use in lifting cakes of ice from the tanks. Each freezing tank contains 696 cans for making ice, and each can has a capacity of 300 pounds of ice.

An ice-storage room full width of the building and 35 feet 2 inches long, divided into ten compartments, each insulated from the others; and a cold-storage room 75 feet long and full width of the building, divided into 26 compartments, occupy the remainder of the building. It is possible that a small section of the building will be set off as a retail salesroom.

Economy of Electric Drive for Small Planing Mill.

The accompanying figures show the average cost of steam power for two consecutive years previous to the installation of electric drive.

First year	$1,176
Second year	1,366
Average yearly cost	1,271

The result of the same mill's operation by electric power for the first year (during which the mill was not operating under normal conditions) was as follows:

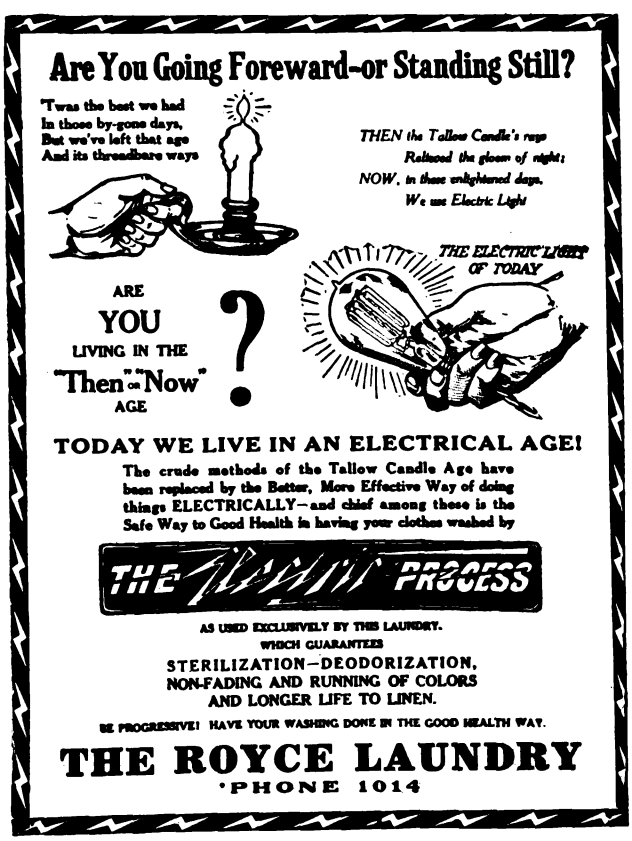
Total cost of energy	$419.00
Maximum bill for any month	55.00
Maximum KW hours for any month	920.00
Minimum KW hours any month	220.00
Maximum demand in H. P.	16.50

Under normal operating conditions, the power bill would run from $55 to $60 per month. Estimating the average yearly power bill at $600, a saving of 50 per cent is shown over the previous cost of steam operation.

Satisfied Laundry Customer Advertises Electricity.

Electrification of laundries is often found a difficult proposition, owing to the requirement of live steam for process purposes. Several of the laundries at Springfield, Mass., are, however, electrically operated. The local company's power rates are particularly advantageous.

One Springfield laundry, the Royce Laundry, specializes in electrical processes. All its machines are motor driven, it has a large number of electric flatirons, and it also employs a process for deodorization and sterilization which consists of the passing of electric currents through the boilers in which the clothes are washed. This process, it is claimed, kills the germs, and does away with the necessity for using powerful chemicals, usually employed, which result in injury to the fabric. The Electric Process lends itself readily to newspaper featuring, as witness the accompanying advertisement.



Advertisement of a Satisfied Power Customer.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

MODERN MOLDING-WIRING MAXIMS.

By Terrell Croft.

Wire for use in molding should have good (approved rubber) insulation because the conductors in molding, particularly in metal molding, lie close together. Furthermore, metal molding is always grounded, hence the insulation on the conductors in it is all that prevents them from contacting with each other or with ground. Wires having weatherproof or slow-burning insulation will ultimately give trouble if they are installed in molding, particularly where subject to dampness.

There should be no joints or splices within a molding system except at outlets, because the insulation on a splice is always inferior to that on the unimpaired conductor

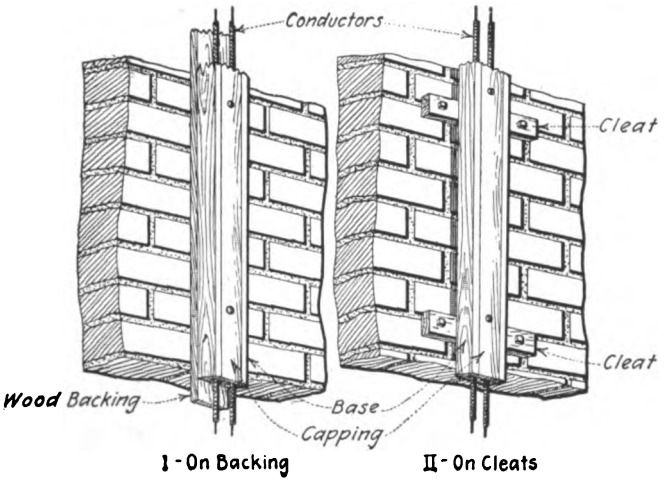

Fig. 1.—Proper Methods of Installing Wooden Molding on Outside Brick or Stone Walls.

and furthermore the bulkiness of a splice frequently, when the wires are in wooden molding, renders it necessary to cut away a portion or all of the tongue (in the molding base) which should always separate the conductors from one another. This weakens the base and may result in short-circuits. Also, experience has shown that there is a tendency on the part of wiremen to leave unsoldered and untaped the joints in molding, if such are made, and they frequently burn the backing when soldering splices.

Approved fittings must be used whenever it is necessary to splice or tap to a wood-molding-wiring conductor. In these fittings the wires are joined together with screw binding posts, rendering the use of solder unnecessary.

Why wires are permitted in wood moldings and are not allowed to touch wood when installed in accordance with the other methods of wiring is a question that is sometimes asked. The wires in a molding installation are installed in a specially prepared protecting raceway and should, under the conditions where molding wiring is permitted, provide adequate security to the conductors. On the other hand, wiring installed in accordance with the other methods is not permitted to touch wood because in these cases the wires can be run in locations where the wood might become damp and result in grounds on the circuit and consequent fire hazard.

The use of wooden molding is being discontinued in spite of the fact that the Code permits its use under certain conditions. Metal molding is safe and is being

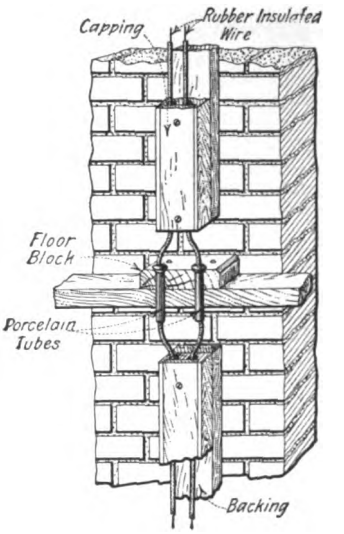

Fig. 2.—Molding Wiring Passing Through Floor.

widely applied, but in certain cities, in New York, for example, the installation of wooden molding is prohibited by the local municipal rules.

Molding wiring should never be installed in damp places. This applies to wiring in metal as well as to that in wooden molding. The conductors are close together and furthermore the structure of the molding is such that moisture can readily enter it. Hence, if it be used in a damp location, low resistance to ground and between conductors will result and trouble will, probably, ultimately occur. If the wood molding becomes damp, it may, at a weak point in the insulation on the conductors, constitute a high-resistance conducting path and carry current until it chars. Then it will ignite readily and may start a fire.

Outside brick and masonry walls are considered as damp places. Therefore, either metal or wood molding when it is carried along such walls should be separated therefrom in accordance with methods similar to one of those suggested in Fig. 1. The backing or cleats on which

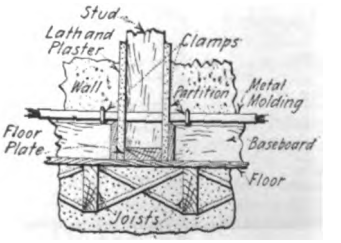

Fig. 3.—Metal Molding Carried Through Partition.

the molding is supported should be thoroughly painted or impregnated to prevent the absorption of moisture.

Where wood molding passes through floors it may be arranged about as suggested in Fig. 2. A floor block at least

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two inches high should be fastened to the floor and holes bored through this block to accommodate the porcelain-tube bushings for the conductors. The function of a floor block is to raise the heads of the tubes high enough above the floor so that scrubbing water cannot enter them. The floor block and the lower end of the molding above it should be protected by wooden boxing, not shown in the illustration. Specially manufactured devices or "kick plates" can be procured to protect molding where it passes through a floor.

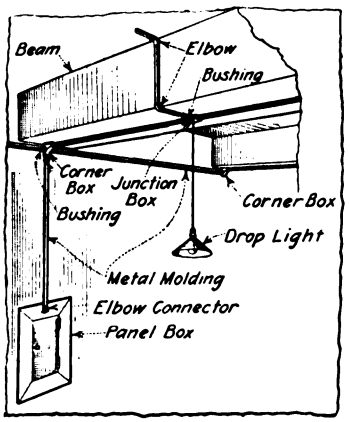

Fig. 4.—Typical Metal-Molding Installation.

The method of carrying a metal molding run through a partition is shown in Fig. 3. The base and capping of the molding must be continuous through the partition, that is, there must be no joints within the partition space.

Hardwood wooden molding only is accepted in certain cities where the use of wooden molding is allowed, it being maintained that the soft wood or white wood molding is of insufficient strength to properly perform its function.

In supporting wood molding care must be taken not to cut away too much of the groove in the backing. The tendency is, particularly when the molding is being clamped to the supporting surface with toggle bolts, to cut large gaps in the tongue of the backing. This weakens the backing and may permit the electrical contact of the conductors of opposite polarity in the molding through the nut on the toggle bolt.

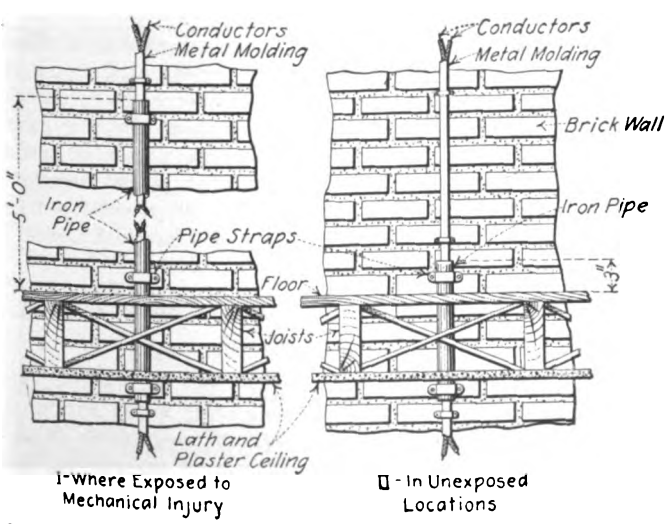

Fig. 5.—Protection of Metal Molding Where Passing Through a Floor.

The places where molding should not be used (this applies to both wood and metal moldings) are, in cellars, in damp places, out-of-doors, or in elevator shafts. In some cities, the use of molding is prohibited in churches and auditoriums. Wood molding should not be used in show windows, because of the liability of nails and tacks being driven through the capping and into contact with the conductors in these locations.

For alternating-current circuits in metal molding all of the wires of the circuit must be installed in the same molding because of the possible eddy-current and inductive-drop difficulties that may be encountered where one wire of such a circuit is installed in a molding. The reasons for this requirement are the same as those which dictate similar regulations for wiring in wrought-iron conduit.

The advantages of metal molding over wood molding are:

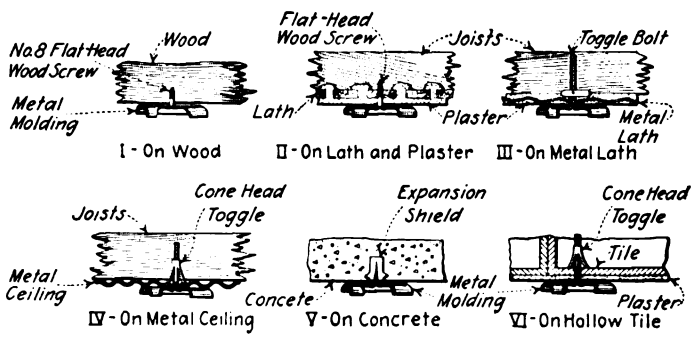

Fig. 6.—Methods of Supporting Metal Molding.

(1) It is non-combustible.
(2) It occupies less space.
(3) It affords greater mechanical protection.

As noted in a preceding paragraph, the use of wood molding is not allowed in some cities. A metal-molding installation is illustrated in Fig. 4, which indicates its adaptability for making extensions to existing wiring systems.

The requirements for the installation of metal molding are, in general, similar to those for wrought-iron conduit, because the function of the conduit is substantially the same as that of the molding. It is to provide a metal-lined raceway for the protection of the conductors.

The maximum wattage permissible on a metal-molding circuit is 1,320, and the maximum permissible voltage is 300. The fuses protecting circuits in metal molding should not be of greater capacities than six amperes.

Metal-molding systems must be continuous from outlet to outlet for the same reasons that it is essential that conduit systems be thus continuous. As with conduit systems, the metal-molding runs must be continuous both electrically and mechanically.

Outlet boxes and approved fittings for metal-molding wiring are manufactured in a great variety of forms. All splices in the system must be made within one of these fittings or boxes, since splices are not permitted within the molding itself. Wherever a metal-molding system joins wiring arranged in accordance with the knob-and-tube, conduit or open-work methods, the junction must be effected in an approved junction box, of which there are a variety of types, made especially for the purpose. Wherever conductors leave the metal-molding system to serve an energy-consuming device, an approved fitting which suitably insulates the wires from one another and protects them from abrasion must be used at the point where they emerge from the molding system.

Where metal-molding runs pass through floors they should be protected as suggested in Fig. 5. The iron-pipe protective tubing is installed for two reasons:

(1) To afford mechanical protection.
(2) To prevent scrub water from entering the molding.

In installing metal-molding protection on side walls at floors the continuous length of iron pipe should, where the molding might be exposed to mechanical injury, extend to a distance of at least five feet above the floor and

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also downward through the ceiling below, and extend beyond the ceiling a few inches, Fig. 5, *I*. The protecting pipe can be held to the supporting surface with pipe straps. In locations where appearance is a factor and the metal molding on a side wall is not liable to mechanical injury,

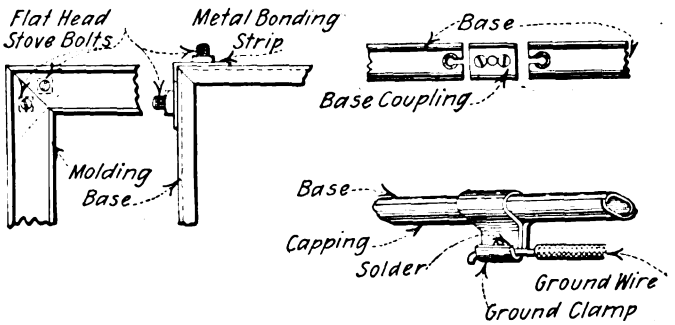


Fig. 7.—Methods of Bonding and Grounding Metal Molding.

as in residences and in office buildings, and where it is obvious that the mechanical strength of the molding and backing is of itself adequate, the iron-pipe protection may ordinarily extend from the ceiling below to a point only three inches above the floor, as shown in Fig. 5, *II*. In warehouses and factories, where mechanical interference is probable, the protection should extend at least five feet.

The methods of supporting metal-molding backing are illustrated in Fig. 6. In any case, the head of the bolt or screw which extends into the molding must not project into the wiring space or offer a sharp edge that might cut the insulation on the conductors.

Metal molding must be grounded for the same reasons that dictate the grounding of conduit systems. Positive grounding decreases fire and life hazard. The ground-wire connection at the metal molding is effected with a special ground clamp, as shown in Fig. 7. Where the ground is connected to the gas or water pipe affording the ground, a ground clamp is, ordinarily, also used. The ground wire should be soldered in each of these clamps.

The metal-molding system must be electrically continuous for the same reasons that a conduit system should be electrically continuous. To insure this condition, the different lengths of metal molding must be firmly joined together so as to constitute a good electrical contact and similar joints must be made at all outlet boxes. The fittings regularly furnished by the metal-molding manufacturers accomplish this result. In Fig. 7 is shown the

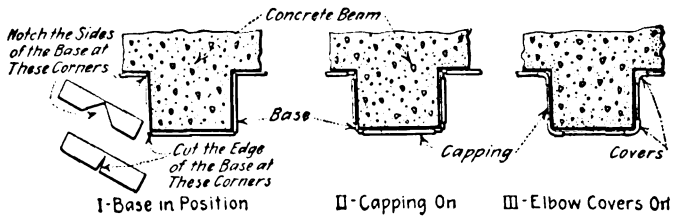


Fig. 8.—One Method of Carrying Metal Molding Around Beams.

method of joining abutting ends of metal-molding backing; also a method of making an improvised corner connection. Fig. 8 shows one of the methods of carrying a metal-molding run around a concrete beam.

Putty Knife As Electrician's Tool.

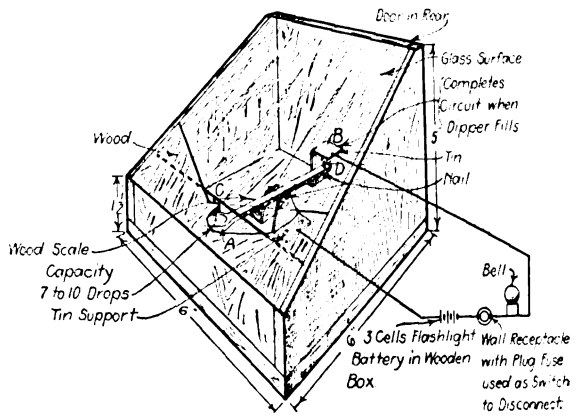
Cutting an inch off the end of a broad, heavy putty knife makes a tool which is invaluable for removing moldings, cutting tongues from floor boards, and other uses in place of a chisel. It will not scar as a wood chisel will and with the shorter length a better temper is found to stand prying, hammering and other abuses. R. Mason.

AN INGENIOUS RAIN ALARM.

By W. D. Wolf.

Being accustomed to sleeping with the windows of my room open during the night, I was sadly disappointed one morning to find that the rain had soaked my writing table and desk, with their contents, both of them being located next to a window. An ordinary rain does no harm, but if the rain is falling at a slant about 10 degrees off perpendicular it gets over the sill. In order to warn me during the night when it is advisable to close the windows I conceived the idea of the device, sketch of which is shown herewith, and found it to be entirely practical, having already served me well in numerous cases.

It is placed right under the sash of the open window and if the rain comes at an angle off perpendicular it strikes the glass surface, which is imbedded in putty, runs



An Ingenious Rain Alarm.

to point *C*, dropping to the spoon end *A*, which when filled throws up the other end of the scale *D* and makes contact with *B* and closes the circuit, ringing the bell. A fuse in series is used as a switch.

Louisville Abolishes Knob-and-Tube Wiring.

With the first of May, the Louisville (Ky.) City Building Inspector's office ceased writing permits for knob and tubing installations. The rush on the office was so great that additional clerks were pressed into service and the total number of permits issued between the time of the announcement that the new regulation would be effective on May 1, and that date, was 1,400. Beginnings were made on many of these installations sufficient to permit their being carried out under the old regulations. In connection with the imposition of the all-metal conduit installation regulation, the building inspector called attention to the fact that all wiring installed on and after May 1 must conform to Rule 15 of the National Electrical Code.

Contractors Co-operate in House Wiring at Springfield.

Fourteen electrical contractors of Springfield, Mass., have joined in a special campaign for house wiring, continuing from April 15 to June 1. Between these dates the contractors will wire existing houses on streets having electric service, on payment of 10 per cent of the contract price at the completion of the work and 10 per cent a month until full payment is made.

The United Electric Light Company joins the contractors in announcing the special offer on which the various parties have agreed, naming the concerns who will do the work. Negotiations are to be carried on between the contractor and the householder, the central station not participating in the contract.

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DIRECT-CURRENT ARMATURE-WINDING TROUBLES.

By T. Schutter.

In direct-current armature windings there are certain troubles which are likely to happen, either through carelessness of the winder, accident, or defects in the material; the

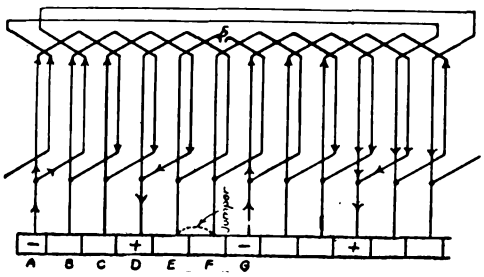

Fig. 1.—Lap Winding With Open-Circuited Coil.

latter should, of course, be detected by the winder. All these troubles which are likely to arise show up in various ways and, if taken care of at once, nothing serious will result, but if the machine is allowed to run, the winding may burn out, also ruin the commutator.

The troubles of a direct-current armature winding are as follows: open circuit, short circuit in a coil or between two or more coils, ground, reversed or cross-connected coil. The above-mentioned troubles will be defined separately, and a practical method for remedying each case will be explained. It might be stated that while these troubles appear in the same manner in both lap and wave windings, their repairs are made differently.

An open circuit is the most frequent trouble which arises and it may be caused in many ways. The leads from the coils may be broken from the commutator, which is caused by poor soldering or carelessness when being connected. When the leads from the coils are being connected to the commutator they should never be pulled down very tight, because when the leads heat up they expand and when they cool they contract; if the cooling is quicker than that of the underlying core, the contraction will be greater than that of the core and the leads will stretch, which in course of time will cause the leads to break off and the winding will be open-circuited.

The proper way to connect leads to the commutator is to allow them to be slack, and when all the leads are connected a light string band is put on to prevent the leads from rising up due to the centrifugal force when the machine is running.

If the machine should run very hot and begin to throw the solder from the commutator, this may cause poor contact between the leads and the commutator bars which will also give the winding the appearance of an open circuit. This style of open circuit can be very easily repaired by resoldering the leads in the commutator.

The action of an armature with an open circuit is that there will be violent sparking at the brushes; the spark will be of a greenish color and have a tendency to follow from one brush to another in the running direction.

If an armature is run only a few moments after the violent sparking has begun, it would be hardly possible to locate the point of trouble by inspection, but if run for some time, the bars to which the open-circuited coil or coils are connected will be burnt and pitted, also the mica between the bars to which the open-circuited coil is connected will be blackened and the surface carbonized.

Should the sparking only occur when starting and then disappear, or occur at intervals of short duration and then disappear again while the machine is in motion, this is called a flying open, and is one of the worst troubles to locate.

When an open circuit appears, the machine should be shut down at once and the trouble located. If it is not possible to locate the defect by inspection and no handy arrangement for testing is available, examine the winding for broken wires. First examine the leads connecting to the commutator to see whether any are loose or broken away from the bars due to contraction; if these are intact, examine the back end winding and see whether any of the coils are broken due to accident; if these also are intact, then examine all other parts of the winding which are exposed. If no broken wires are found, then the armature should be taken out of the frame and tested to locate the open-circuited coil.

To test an armature there are two practical shop methods that can be used. One is the use of a test lamp and the other is the drop-of-potential method.

The lamp is only practical on high-resistance windings, while the drop-of-potential test is practical on any winding by varying the value of the current used for testing.

In lap or parallel winding one open-circuited coil will show up in but one place on the commutator, while in a series or wave winding it would show up as many times as there are coils in series between adjacent commutator bars. (The number of coils in series between adjacent commutator bars in a series winding equals half the number of poles, thus in a four-pole winding there will be two coils, and in a six-pole winding there will be three coils in series between adjacent commutator bars.)

The Figs. 1 and 2 are simple diagrams of a lap and a wave winding. In Fig. 1 coil 5 is open-circuited, and in Fig. 2 coil 2 is open-circuited. Fig. 2 is a four-pole series winding and there will be two coils in series between adjacent commutator bars.

Assume that Fig. 1 is a high-resistance winding, and we are using a test lamp to locate the trouble. First remove the armature from the frame, and with the leads of the test lamp test between bars *A* and *B*, as the coil connected to these bars is a good one; the lamp will light, but not as brightly as it would across the line, since the resistance of the coil is in series with it. The same result will be obtained between bars *B* and *C*, *C* and *D*, *D* and *E*, but between bars *E* and *F* the lamp will burn very dim, as at this point the open-circuited coil is connected and the resistance of the entire winding minus one coil is in series with the lamp. The same thing will occur between bars *A* and *B* in Fig. 2, as one of the two coils which are in series between these two bars is open-circuited. If there were more than one open circuit in either winding, the lamp would go out when the defective points are reached.

If the windings were of low resistance, it would be almost impossible to locate the open circuits with a test lamp, and in this case the drop-of-potential method would be the best and

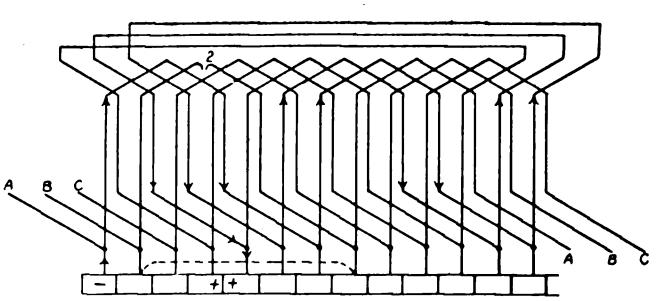

Fig. 2.—Diagram of a Wave Winding—Coil 2 is Open-Circuited.

most accurate. Fig. 3 shows a simple arrangement for the drop-of-potential test.

L are lamps to regulate the test current.

S_1, S_2, S_3 are switches to control the lamps.

VM is a low-reading voltmeter which indicates the drop in potential.

AC are the armature contacts which are set on the commutator in the same position as the brushes would be on a two-pole machine (diametrically opposite).

VL are terminals to which the voltmeter leads are connected to take the readings between bars.

By setting contacts *AC* on the commutator, as shown in Fig.

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4, and regulating the current so as to get a reading at about the center of the scale from a perfect coil, the drop across a good coil will be equal to I×R; assuming that I=2 amperes and R=0.5 ohm, then the drop will be 2×0.5=1 volt. When all coils between the points *A* and *A'* have been tested, give the armature a half turn; this will bring *A'* to *A*, and *A* to *A'*, then proceed to test as before. In this section there will be no reading on the voltmeter, as there is no current flowing, until bars *B* and *C* are reached. At this point the needle of the meter will be thrown across the full scale very violently, as the full voltage applied to the armature is recorded at this point. This test applies to both a lap and a wave winding.

To repair this defect, first examine the winding as previously explained. If no broken wires are found, and it is impossible to open up the armature to replace or to repair the winding at once, an emergency or temporary repair can be made, by taking the leads of the open-circuited coil from the commutator, and soldering a jumper across the bars, as shown in Fig. 1 for a lap winding and as shown by dotted line in Fig. 2 for a wave winding. It is not advisable to cut out too many coils in a winding, and all defective ones should be repaired or replaced at the first opportunity.

It must be remembered that the connections between the coils and the commutator bars are not made in the same manner in lap and wave windings. In lap windings opposite ends of the same coil are connected to adjacent commutator bars, but in wave windings opposite ends of the same coil are connected

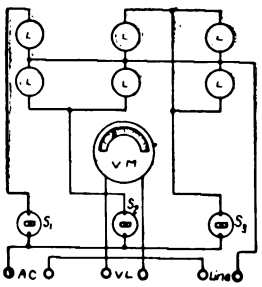

Fig. 3.

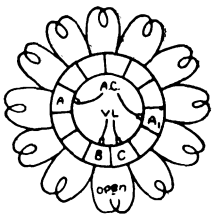

Fig. 4.

a certain number of commutator bars apart; this will depend upon the coil and commutator pitch (see Fig. 1 and 2).

A short circuit in one coil or between two or more coils is caused by defective insulation or carelessness in winding. In windings where there are two or more coils in the same slot, a strip of insulation should be placed between them, also a piece of very thin insulation between the coils at the end windings where they cross one another.

An armature with a short-circuited coil or coils, when used in a motor, will usually fail to start on the first few points of the starter, and when running it will not run with an even, steady motion, but will run in a jerky manner. The cause of this is that when the short-circuited coils come under the pole they will have a tendency to reverse the direction of motion, but the momentum keeps the armature going in the same direction.

In lap and wave-wound armatures the tests for a short circuit in one coil are made in the same way, that is, by using the drop-of-potential method as described for an open circuit, only when the short-circuited coil is reached the drop will be less than in a perfect coil, because its resistance will be less.

There is no practical way to remedy a short-circuited coil unless the short can be cleared. If this is impossible and the machine cannot be shut down to permit replacing the defective coil, take the leads of this coil off the commutator and then cut a piece out of the coil, that is, cut a piece out of every turn of wire which composes the coil. Then solder a jumper across the commutator bars from which the leads have been taken as has been explained for an open circuit.

To test for a short circuit between two or more coils which cannot be located in any other way, a test lamp is the most convenient and accurate method. First disconnect all the coils from the commutator, also one coil from another; then connect one end of the test lamp to the beginning of any coil permanently and call it No. 1; with the other end of the test lamp test two or three successive coils to see whether they are shorted with No. 1; if the lamp will not light from any other end except the end of the first coil, splice this end to the beginning of the second and proceed to test as before.

In Fig. 5, coils 2 and 5 are short-circuited together. This being the case, the test lamp will light when the leads are connected to points *A* and *E*, with the leads of coils 3 and 4 still disconnected. If the short cannot be cleared, the armature

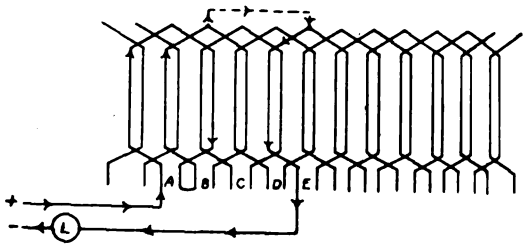

Fig. 5.—Coils 2 and 5 Are Shown Short-Circuited.

must be rewound if hand wound, or the coils replaced by good ones if form wound. This is the only remedy.

A ground is also caused by defective insulation, which will allow the winding to come in contact with the core, shaft or other metal parts.

To test for a ground the test lamp or the drop-of-potential method can be used. If using the test lamp, take the leads out of the bars each quarter way around the commutator; to locate the section in which the ground exists put one end of the test lamp on the shaft and with the other end test to each quarter. The lamp will light only between the shaft and the section in which the grounded coil is located. Then divide this section into smaller parts and test until the grounded coil is finally located.

When the drop-of-potential test is used, apply the leads *AC* (Fig. 3) to the commutator as explained; fasten one of the voltmeter leads to the shaft of the armature, and with the other lead test to all bars. The bar or bars from which you get the lowest or no reading are the ones to which the grounded coil or coils are connected. This test applies to both lap and wave windings, and the only remedy, if the ground cannot be located, is to rewind.

Reversed or cross-connected coils are coils with their leads crossed. In Fig. 6 a section of a winding is shown with a coil reversed. The action of the armature with such a defect will be the same as that of a short circuit. To locate this defect

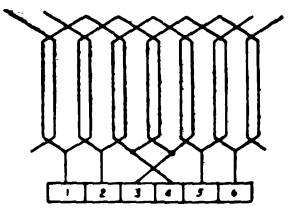

Fig. 6.—Winding With Cross-Connected Coil.

use the drop-of-potential test. Place leads *AC* (Fig. 3) on commutator, and with the voltmeter leads test between adjoining bars. The reading between bars 2 and 3 will be twice that of any other normal pair of bars; between bars 3 and 4 the reading on the voltmeter will be reversed; between bars 4 and 5 there will be another double reading. It will be seen that between bars 2 and 3, also between bars 4 and 5 there are two coils in series. To remedy this defect, take the leads from bar 4 and put them on bar 3, and the leads from bar 3 and put them on bar 4.

These methods of testing direct-current armature windings and making their repairs are practical in every way, and by following the instructions, which are very simple, they will never fail.

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Proper Handling of Accounts Payable

By George W. Hill

This article is the seventh of the present series on business and accounting methods for electrical contractors. Mr. Hill describes in this article a convenient and systematized method for handling accounts payable and shows how this fits into the general accounting system which he recommends. The value of such a system in giving a firm a proper credit standing is pointed out.

Owing to the peculiar character of the Accounts Payable account, and lack of uniformity in form, size and shape of the various invoices received from the numerous concerns with whom we do business, each concern using invoices adaptable to its own system of handling accounts, there seems to be a demend for some method which will in a large measure not only provide a file or reference binder but a complete and comprehensive record of invoices.

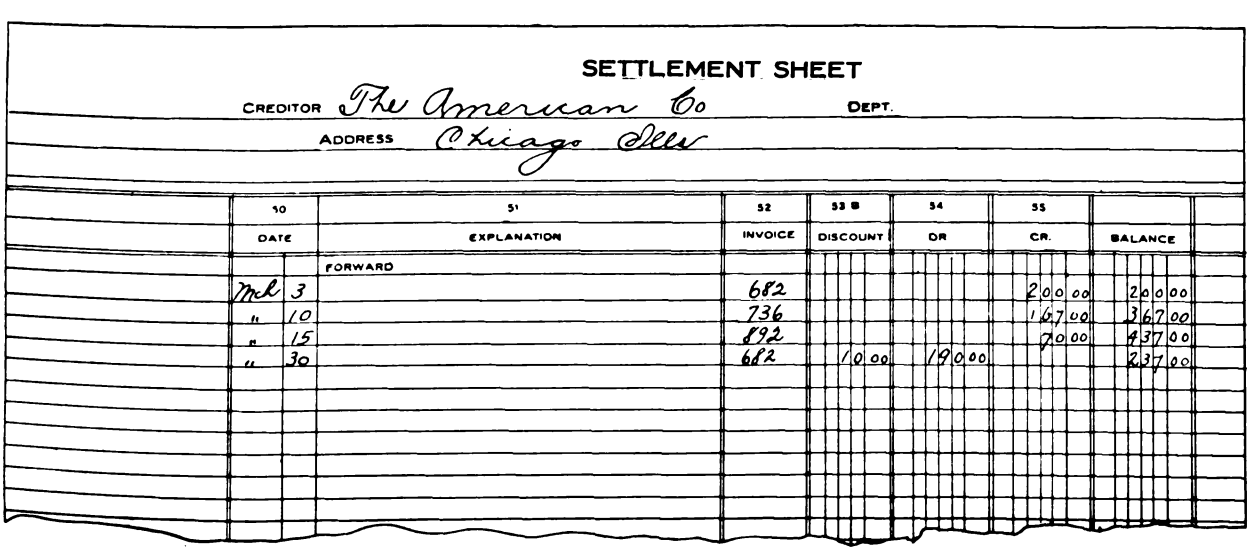
There are as many methods of handling the Accounts Payable account as there are concerns in business, and the old form of bookkeeping seems to prevail in many offices which carries with it the idea of filing the invoices separate and apart from the actual records, and the device as shown in the accompanying illustration is presented in the hope that it may prove a convenience to those who desire to keep close tab on their Accounts Payable account. This simple method will draw the various accounts together, and show at a glance the true condition of the entire account, as well as provide a ready reference and record of all the individual accounts. There is a disposition on the part of many, in an effort to eliminate as much detail as possible, to let the other fellow keep the books, but this is commendable only so far as it will prove efficient in our own office. Many concerns are not carrying their Accounts Payable account through their books, but simply using files for invoices and transferring them from unpaid to paid binders and considering the amount of unpaid as their total accounts payable in taking a financial statement, which is often delayed until the end of the fiscal year. Many discrepancies creep in during the year and often misunderstandings and disputes arise, which are settled with more or less difficulty and in some cases with the disastrous result of severing what might otherwise be pleasant and mutually profitable business arrangements.

In order to not only provide a convenient file but a complete and comprehensive record of this very important account in all business, the writer has designed a large manilla envelope, on the front of which is ruled and printed that which might be called a "Settlement Sheet," space being provided at the top to contain the name of the creditor as well as such other general information as might seem necessary, and from left to right it will be observed the columns are provided for the records. Column 50 is for the date. Column 51 for any explanation thought necessary, such as due and discount dates, special arrangements, etc. Column 52 is invoice number, Column 53B discount taken in settlement of account or individual invoice, Column 54 amount of payment made on account, Column 55 amout of invoice, balance column for the purpose of carrying the balance due. It will be seen that by simply adding the amounts represented in the balance column the total of accounts payable is ascertained.

From this record an absolute proof of the Accounts Payable account may be had, as the previous accounts payable plus the purchases (Column 55) minus the total of Columns 53B and 54 will represent the total accounts payable, as shown from the total of all balance columns. This is a simple operation and is accomplished with little difficulty where an adding machine is in use in the office.

These envelopes are 12 by 9.5 inches in size and will contain conveniently any sized invoice which may be received, together with other memoranda which may seem desirable to file with the account. These envelopes may be placed in standard vertical files, alphabetically and will prove a very convenient and compact record.

It often becomes necessary to make a close investigation of one particular account, and by simply going to the filing case the record of all invoices and documents are found within the envelope which may be lifted from the file and taken to the desk of the bookkeeper or elsewhere and a thorough investigation made with all records and documents before you. The entire account may be checked up. Such a record seems very essential as the jobbers and manufacturers are becoming more strict with their customers and many are refusing to extend credit to those whose methods of handling accounts are such that unpleasantness and misunderstandings are continually arising and from whom it is impossible to secure a comprehensive statement of their standing in the business world.



SETTLEMENT SHEET

CREDITOR The American Co DEPT.

ADDRESS Chicago Ills

50 DATE		51 EXPLANATION	52 INVOICE	53 B DISCOUNT	54 DR	55 CR.	BALANCE
		FORWARD					
Mch	3		682			200 00	200 00
"	10		736			167 00	367 00
"	15		892			70 00	437 00
"	30		682	10 00	190 00		237 00

Settlement Sheet for Electrical Contractors' Accounts.

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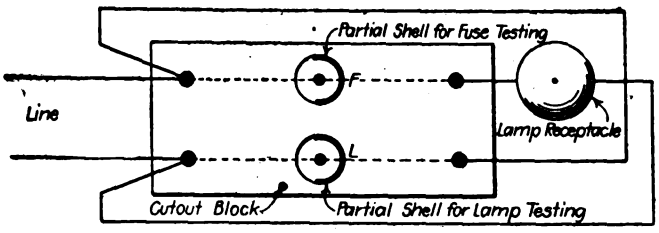
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fuse and Lamp-Testing Block.

A cutout block can be made into a convenient fuse and lamp testing set by widening the screw shell on the cutout so that a fuse plug or lamp can be slipped in, thus saving time as it will obviate screwing the plug or lamp in. Cut a part of the



Handy Fuse and Lamp-Testing Device.

screw shell off which will simplify it a little. Then take a lamp receptacle and connect it as shown in diagram. This lamp will burn when fuse plug is good.

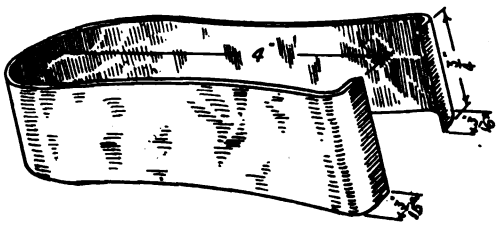
Benjamin Swanson.

Fishing Wire in Fixtures.

We have had excellent results in wiring bent fixture arms by using a piece of wire solder about one-eighth inch long and cutting about half way into it with a knife and pressing this on a strong linen thread or string. The weight of the solder will pull string through fixture easily, if held properly and tapped gently. In larger fixtures a larger piece of solder doubled and clamped on the string with pliers will be found useful. O. B. Welch.

Convenient Wire Scraper.

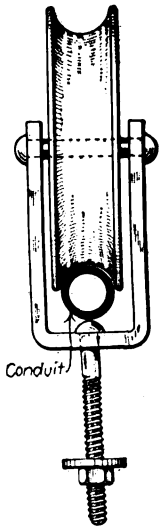
A handy wire scraper for skinning lamp cord, magnet wire and other small wires can be made from an old hack saw of a power machine. Take a piece about 10 inches long and grind off the teeth. It is then bent into shape as per sketch and the two lips ground to a level to form a



Simple Home-Made Wire Scraper.

cutting edge. By placing the wire between the edges and pressing the scraper together the wire can be easily cleaned of insulation by pulling the scraper over the wire. If an old saw blade cannot be obtained, a piece of phosphor bronze, 10 inches long and 0.75 inch wide and one-sixteenth inch thick can be used, although the cutting edge will not hold as well. However, the writer has one made of this material which has been in service a number of years.

F. A. Grohsmeyer.



Conduit Bender.

Simple Device for Bending Conduit.

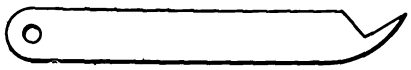
A simple and cheap fitting for bending fairly large conduits can be made by taking a piece of one-half-by two-inch strap iron and bending it into the U-shape shown in the sketch. Then drill through it three holes, two for a pin to hold a grooved pulley wheel and the third for a stout bolt. The pulley should be about 8 by 2.5 inches and can be bought cheaply at most any foundry or machinery supply shop. Next bore a hole through a post, a heavy plank or the floor, and fasten the outfit by putting the bolt through the hole and drawing up the nut and washer tightly.

By putting the conduit through as shown, a very nice bend can be quickly made. This outfit can be used for all the sizes of conduit that fit well within the groove of the pulley used. Its use is especially convenient and desirable on a large job where a great deal of conduit has to be bent.

Walter Morris.

Handy Tool for Commutator Repairs.

While out on a job recently it was necessary to repair a short-circuited commutator. A knife was not handy to dig out the mica between the segments, and to go behind the commutator. I found an old hack-saw blade and ground it on an emery wheel into the shape shown in the sketch. With the



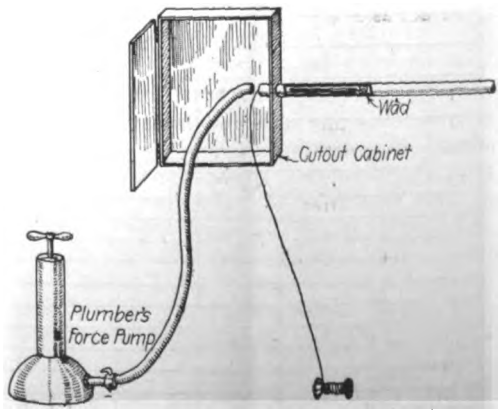
Tool for Commutator Work.

point I scratched till I had a start in the mica. The rounded end served as a lever, while the point dug out all the bad mica. I found this a very handy tool for all commutator work, especially the taking out of short-circuits in a commutator.

J. Wagner.

Fishing Conduit Runs by Air Pressure.

In a recent issue a contributor gave his idea of fishing hard conduit runs by means of a vacuum cleaner, using the suction of the machine to pull a cord through. The following method has been used by me a number of times when every other method had failed. It is especially useful in new buildings. The scheme is shown in the sketch herewith. You can nearly always obtain use of a plumber's force pump on a new building. Put in as much strong thread as possible with a round piece of cloth or wad acting as a carrier. Apply end of hose to conduit opening. At every operation of the pump you will find the thread advanced about three feet. M. Podell.



Conduit Fishing by Air Pressure.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

SOWING THE SEED FOR INTENSIVE CULTIVATION IN MERCHANDISING.

Business-Building Suggestions to the Electrical Dealer for Securing the Best Publicity.

By W. B. Parker.

This is the second of a series of articles describing practical methods the electrical dealer can make use of in the work of business building. The writer believes many men are unnecessarily limiting themselves as to the extent of territory in which they reach out for new business and others are not getting the results they should, even in the limited territory they are attempting to cover.

Following the conclusion reached in the previous article that newspaper and direct mail advertising were the only methods of publicity worth considering as sure producers of new business, we will now take up the matter of newspaper space and the kind of copy it should be filled with. It is not so important that a large space should be contracted for as that some space should be used regularly and that the copy should be changed at least weekly. Where such an arrangement is possible, it is best to reserve space on a particular page, so that readers will always find it in the same place and will come to look for it there. As small a space as seven inches can be used very effectively if it really contains news. Three insertions weekly, where a daily is used, will be found almost as resultful as daily insertions.

Advertisements are primarily store news and will be considered as such and read as carefully as any other part of the paper if the dealer does his part in editing them and making them interesting. The writer advises two styles of advertisements to be used alternately. One mentioning specific articles and naming prices and the other emphasizing the service offered to patrons. You can not emphasize service too much—and by service is meant your desire and ability to give entire satisfaction. Once convinced that he can place absolute confidence in your statements about any goods you handle and you have gone a long way towards making a permanent customer. He will not be so likely to allow cut-price offers of others whose reliability he does not feel so sure of to tempt him to take the chance of inferior goods. Where as small a space as seven inches is used there is, of course, not much room for display, but the head line should be in fairly good sized black-face type, as should the signature at the bottom. The smaller light-face type would be suitable for the body of the advertisement. It is a very good plan to have a distinctive signature engraved, and use it as a kind of trade mark in all newspaper advertising.

Next comes the matter of direct mail advertising. To obtain the most business possible in a given territory letters must be used. And the right kind of letters are not at all expensive, for they produce a greater volume of immediate returns than any other form of advertising, and this is true even where the persons receiving the letter live near the sender's place of business and are personal acquaintances. People like to feel that they are considered such desirable customers that this special effort is made to get their business. Such letters should have one or two objects in view—either the making of a special, time-limited offer on certain merchandise or should emphasize the service offered patrons at all times, with special mention of some particular article.

General letters merely inviting the recipients to trade with the dealer sending them, are not effective, at least as to early results, and should be avoided. Following is a sample of a service letter with a particular item mentioned. It has the elements of a successful sales letter,

Dear Mr. Smith:

When you spend your good money for electrical work or supplies you want to feel sure of securing full value. You want to know that should anything go wrong it will be promptly made right

That is exactly the kind of service we offer you. With us no deal is complete until the customer is satisfied. It's the modern way of doing business and it is the only way that is really worth while

This matter of service is one we want to emphasize. While we keep nothing we cannot honestly indorse, yet it often happens that an article that is good under some circumstances is not so suitable under others. We always stand ready to give you the benefit of our expert knowledge and unbiased opinion

Just now we offer a special inducement in a six-pound Electric Iron, complete with cord, plug and stand, at only $2.50. This is only one of a number of items that are of more than ordinary interest to the careful buyer

Whether intending to purchase or not, you are extended a cordial invitation to inspect our display during the coming week. You will be certain to be interested in the latest products of the electrical industry we are now showing

Yours very truly,

DEALER & COMPANY.

A Business-Producing Letter.

first, because it is so short that it is easily read and remembered; second, the first paragraph indicates financial benefit to the reader; third, the special item mentioned gives the reader a particular offer to consider at the time, and fourth, because the closing paragraph suggests a reason for calling even if not ready to decide on buying anything.

Much attention should be paid to the appearance of all letters sent out. It pays to use a good quality of paper and to see that the general appearance is good. They should be printed in imitation of typewriting through a silk ribbon, as is done on the multigraph and similar machines, although the work can be done on an ordinary printing press if the printer understands the process. A blue or purple ribbon usually gives good results and if a typewriter is convenient the letters should be filled in with the name of the recipient, as indicated in the sample. Otherwise, the salutation may simply be "Dear Friend" and printed with the balance of the letter. Each paragraph should be indented and spaced so that it stands out clearly. All letters should be signed with pen.

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A System of Dividend Coupons for Electrical Merchandising.

A new plan in connection with the sale of current-consuming devices is being followed by the Commonwealth Edison Company, of Chicago, Ill. It consists in

Cover of Premium Booklet Used by Chicago Company.

arranging with merchants throughout the company's territory to give out to their customers with each purchase Federal dividend coupons, which are furnished by the Federal Profit Sharing Company, a company closely associated with the Federal Sign System (Electric). Merchants cannot take advantage of the plan unless they used a Federal sign on Commonwealth Edison service.

The coupons are of the five-cent denomination and are redeemable at the company's Adams Street Electric Shop, being accepted in exchange for any current-consuming device. Coupon books are obtainable from any of the merchants, each book holding 960 of them. Once a month the holder of a book may secure 20 coupons free by merely presenting the book at the company's office. The coupons are non-transferable, so that even if a collector has a number of books it will not be possible to fill up one with free coupons.

The redemption value of the coupons is based on the wholesale price of the electrical merchandise and is, therefore, considerable higher than other systems of its kind. The cost of the Federal coupon to the merchant who gives them to his customers will be actually 25 per cent less than the cost of other stamps.

The Federal Profit Sharing Company is the organizer of the movement. This concern will sell to central stations throughout the country, urging the benefits to the central-station company by increased attendance at electric shops, increased interest on the part of consumers of current, increased consumption of current by the use of the devices used as premiums, and increased good will for the central-station companies promoting the plan in each community.

The coupon book is not merely a blank book for holding coupons, but also a very attractive catalog of a great many of the devices used as premiums. It cannot help but greatly stimulate interest in the plan.

Electric Washing Machines and Ranges Featured During Clean-Up Week.

The Gainaday electric washing machine was featured in the appliance department of the Boston Edison Company during clean-up week. A demonstrator operated one of the machines in the show window. The electric range was also an attractive exhibit, with a conspicuous placard announcing that for $10 a range would be installed in the home of any customer of Edison light.

Combining Facilities and Service Policies to Secure Quality of Service.

Trade should be founded on service. Furnishing merchandise is a service, the quality of which depends on the facilities and policies of an organization. The firm handicapped by lack of facilities may be in a position to furnish a high degree of service because its policies towards its customers are such that a high standard of "willingness to serve" is maintained. By adding adequate facilities to this quality a business enterprise has the very best means for the conduct of trade.

These points are illustrated by the new fixture room recently installed by the Northwestern Electric Equipment Company, of St. Paul, Minn. This room is maintained for the use of the company's customers, who are given the liberty of bringing in their trade and selling the fixtures from the floor, or customers may send their trade in with letters of introduction, the company makes the sale and credits the merchant in the locality from which the purchaser comes.

The stock of fixtures is kept very complete, and the company tries to make the room one of the most attractive of its kind in that section of the country. The wall cases, which run the entire length of the room, are wired for lamps, and the ceiling and portable fixtures can be lighted at will for display purposes. The ceiling fixtures are controlled in rows with three-way switches

New Display Room of Northwestern Electric Equipment Company.

and the wiring is arranged so one-half of the fixtures on each row are lighted at the same time, giving an opportunity for comparison with the remaining fixtures in the row.

Statistics on the Growth of the New York Telephone Company.—Statistics prepared by F. H. Bethell, vice-president of the New York Telephone Company, indicate the surprising growth of this public utility. The New York Telephone Company gained more than 91,000 telephones last year in New York state and northern New Jersey. It now serves 1,246,000 users of telephones and averages 5,000,000 calls daily. There are now 622,000 telephones in New York City.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to not over 300 words. Payment will be made for all answers published.

Questions.

No. 342.—Trouble Finders.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

No. 346.—Electric Arc for Cutting Scrap Metal.—What voltage should be used in cutting up old boilers with an electric arc? Of what material and shape should the electrode be? What safety device is most practical for preventing overloading transformers used in such work?—L. G. C., Lincoln, Neb.

Answers.

No. 340.—Three-Phase Versus Single-Phase Transformers.—If the three-phase transformer actually possesses all the advantages that are claimed for it, why is the three-phase distributing transformer not used instead of the single-phase on a larger scale? How do the two compare as regards reliability and cost?—N. T., Chicago, Ill.

The single-phase distributing transformer has given good satisfaction for general distribution work. The advantages of the three-phase unit are often more than counteracted by the disadvantages. Single-phase transformers are more flexible than are the three-phase type. For loads up to about 25 kilovolt-amperes two transformers can often be used instead of three without causing any serious unbalance of voltage or current. Lighting and power are usually supplied by the same circuit, hence for this reason alone single-phase units are required in any case, and by adhering to the single-phase transformer the number of different sizes and the total number of transformers that must be kept in stock may be greatly reduced, while the amount of reserve capacity on hand ready for emergency is considerably greater for the same investment. If one single-phase transformer is in trouble it rarely affects the other units in the same bank, and the time of service derangement is a minimum, due to the smaller amount of work necessary in replacing the damaged unit, while frequently the two remaining transformers may be made to carry the load, or at least partial load, until the defective unit has been replaced. On the other hand, damage to one phase of a three-phase transformer usually affects at least one of the other phases, which means that the cost of repairing will be greater, also the loss of time in restoring normal service, not to consider the extra expense of replacing the transforming apparatus of all three phases, whereas the replacement of one would ordinarily suffice.

The chief disadvantage of the three-phase transformer, and the one which is largely responsible for its lower cost per unit of capacity, is the dependence of one phase upon another through the magnetic circuit, while the high cost of maintaining reserve capacity is also a factor. Pole-type transformers are subject to greater hazards from storms, lightning, etc., than are transformers of the indoor type, and for this reason alone the single-phase transformer is quite often given preference over the three-phase, because, although the first and installation costs are in favor of the latter, the operating cost is in favor of the former. In vaults and industrial substations under cover, the case is different; the hazards are less, and here the advantages of the three-phase distributing transformer may outweigh the disadvantages, in that it enables lower initial and installation costs, permits the use of smaller buildings, etc. On the other hand, one single-phase transformer may be ample reserve capacity for a bank of three single-phase units, whereas one three-phase reserve unit would be needed for a three-phase transformer.

Where poles are jointly used by two or more companies the matter of space economy is very important, and here the three-phase transformer is at a very great advantage. Again, in underground distribution, where the load density is high and conditions congested, a condition that will become worse as underground distribution comes into more universal application, the three-phase transformer offers about the only suitable solution.

The writer thinks it doubtful whether the three-phase distributing transformer will find very general application in place of the single-phase unit in this country, except as stated above, and for serving sparsely populated districts where lightning is not severe, and for supplying small three-phase loads with little lighting, such as is the condition at many irrigating plants, oil wells and similar purposes, where the three-phase unit enables the initial investment to be kept down, in this way permitting immediate returns upon the investment. The three-phase distributing transformer has its sphere, but it is a narrower one than that of the single-phase type. This opinion is unbiased, and will be found to be that of many central-station companies who have given this matter careful deliberation. —K. R., Chicago, Ill.

No. 341.—Controller for Bascule Bridge.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

To the writer's knowledge there is now in successful operation a magnetic switch controller, fully automatic in every respect, operating a motor-driven lift bridge, the motors being of direct-current type. Describing it briefly, the controller consists of shunt-wound magnetic contactors of necessary size, main-line knife switch, overload relays, and current-limit relays. All of these parts are mounted on individual slate panels with busbar wiring in the rear. Further, the apparatus consists of separate cast grid resistances, a comparatively small master controller for the operator, and necessary automatic limit switches. As explained above, the control equipment is entirely automatic. The operator can throw the master controller from "off" position to full "on" position, and the control board takes care of the bridge, including slow down and final stop. In this particular instance three limit switches are used. The first limit switch opens all of the magnetic switches and inserts the starting resistance, which lessens the motor speed; the second limit switch shunts the motor armature, further lessening the speed, and this point of slow down can be adjusted to suit any given condition of load; the final limit switch automatically cuts the motor off the line, and then shunt-wound electric brakes are set, thus definitely stopping the bridge at the desired point.

The writer realizes that a lift bridge is not a bascule bridge, but can see no possible trouble in building a similar magnetic switch controller for a bridge of the latter type. As far as the varying load is concerned, automatic magnetic switch controllers have been built for several years to operate blast-furnace skip hoists, and in such installations the same bucket or skip will at one trip carry up a load of coke, at another trip will carry up a load of limestone, and at another time will carry up a load of ore, and among these three materials you will find a wide variation in weight for the same volume, and therefore a

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difference in load. The same controller can be built to hoist these loads, and have a stopping point for the skip which will not vary over one-half inch for any of the loads.

Such a small variation in stopping point, with such a wide variation in load indicates definitely that a bascule bridge could be handled by an automatic controller and limit switches, so set that they would not only prevent smashing or upsetting the bridge leaves, but would always stop the bridge in exactly the proper position. As a matter of fact, investigation will show that bridge engineers provide limit switches at the upper and lower limits for preventing overtravel of the mechanism, even when using manually operated controllers.—W. H. W., Chicago, Ill.

No. 343.—Theater Emergency Lights.—Rule 38*a* of the National Electrical Code provides that "where supply to a theater cannot be obtained from two separate sources, the feed for emergency lights must be taken from a point on the street side of main service fuses." Has this provision been found ample for the purpose? Would it not be desirable to insist on an entirely independent source, such as a storage battery?—J. H. R., Pittsburgh, Pa.

The object of the rule in regard to theater lights is obviously to provide light in case of emergency when the regular theater lights are off, so as to enable the audience to leave quietly and without danger of panic. If the main lights are off for only a short time, these emergency lights can be used until the circuit is again established. It would seem to the writer that it would be well in that case to have the emergency circuit taken from the street side of the main circuit fuses. Owing to an unusually heavy theater load or some accident, the inside fuses might blow. The outside emergency circuit could be thrown on until the fuses were replaced. Sometimes, however, a generator goes wrong in the power house, or a main feeder blows up, in which case obviously the outside circuit would be useless and, if the lights suddenly went out for some such cause, there is always the danger of a panic, resulting in possible loss of life. While the writer has never heard of any great catastrophe happening on account of just such an accident, the possibility should not be overlooked and provided for.

As an independent source of electric light there are two commercial possibilities—dry cells and storage batteries. There is on the market an arrangement of dry batteries known as a multiple battery in which five dry cells are connected in series and three such sets in multiple. Such a battery is fully capable of operating six six-volt two-candlepower miniature incandescent lamps for half an hour or more, which will give sufficient light to effectually prevent any panic in leaving a small theater, such as the usual motion-picture house. Dry cells are, however, subject to deterioration by long standing and the manufacturers are not willing to make any guarantee as to the length of time it is safe to keep one of these batteries. A test made for this specific purpose in the laboratory of one of the manufacturers has shown that at the end of a year the battery was capable of fulfilling the condition just imposed. The manufacturers recommend that when such a battery is used, it should be tested once every two months and they can assure the user that as long as a momentary test shows the battery to be in good condition it is safe to keep it in the circuit. For larger theaters the storage battery is probably the best solution. Even a small battery will be ample to supply sufficient current to light the lamps for the required length of time. The only trouble is that the battery must be regularly inspected, recharged every two or three months and kept filled with water to replace that lost by evaporation. In conclusion, the writer strongly believes that one of these two independent sources of current is necessary to prevent the possibility of a great catastrophe and the choice should be made according to the particular conditions involved.—V. A. C., Cleveland, O.

No. 345.—Demagnetizing Iron Castings.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

Probably as practical a way as any to demagnetize a piece of iron without the use of alternating current is by means of heat. If the piece is considerably longer than it is wide, it would be well to hold it so that its length will be in an east-and-west direction. The process is simple and is easily accomplished, it being merely necessary to apply heat in any way until the piece approaches redness. This process can be hastened somewhat by pounding the iron with a hammer made of any nonmagnetic material, such as lead, brass, etc., at the same time as the heat is applied. Of course, the size and the nature of the work will determine the practicability of the above method.

The writer has also seen small pieces that have been slightly magnetized cleared of their magnetism by holding them in an east-and-west direction, at the same time pounding them with a hammer made of a nonmagnetic material. By testing with a compass at frequent intervals and continuing the process a point will be reached when it is found that neither end of the piece repels the compass needle, indicating that the piece is demagnetized. As mentioned above, this process is only useful when the amount of magnetism is very small. The above test for magnetism will also be found useful where heat is used as a demagnetizing agent.—A. B., Cleveland, O.

"Sociability Run" and Contest for Electric Cars to Be Held in New York.

Electric pleasure car owners in New York City will have a day of their own on May 19 when the New York Electric Vehicle Association's "sociability run" will take place. The run is planned with the object of encouraging sociability among the hundred or more women drivers of electric automobiles in New York and of demonstrating the practicability of the electric car for long runs.

The start will be made at 2:30 p. m. from the Electric Garage, Central Park West and Sixty-second Street, proceeding up Riverside Drive, through Van Cortlandt Park and Westchester to the Siwanoy Country Club, Bronxville. Invitations are being sent by the New York Electric Vehicle Association to all owners of electric pleasure cars in Manhattan and the Bronx.

One of the features of the run will be a competition in the form of a secret time contest. The distance to be covered is approximately forty miles. Three judges will make the run in their own cars before the day of the contest, each one noting the total time in which he made the run. The average of these records will be obtained and will be used as the secret time for the run. The contestant coming nearest to driving her car over the route in the secret time will be awarded a prize. All that the contestants have to gauge their time by is the approximate speed in miles per hour which they are told to make.

Students of Ohio State University Hold Successful Electrical Show.

Students of the electrical engineering department of the Ohio State University, Columbus, held their third electrical show April 27-29. The exhibits and the number of visitors were such as to make the affair a complete success.

Among the distinctive attractions were two of Columbus origin, one an exhibition by the Automatic Reclosing Circuit Breaker Company, which makes an appliance invented by a former student. It is said to be the only circuit-breaker that will close automatically after any abnormal cause. The other exhibit was that of the Electro-Pasteurized Milk Products Company, which takes credit of having the only process of the kind in existence.

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BOOK REVIEWS

"Theoretical Elements of Electrical Engineering." Fourth edition, revised. By Charles Proteus Steinmetz. New York: McGraw-Hill Book Company, Incorporated. Cloth, 368 pages (5¾x9¼ inches), 194 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $3.00.

This is the fourth revised edition of the well known book on electrical engineering by Dr. Steinmetz. Although the book when first published in 1898 immediately took a high rank, it has been improved and has increased in favor with each revision. In the present edition everything beyond the most fundamental principles of general theory and special apparatus has been withdrawn, and the theoretical elements of present-day engineering have been included. This process has prevented the increase in the size of the book and yet permitted the incorporation of much new material.

The subject matter of the book has been divided into two parts, General Theory and Special Apparatus. The first part is subdivided into 20 sections, each of which consists of the theoretical discussion of some magnetic or electric principle. To represent graphically some of the electrical quantities the author has adopted the crank diagram in conformity with the decision of the International Electrical Congress of Turin. This Dr. Steinmetz evidently does with reluctance for he still believes it is inferior to the polar diagram which he formerly used. The second part, which comprises about two-thirds of the book, is devoted to the discussion of electrical machinery under the heading "Special Apparatus."

The reviewer has always been a great admirer of Dr. Steinmetz's writings, but his admiration has always been tinged with disappointment because his textbooks were not used as widely as their merit warranted, and as the pre-eminence and scholarship of their author justified. It is a regrettable fact that instructors and students shun the use of these books. The inherent difficulty of the subject is not always the sole reason for this avoidance, for very few persons can make a difficult electrical problem or phenomenon more clear to the understanding than Dr. Steinmetz, but many feel that the method of attack employed by the author is usually from the most difficult angle; or to put it in another way, that the more difficult and unfamiliar aspect of the subject is first presented.

This difficulty is illustrated in the present text in the discussion of inductance on page 21. The student learns in his study of elementary principles that self-induction and mutual induction are co-ordinate terms and that each expresses one aspect of the general phenomenon of electromagnetic induction. When, however, he takes up the present text he finds that the author uses these terms in a slightly different sense. In fact the unusual use of the term self-inductance has lead the author himself into an inconsistency, for on pages 24 and 133 he uses self-inductance and inductance synonymously.

Some of the other definitions of fundamental electrical quantities, if not misleading, are at least difficult of apprehension. Thus on page 54, "a condenser is said to have unit capacity if unit current existing for one second produces unit difference of potential at its terminals." It is also regrettable that the author still defines a magnetic field as a field of force. The fact that magnetic intensity is measured in terms of the force exerted on a magnet pole does not make field intensity and force physically identical. It seems to the reviewer that the use of the term force in this connection leads to confusion instead of clarity.

One more example must suffice to illustrate the difficulty a student has in comprehending the author's definitions. On page 122, electrical apparatus is classified in accordance to the classification of the Standardization Rules of the American Institute of Electrical Engineers, but the definitions differ considerably. Thus synchronous machines are defined as follows: "*Synchronous Machines,* consisting of a unidirectional magnetic field and an armature revolving relatively to the magnetic field at a velocity synchronous with the frequency of the alternating-current circuit connected thereto." If the reader will compare this definition with that in the Standardization Rules he will at once appreciate the point raised.

It must not be understood that the reviewer considers these defects to be serious. The book is so excellent that one feels a little disappointed to find minor defects. One particularly valuable feature is the addition of many illustrative problems.

The treatment, in the main, is of course scholarly and thorough. Dr. Steinmetz's ability to use mathematics to elucidate difficult electrical phenomena is too well known to need mention. The book should find a more extended use in the class room than its predecessors, and no teacher can afford to be without it.

C. M. JANSKY.

"Test Methods for Steam Power Plants." By Edward H. Tenney. New York: D. Van Nostrand Company. Flexible imitation leather, 224 pages (5x7¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

This book was written "to bring into one volume those methods of analysis which can be used to good advantage in the power plant and which will aid the power-station engineer in keeping costs of generation at the lowest figure." There are six chapters dealing with test methods for fuels, combustion, waters, boilers, prime movers and lubricants, followed by a form for reporting boiler tests and a set of values of properties of substances and constants.

The scope of the book is good and there are many good sections but it is regretted that in a number of places the author has forgotten that the man who will use the book does not have as much knowledge as the author and consequently the discussions are not complete enough. At other places the author has failed to state various precautions necessary in making tests or using apparatus.

The book has a good table of contents, list of illustrations, list of tables and an index. It is well printed and bound.

"Overhead Transmission Lines and Distributing Circuits: Their Design and Construction." By F. Kapper. Translated by P. R. Freidländer. New York: D. Van Nostrand Company. Cloth, 300 pages (7¼x9¾ inches), 297 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $4.00.

There is a demand, in the transmission and distribution field, for a book containing the derivation and application of formulas necessary in designing and erecting a transmission line. Heretofore it has been necessary to go through a number of engineering books and juggle the various formulas into one applicable to the particular problem in question. Mr. Kapper's book seems to have satisfied this long felt want in that it puts a library of information on transmission and distribution engineering in one volume. He has very carefully collected data pertaining to transmission and also adjusted the various formulas so as to make them apply to the design of transmission lines. He has done this in such a clear and simple way, that only a knowledge of simple arithmetic is necessary in order to use the formula. Each problem is very carefully solved by means of the numerous practical examples.

The following subjects are treated very fully and comprehensively: Conductor Materials; Sags; Structures (Designed of Wood and Steel); Wood Preservatives (Copper Sulphate, Kyanizing and Creosoting); Insulator Hardware; Tower Foundations (Concrete and Back Fill); Conductor Arrangement; Ties and Splices; Erection (Procedure and Method); Overhead Distribution (House-top); Right of Way and Tools. All of the above subjects are so well indexed as to put them before one with the least possible effort.

M. H. WAGNER.

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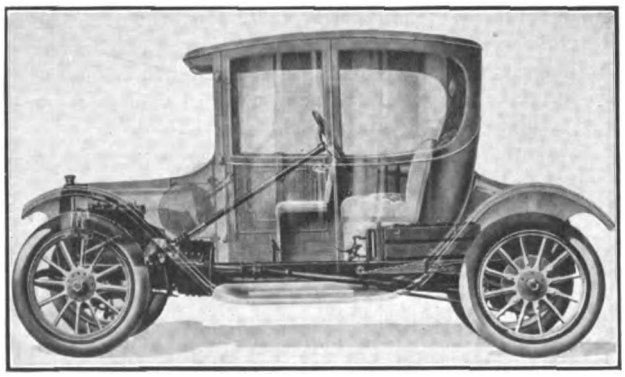
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Gasoline and Electricity Harnessed Together in Woods Dual-Power Car.

Some months ago the rumor of a self-charging electric startled the automobile industry. When this rumor was confirmed by the announcement of the Woods dual-power, or combination gasoline and electric car, great interest was aroused. While descriptions of this motor novelty have appeared, it is only recently that pictures have been obtainable.

The phantom view of the new car, shown herewith, has been supplied by the Woods Motor Vehicle Company, Chicago, Ill., to give a clear presentation of the construction,



Phantom View Showing Arrangement of Woods Dual-Power Car.

which is said to have developed unheard of and heretofore unbelievable efficiency and economy.

The power plant consists of a small gasoline engine and an electric motor-generator combined into one unit and mounted on a three-point suspension. The movement of a finger lever on the steering wheel connects the gasoline engine to the electric motor-generator, which cranks the engine and develops power that is transmitted through the armature shaft of the motor and propellor shaft direct to the rear axle.

The car starts as an electric by a simple movement of a finger-controlled lever on the steering wheel which operates the means for connecting the battery to the motor and increasing the speed as the lever is advanced.

At any advanced position of the electric lever the first movement of the finger-controlled gasoline lever instantly starts the gasoline motor. As this lever is moved forward, it causes the car to be operated more on the gas, and at a certain point it will run as a straight gasoline car, neither charging nor discharging the battery. With a slight variation of the relative position of the two levers on the steering wheel the battery may be either charged or discharged at will on any speed from ten miles an hour to 28 or 30 miles an hour. Electricity is generated and stored in the battery while the car is running.

At any speed above six miles per hour dynamic braking may be effected by retarding the electric lever. This causes the electric motor to run as an electric generator driven by the gasoline engine or by the momentum of the car. The power thus generated is used for charging the battery. The same effect may be obtained by a simple movement of the foot brake pedal, which also acts as a mechanical brake below six miles per hour.

Wonderful gasoline cars have been made and wonderful electrics have been made, but the credit of combining the two into one combination car must be awarded to the Woods engineers. This ingenious combination is said to create the most astonishing results. It is more than a gas car, more than an electric. It has the advantages of each and none of their disadvantages. It can be run as a gas car or as an electric. But when the combination of these two powers is used, then comes all that can ever be hoped for in an automobile—a self-charging, non-stalling, two-power car with unlimited mileage, adequate speed, and greatest economy.

The logical evolution of motor development embodied in this epoch-making two-power car is believed to mark a revolution in the automobile industry.

This dual-power car is described by its producers as having all the luxuriousness of the electrics that the Woods company has produced for nearly twenty years, plus unlimited mileage, 40 per cent greater speed, instantaneous acceleration, finger control of starting and stopping, maintenance lessened, efficiency and utility increased, outside charging plants eliminated, an enormous time saver—in other words, a two-power car with speed, power, simplicity, economy and efficiency, each in a degree never before possible in any type of automobile.

Improved Bell-Ringing Transformer.

The field of the bell-ringing transformer is constantly increasing. Formerly confined to stores, offices and large institutions, such as hotels and hospitals, it is now becoming a necessary equipment in all private homes. There is an increasing demand for a transformer perfectly

New Thordarson Bell-Ringing Transformer.

adapted for this purpose—high in output but low in price. This is the more difficult to satisfy, as the size of circuit varies with almost every installation.

To meet these varying conditions a new transformer has recently been devised by the Thordarson Electric

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Manufacturing Company, Chicago, Ill. It overcomes the difficulty of varied current by substituting for a single secondary voltage three separate voltages, of 6, 8 and 14 volts. The installer can thus connect the bell circuit to whatever voltage it requires, without the repeated expense of buying larger transformers as the circuit enlarges. Because of its triple secondary, this outfit has been named the "3-Way."

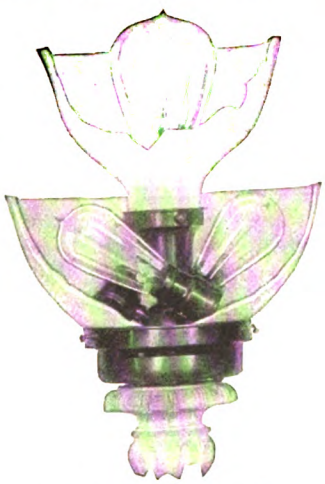
This transformer has been designed to give the maximum capacity allowed and approved by the underwriters. Therefore, though low in price, it is said to supplant transformers selling for double its cost.

Difusolite Portable and Floor Lamps Embody New and Distinctive Features.

A serious difficulty encountered with practically all table, piano and floor lamps is that the lamp bulbs themselves are exposed to any one looking under the shade and at the light source. This makes the use of such lamps detrimental to the eyes, particularly of children whose stature is not sufficient to make the shade screen the light from their eyes. Another objection is that the undiffused light from the lamps is reflected from highly glazed papers or other surfaces to the eyes of readers who are not particularly careful about the position in which books or magazines are held while reading. The development of means to overcome these difficulties has been given much thought, and in a new type of lamp now being placed on the market the problem seems to be completely solved in a very ingenious manner.

In this type of lamp, known as Difusolite, the lamp bulb is inclosed by an upturned bowl made of good diffusing glass. This diffuses any direct light coming from the lamp in a downward direction and at the same time reflects a considerable percentage of the light upward to the ceiling which serves to make the unit resemble a semi-indirect fixture. Three forms of the Difusolite lamp are made, of which the first corresponds to the description just given. In this case a pull-chain socket is used, surrounded by a combination socket-cover and shade-holder. This equipment can be attached to almost any table or floor lamp. It is known as the Single Difusolite.

Single Difusolite Lamp.



Double Difusolite Rheo.

A modified form of this, known as the Double Difusolite, includes the equipment just described, and also has below it another bowl of larger diameter in which two or three lamps are placed. This double arrangement provides for separate control of the lamps in the two bowls. If it is desired to secure a soft semi-indirect light upward, the upper lamp is used. If a well diffused downward light for reading, sewing, etc., is desired, the lamps in the lower bowl are used. By turning on both sets of lamps a combination effect giving maximum illumination throughout the room is obtained. This lamp is operated by means of a switch in the base of the pedestal.

A modified form of the outfit just described, which is known as the Double Difusolite Rheo, is made so as to correspond with the description just given, but also including a dimming device, by means of which the light can be dimmed to almost any desired extent.

In none of these three types of lamps are the bulbs or sockets exposed. The basic features of these lamps are covered by patents. These lamps are adaptable to both simple as well as ornamental table and floor lamps, and in all cases are arranged so that the shade is supported on the rim of the upper diffusing bowl, which does away with the more or less unsightly supporting arms commonly used. These lamps are manufactured by the George C. Lynch Company, 236 Fifth Avenue, New York City.

Motor-Driven Revolving Floor in Restaurant.

Each year the leading cafes in New York City strive for something new and novel with which to attract their patrons. This year was no exception, and one of the more enterprising, Murray's, at Forty-second and Broadway, sprung a surprise on its neighbors and patrons by the introduction of a "revolving dance floor," which is advertised quite extensively. The object of this floor was to add exhilaration and excitement to the disciples of Terpsichore who pursued the intricacies of tango, etc.

Difusolite Lamp, Showing Applicability of Principle to Artistic Lamps.

In order to provide the motive power for the floor, a Westinghouse type CD 0.5-horsepower motor that operates at 1,165 revolutions per minute was secured. When the installation was started, however, it was found that the speed was excessive, even for the patrons of the Great White Way, and a Westinghouse type DA regulator was added to the equipment, which reduced the speed to such an extent that dancing could be indulged in by anyone so desiring with comfort and pleasure.

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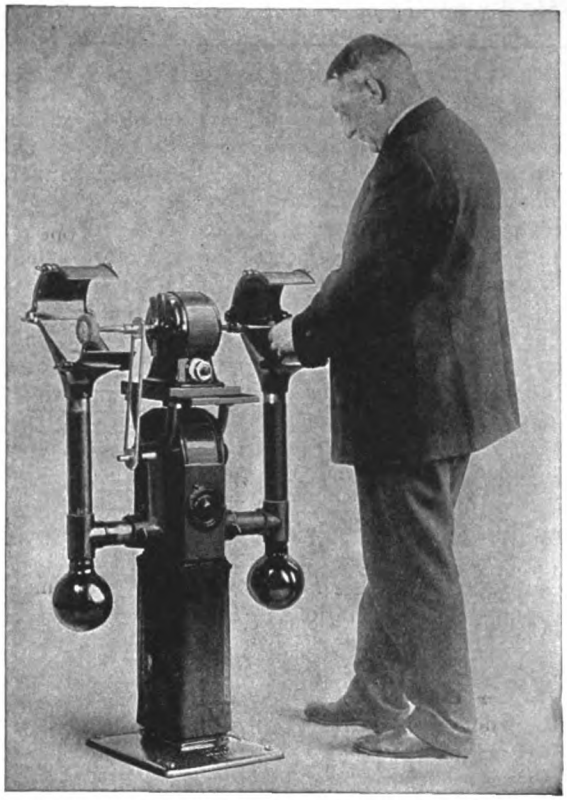


Fig. 1.—Luden's Polishing Lathe with Dust Catcher.

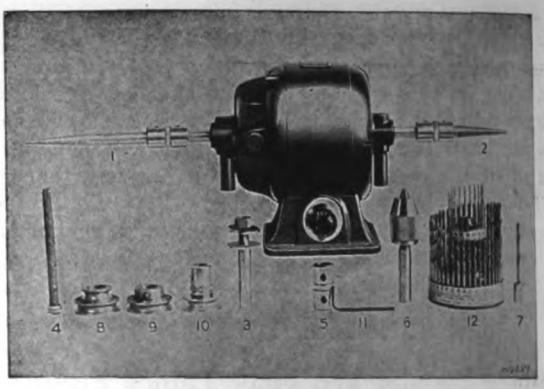


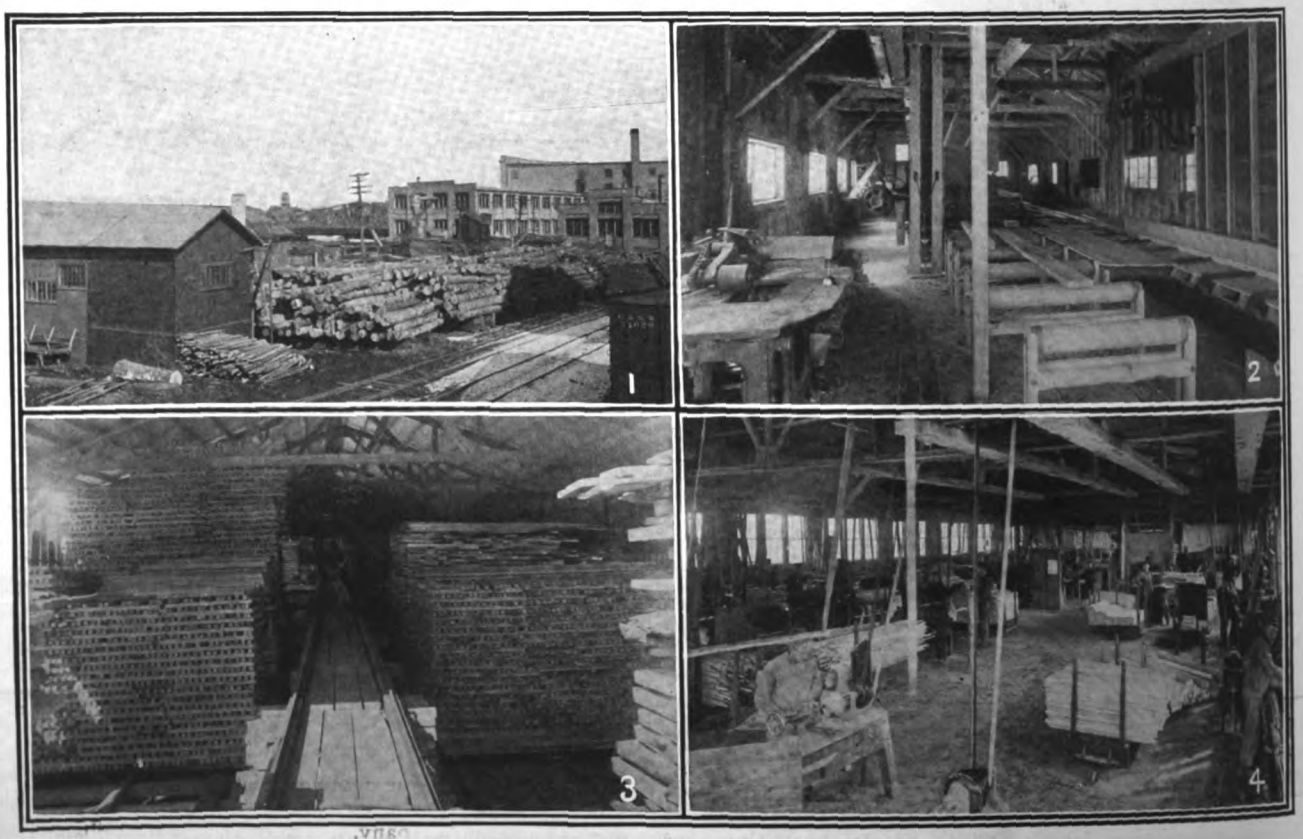
Fig. 2.—Jeweler's Lathe Without Dust Catcher.

Jeweler's Electric Polishing Lathe.

An electric polishing lathe, that "saves the gold and bags the dust," is shown in the accompanying illustration. The complete outfit consists of a Westinghouse motor mounted on a pedestal equipped with fan, dust traps, and universal hoods. The motor is manufactured especially for J. C. Luden, of Reading, Pa., who mounts it on the pedestal and markets the complete outfit.

When polishing and grinding is being done, the particles of dust flying from the wheels are thrown against the universal hoods and adjustable shields, and drawn down the vertical suction pipes. This dust is then separated from the air during the passage of the air through four traps which dispose of it without clogging the apparatus. Thus all the valuable dust is collected and saved.

In case only the lathe is desired, an outfit such as is shown in Fig. 2 is furnished. The motor is mounted on a low base and furnished with the various attachments for buffing, grinding, drilling, etc.



Views in the Plant of the Oshkosh Manufacturing Company, Oshkosh, Wis.

An important element in the expediting and cheapening of construction of railroads, electric power, light, telephone and telegrah lines, etc., is the use of dependable time and labor-saving tools. Prominent in the production of such tools is the Oshkosh Manufacturing Company, several views of whose factory are shown above. Fig. 1 gives an idea of the lumber yard where logs of rock maple and fir are received and stored until ready for cutting in the sawmill. The rear of the factory buildings is also shown. Fig. 2 shows part of the sawmill where the logs are cut into sections for seasoning. Fig. 3 is a view of the seasoning and storage sheds where the selected squares from which handles are to be made are air seasoned. Fig. 4 shows the turning department of the woodshop; here tool handles, poles, stakes, etc., are turned and finished by special machinery. The company also has two blacksmith shops, a machine shop, assembling and shipping departments. All of the machinery is electrically driven and the most progressive methods are used throughout the shops.

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INDUSTRY ACTIVITIES

American Electrical Works, Phillipsdale, R. I., has issued under date of May 2 its price lists on wire and cable and Enduro spark coils.

The Cutter Company, Philadelphia, Pa., has issued an illustrated booklet showing a number of installations of its I-T-E circuit-breakers.

Stentor Electric Manufacturing Company, New York City, has prepared a booklet on auto telephones, which are a part of its loud-speaking telephone equipment.

King Foundry Company, St. Joseph, Mo., maker of the well known King whiteway standards, announces that its Chicago office recently has been moved to new quarters at 927 Monadnock Building. This office is now in charge of E. M. Hervey.

American Engineering Company, Philadelphia, Pa., has issued a 62-page pamphlet on fuel-burning reports, which is the first of a series compiling the results of various tests on the Taylor stoker. Test-record sheets from a large number of different plants are given.

Underwriters' Laboratories has issued a 38-page booklet which gives an outline of the organization, purpose and methods of the institution. The booklet includes illustrations and a description of the principal offices in Chicago, Ill.; organization chart, explanations of the different classes of service and charges therefor, illustrations of labels and a list of label costs.

Hughes Electric Heating Company, Chicago, Ill., has ready for distribution a new 84-page catalog containing much comprehensive data on electric cooking, results that may be expected, approximate cost, etc. The company also has ready a window display outfit for use by central stations and dealers, comprising posters, cards, ribbons, etc., and complete information and equipment for making an attractive display.

Fan-Motor Manufacturers to Form Association Section.—There will be a meeting of manufacturers of fan motors to consider the formation of a Section in the Associated Manufacturers of Electrical Supplies on May 17, at the Hotel Biltmore, New York City, at 10 a. m. This meeting has been called by Charles E. Dustin, the general secretary of the Association, on the request of a number of manufacturers, and it is believed that the Section will be one of considerable importance and prove of advantage to the members. All manufacturers of fan motors will be welcome at this preliminary meeting. The board of governors of the Associated Manufacturers of Electrical Supplies will hold a meeting at the Hotel Biltmore the same day.

The Electric Storage Battery Company, Philadelphia, Pa., has plans prepared for a new "Exide" Battery Depot, which will be built at Seventeenth and Walnut streets, Kansas City, Mo. This building will be two stories, of concrete and brick construction with stone trimmings, and with large windows to provide a maximum of natural light. The building will be about 70 by 100 feet. The first floor will contain a sales office and battery depot, with provisions for the prompt replacement or repairs of storage batteries for gas-car starting, lighting and ignition and for electric-vehicle propulsion. The second floor will be used for storage and manufacturing purposes. In this depot will be constantly carried in stock a full line of "Exide" starting batteries and parts for nearly every make of car, also "Exide," "Ironclad-exide," "Hycap-Exide" and "Thin-Exide" batteries and parts for pleasure and commercial electric vehicles.

The Louisville Storage Battery Company has opened a new storage battery service station at 726 South Fourth Street, Louisville, Ky., where the company will handle U. S. L. and other batteries. Automobile owners who were solicited were provided with cards which entitled them to free inspection of their storage batteries and to free loan battery service while their own storage batteries are being recharged or repaired.

Mohawk Electrical Supply Company, Syracuse, N. Y., has leased a six-story and basement building, 112 by 21 feet, at 325 South Warren Street, that city, and after extensive alterations and improvements expect to take possession June 1. Heretofore the company has occupied a warehouse separate from their retail department and offices, and the new move will enable it to have the entire business under one roof. The alterations and improvements to be made will be along the lines of placing the company in a position to give its trade the best of service.

Snyder Electric Furnace Company.—A recent article in the trade press called attention to the fact that all the elecric furnaces in Germany, operating under war conditions, were turning out 129,646 metric tons of steel every 12 months. If the Snyder electric steel furnaces recently sold and those now in operation, were mobilized for war service, on 24-hour basis, they would turn out 77,975 tons of steel every 12 months, or within 40 per cent as much steel as all the electric furnaces operating in Germany. Europe is the mother of the electric furnace, and the steel foundrymen in Europe are considered very progressive. Judging, however, from the above facts manufacturers in this country are keenly alive to the value of the electric furnace.

Marconi Company Insures Operators—About 500 wireless telegraphers aboard ships on the high seas, and a few in the war zones, have had their lives insured under a group insurance policy, as employes of the Marconi Wireless Telegraph Company, the contract having been closed recently with the Travelers Insurance Company. The contract also provides for about 500 other employes who are distributed over the American continent. These employes have all been in the company's service a year or more. There are about 900 other employes who will likewise be included when they have completed a year of service for the telegraph company. The insurance amounts to $500 for each of those who have been in its service more than a year, and $1,000 for those who have been in the employ of the company five or more years. The insurance is granted to all without medical examination.

Westinghouse Electric & Manufacturing Company.—A contract was recently signed by the Murray Motor Car Company, Pittsburgh, Pa., for Westinghouse starting and lighting equipment for the new Murray car. The equipment used will be a frame, 750 round-type starting motor operated by screw pinion shift, and a frame, 400 round-type lighting generator, and will be used in connection with the Hirschell-Spillman eight-cylinder engine. The Westinghouse company has recently arranged with the following companies to act as additional service stations: Arthur Jones Electric Company, Chicago, Ill.; East William Street Garage, Decatur, Ill.; Fitch Auto Supply Company, Peoria, Ill.; Central Electric Garage, Springfield, Ill., and W. H. Hamilton, Jefferson, Ill. The company has recently announced an increase in the retail price of its starting and lighting equipment for Ford cars to $85. This increase is due to the marked rise in the cost of raw materials.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

INSULATING SUPPORTS.—General Devices & Fittings Company, 817 West Washington Boulevard, Chicago, Ill.

Insulating supports for busbars and for contact-rails of electrically operated traveling cranes, 600 volts, or less, catalog Nos. L-291A, L-586, L-876.

Listed March 31, 1916.

OUTLET BUSHINGS.—Charles G. Robin, 48 Warren Street, New York, N. Y.

A galvanized iron plate threads on end of rigid conduit and supports a porcelain cap with two or three outlets for conductors. ½-inch to 1-inch sizes.

Listed March 31, 1916.

PLUG-FUSE CUTOUT BASES.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins, 31-60 amperes, 250 volts, catalog Nos. 1119-22.

Listed March 31, 1916.

RECEPTACLES, Standard.—General Electric Company, Schenectady, N. Y.

Porcelain base, double-ended receptacles, "G. E." 660 watts, 250 volts, catalog Nos. 42454, GE715.

Standard for use with metal reflectors when wiring is either concealed or carried in a closed metal trough at back of reflector.

Listed March 31, 1916.

REGULATOR FOR HEATING SYSTEMS, Thermostatically Controlled.—Minneapolis Heat Regulator Company, 2747 Fourth Avenue South, Minneapolis, Minn.

A motor thermostatically controlled, and designed, through a gear-train and crankshaft, to regulate dampers of furnaces on air, steam and hot-water and natural-gas systems so as to maintain a predetermined temperature at thermostat. 50 watts, 110-125 volts.

Listed March 31, 1916.

SIGNAL APPLIANCES.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins.

A special flush switch controls a 125-volt, signal-lamp circuit which can be opened by a button and closed by solenoid, these forming parts of switch. The circuit of solenoid can be closed by a special pendent bush-button flush switch, catalog No. 487, and includes a small single-pole glass-tube fuse in a special casing. The closing of circuit by flush switch is designed to open circuit of solenoid and pendent switch.

An auxiliary audible signal device consisting of a 3-inch single-stroke bell designed for connection in series with coil of solenoid switch and including a push-button switch whereby bell may be shunted if desired.

An auxiliary silent signal device consisting of a number of miniature lamps which light separate bull's-eyes when individual circuits are closed.

Listed March 28, 1916.

SWITCH BOXES.—Steel City Electric Company, 1207 Columbus Avenue, N. S., Pittsburgh, Pa.

Pressed-steel sectional switch box for flexible tubing, catalog No. 750. This box has removable sides and suitable fastenings whereby a gang box of any desired number of units can be obtained.

Listed March 31, 1916.

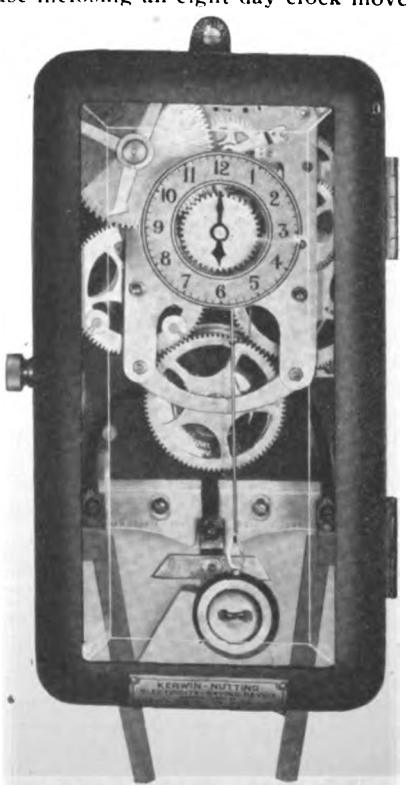
SWITCHES, Automatic.—Berry-McKnight Auto-Electric Time-Control Clock Company, Marine City, Mich.

Time switch, one and two-pole types. A cast-aluminum casing inclosing a clock mechanism with levers operating a mercury-contact knife switch. 30 amperes, 125 volts.

Listed March 27, 1916.

SWITCHES, Automatic.—Kerwin Brothers, Oelwein, Iowa.

This device consists of a cast-iron case inclosing an eight-day clock movement, arranged to operate a standard snap switch in combination with two single-throw, single-pole knife switches in series for manual control. "Kerwin-Nutting," 20 amperes, 125 volts.



Automatic Switch.—Kerwin Brothers.

Listed March 27, 1916.

SWITCHES, Automatic. — United States Air Compressor Company, 6526 Carnegie Avenue, Cleveland, O.

Double-pole, single-break, spring-controlled, diaphragm-operated switch for use with motor-driven air-compressors up to 1 horsepower, 250 volts.

These devices are rated standard as being in compliance with requirement of the National Electrical Code. This rating is to be understood as indicating that in their construction the electrical fire hazard has been reduced to an acceptable degree. It is not to be construed as a recognition of the device for use in connection with automatic sprinklers or similar fire protective equipments for which service their merits have not been investigated.

Listed March 27, 1916.

SWITCHES, Fixture.—Harvey Hubbell, Incorporated, Bridgeport, Conn.

Hubbell switches with pull-socket mechanisms; 3 amperes, 125 volts; 1 ampere, 250 volts; catalog No. 6102.

Listed April 4, 1916.

SWITCHES, Surface Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. With metal covers.

Single-pole; 3 amperes, 250 volts; 5 amperes, 125 volts; catalog Nos. 2690-91.

Listed March 29, 1916.

SWITCHES, Surface Snap.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins. With metal covers.

Two-circuit, 5 amperes, 250 volts; 10 amperes, 125 volts; catalog Nos. 2649-63.

Listed March 30, 1916.

WIRE, Rubber-Covered.—Bourn Rubber Company, Providence, R. I.

Marker: One green and one soft uncolored cotton thread, parallel with wire between insulation and braid.

Listed March 28, 1916.

WIRE CONNECTORS.—Frankel Display Fixture Company, 177-179 Hudson Street, New York, N. Y.

Frankel solderless splicing devices for connecting wires. Various styles for No. 0000 B. & S. gage stranded wire.

While these connectors are not considered satisfactory substitutes for soldered joints in general wiring, they are deemed suitable for use in connecting terminal wires of motors, starting compensators and other electrical apparatus to supply mains where it is desirable to frequently disconnect such supply mains from the apparatus and where such connections are open to view. When so used the joints must be well taped.

Listed March 31, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. RALPH W. DONGES has been re-elected president of the Board of Public Utility Commissioners of New Jersey.

MR. L. R. FRANCISCO, of Jersey City, N. J., formerly chief engineer for the American Tobacco Company, has been appointed by Mayor Thompson, of Chicago, as the city's representative on the Board of Supervising Engineers, Chicago Traction. He succeeds MR. E. W. BEMIS.

MR. JAMES E. COLE, Wire Commissioner of Boston for the past eight years, has been reappointed by Mayor Curley for a four-year term. During the last year the income of the department has been about $37,000, a large increase over previous years, due to a new fee system put into effect by Commissioner Cole.

DR. W. F. M. GOSS, dean of the college of engineering of the University of Illinois, has, upon the nomination of the American Society of Mechanical Engineers, been appointed by the Secretary of the Navy, as a member of the board of directors of the organization for industrial preparedness for the state of Illinois, and as associate member of the Naval Consulting Board.

MR. R. C. RITCHIE, formerly in charge of the office of the automobile-equipment sales-service station of the Westinghouse Electric & Manufacturing Company, in Chicago, Ill., has been transferred to the main office at Pittsburgh, Pa. He is succeeded in the Chicago office by MR. M. W. HANKS, who was formerly in the sales-service station at Indianapolis, Ind.

MR. WILLIAM F. SIMS, who recently accepted a position in the engineering department of the Commonwealth Edison Company, Chicago, Ill., was born in Green Bay, Wis., in 1875. He was graduated from Armour Institute of Technology in 1897 and entered the engineering department of the Chicago Telephone Company, and was assistant engineer when he left that company in 1901 to take up work in the engineering department of the Chicago Edison Company. In 1907 he became field engineer in the division of electrical distribution, Board of Supervising Engineers, Chicago Traction, having general supervision of outside work during the rehabilitation of the surface lines. In 1911 Mr. Sims entered the employ of the Stone & Webster Engineering Corporation, of Boston, Mass., and had charge of the design and construction of the underground transmission system and also of the substation construction for the Boston Elevated Railway Company. He also had charge of the electrical installation in the Keokuk (Iowa) plant of the Mississippi River Power Company, and was superintendent of construction of the Pensacola (Fla.) power plant and other work of like nature. Mr. Sims was a lieutenant in the Second United States Volunteer Engineers during the Spanish-American War and now is acting chief engineer of the Illinois Naval Reserve.

MR. E. B. ELLICOTT, who has resigned as chief electrical engineer of the Sanitary District of Chicago, was born in Lockport, N. Y., in 1866. He began his career in the electrical industry with the Concordia (Kans.) Electric Light Company in 1885. During 1887 he was engineer and electrician for the Salina (Kans.) Gas & Electric Company and in 1888 he returned to Concordia as superintendent of the plant there. In 1890 Mr. Ellicott entered the employ of the Western Electric Company, Chicago, Ill., and installed steam and electric plants until 1891 when he was placed in charge of the Urbana (O.) Electric Light Company, owned by the Western Electric Company. In 1892 he was made assistant superintendent of construction for the latter company and held this position until 1897 when he was appointed city electrician for the city of Chicago. In 1903 he was given leave of absence to

E. B. Ellicott.

accept the appointment of chief mechanical and electrical engineer of the Louisiana Purchase Exposition at St. Louis, and designed and superintended the installation of a large part of the steam and electrical equipment there. In 1905, Mr. Ellicott resigned as city electrician after his appointment as electrical engineer for the Sanitary District of Chicago. During the 11 years he has held this position, he has superintended the construction of the 32,000-kilowatt hydroelectric plant, transmission system, substations and distribution system. Mr. Ellicott has been a member of the American Institute of Electrical Engineers for many years and was recently made a fellow. He will devote much of his time to his ranch in Central Idaho, and probably will engage in some engineering activity in Salt Lake City, Utah.

MR. J. R. WILSON, formerly sales manager and vice-president of the Crocker-Wheeler Company, of Ampere, N. J., has become associated with the Davison Chemical Corporation, of Baltimore, Md., as manager of its office at 120 Broadway, New York City.

MR. W. C. DAVIET, district superintendent of the Postal Telegraph & Cable Company, was elected president, and MR. JAMES CLARK, JR., of the James Clark, Jr., Electric Company, vice-president of the Louisville (Ky.) Rotary Club, at a meeting held May 4.

MR. HAROLD K. WELD has been placed in charge of the Minneapolis office of the Standard Underground Cable Company, with headquarters at 717 Plymouth Building. The territory covered will include Minnesota, North Dakota and portions of South Dakota, Wisconsin and Michigan. Mr. Weld has previously been working out of the Chicago office, and prior to his connection with the Standard Underground Cable Company was connected with the McRoy Clay Works, Chicago.

OBITUARY.

MR. H. N. FOSTER, traffic superintendent of the Chicago (Ill.) Telephone Company, dropped dead in Winnetka, May 4. He was graduated from Yale in 1896 after which he entered the employ of the Chicago Telephone Company. Mr. Foster was 42 years old.

MR. WILLIAM H. CAPEL, secretary of the New England Westinghouse Company and the J. Stevens Arms & Tool Company, of Springfield, Mass., died April 23. Mr. Capel was born in New York City, March 8, 1867. In April, 1899, he entered the employ of the Westinghouse Electric & Manufacturing Company, holding several positions in the executive offices of this company in New York City, having been for several years past closely associated with Vice-President L. A. Osborne.

MR. HENRY FLOY, who installed the first 25,000-volt underground transmission system, died in New York City, May 5, aged 49 years. He was born in Elizabeth, N. J., and after being graduated from Wesleyan University attended Cornell University, where he received his degree in 1891. During 1892-1898 Mr. Floy was associated with the Westinghouse Electric & Manufacturing Company. In 1898 he was associated with Prof. R. C. Carpenter, of Cornell, as consulting engineer. Three years later he severed his connection with Professor Carpenter and since that time has been in business for himself.

MR. LUCIEN IRA BLAKE, well known electrical engineer, died May 4, in Boston, Mass., aged 62 years. He was the inventor of the telegraph used in submarines and of other electrical devices. Mr. Blake was born in Mansfield, Mass., and after being graduated from Amherst College in 1877 attended the University of Berlin. Following this he was professor of physics and electrical engineering at the Rose Polytechnic Institute in Terre Haute, Ind., and during 1897-1906 occupied the same chair at the University of Kansas. In 1893 he was appointed constructing electrical engineer to the United States Light House Board, and during 1906-1907 was chief engineer of the Submarine Signal Company, of Boston.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

GRAY, ME.—Plans are being made for the establishment of electric-lighting and water-works systems here.

SKOWHEGAN, ME.—The Central Maine Power Company, of Augusta, has purchased land and a water-power site here.

CONWAY, MASS.—Negotiations are being made by the Deerfield River Electric Light Company, of this city, and the Greenfield (Mass.) Electric Light & Power Company for the purchase by the latter company of the local electric-lighting plant. If the sale is made the Greenfield company expects to rebuild the lines and make a number of improvements in the power plants at a reported cost of $20,000, and give 24-hour service.

MARLBORO, MASS.—The Marlboro Electric Company is planning to make extensions to its distribution lines.

NEW BEDFORD, MASS.—The New Bedford Gas & Edison Light Company is soon to have a new power station constructed by the Stone & Webster Engineering Corporation, Boston. It will be located at Cannon Street, east of Water Street, and will be of brick pier and curtain wall construction, with metal window frames and wire glass. The main building will be 90 by 144 feet and 65 feet high, and the boiler house 54 by 166 feet and 65 feet high. A coal bunker 25 by 64 feet and 24 feet in height will be constructed.

NORTHFIELD, MASS.—The Athol (Mass.) Gas & Electric Company is planning to furnish energy for street lighting here.

SHIRLEY, MASS.—The Shirley Electric Company has applied to the Massachusetts Gas and Electric Light Commission for authority to issue 275 shares of preferred and 275 shares of common stock, each at $50 par value, to pay for extensions to plant, consisting chiefly of a transmission lines.

TURNERS FALLS, MASS.—The Turners Falls Power & Electric Company has asked permission from the Gas and Electric Light Commission to increase its capital stock by an issue of $1,280,000 in order to pay off indebtedness and to make plant extensions.

WORCESTER, MASS.—The Worcester Consolidated Street Railway Company is planning to place its feeders in Portland Street underground.

CHATEAUGAY, N. Y.—The Chasm Power Company has been granted permission by the Public Service Commission to issue $47,000 in bonds, $5,000 of which will be used for new construction.

BUFFALO, N. Y.—The Public Service Commission has approved the franchise of the Buffalo General Electric Company for the erection of its steam and electric power plant on the river road opposite Grand Island. The plant will cost nearly $5,000,000. The Commission likewise granted the franchise of the company to build transmission lines from the plant to the Buffalo city line and also approved a third franchise of the company for the sale and distribution of power in the city of Tonawanda. The company to date has expended $250,000 in the construction of the plant.

LOWVILLE, N. Y.—The Wetmore Electric Company, which supplies Lowville, Croghan, New Bremen, Beaver Falls and Castorland with energy, will expend $20,000 this season in the building of a transmission line from Lowville to the power plant in Belfort.

PLATTSBURGH, N. Y.—A franchise of the Plattsburgh Gas & Electric Company for electric power lines in this city has been approved by the Public Service Commission.

ROCHESTER, N. Y.—Improved lighting on Main Street is being planned by the Main Street East Improvement Association.

WILLSBORO, N. Y.—The Bouquet Electric Power Company has been granted permission by the Public Service Commission to issue $10,000 in preferred stock, the proceeds of which will be used for new equipment.

BUTLER, N. J.—The Borough Council is planning for an extension to the municipal electric-lighting plant and system. A committee has been appointed to obtain estimates of cost.

JERSEY CITY, N. J.—The Grove Street Merchants' Improvement Association will investigate different types of street lights for the proposed new white-way lighting system on Grove Street.

NEWARK, N. J.—John Campbell & Company, manufacturer of chemicals, will build a power plant in connection with its new plant on Plum Point Lane.

NEWTON, N. J.—The Board of Trade is negotiating with the Township Committee for the installation of a new electric street-lighting system, replacing the gasoline system now in use.

TRENTON, N. J.—The City Commission is having preliminary plans prepared by the Public Service Electric Company for the proposed new street-lighting system in the business district. The use of ornamental iron poles, twelve feet high, is being considered.

MEADVILLE, PA.—An issue of $10,000 in bonds for extensions and improvements to the municipal electric-lighting plant will be considered at an election May 16.

MONT ALTO, PA.—The Waynesboro Electric Light Company is planning to extend its transmission lines to this city to furnish energy for street lighting and private consumption.

WASHINGTON, D. C.—The Potomac Electric Power Company is planning to build a power house on Benning Road northeast. The concrete building to be erected is estimated to cost $25,000.

RICHMOND, VA.—A bond issue of $50,000 for a municipal electric-lighting plant is being contemplated.

MOUNT HOPE, W. VA.—The Mount Hope Electric Power & Water Company has applied for a franchise to construct an electric-lighting system.

SALISBURY, N. C.—The city is considering a proposition for the establishment of a municipal electric-lighting plant.

UNIVERSITY, N. C.—The J. B. McCray Company, of Atlanta, Ga., will receive bids in June for the electric-lighting and heating plant to be installed at the University of North Carolina at an estimated cost of $50,000.

NORTH CENTRAL STATES.

ATHENS, O.—Field Scott, Director of Public Service, is advertising bids for labor and materials necessary to install an ornamental lighting system on Court Street.

CINCINNATI, O.—The Peters Cartridge Company, which is making rapid progress in the construction of a large plant at King's Mill, near this city, is preparing to call for estimates on the building of a power plant for use in the operation of the factory.

CINCINNATI, O.—Plans under which it will be possible to require all companies in the city using overhead wires to place them underground within a definite period are being prepared by City Electrician W. O. Kleine. Under this plan the city is to be divided into districts, in each of which the several companies affected will be given not less than a year to make the change from overhead to underground installation of their wires.

FOSTORIA, O.—City officials are making estimates for the installation of a municipal electric-lighting plant, water-works and sewage-disposal plants.

GERMANTOWN, O.—The City Council has employed S. E. Pollard, of Cincinnati, to render a report and estimate covering the reconstruction of the municipal electric-lighting plant in connection with a proposed new waterworks system and other new construction. Mr. Pollard will make a tentative outline of the work to be done and its probable cost.

HILLSBORO, O.—There is every indication that actual work upon the construction of the Hillsboro, Cynthiana and Chillicothe traction line will be commenced soon after the meeting of the directors, which will be held at Chillicothe, May 15.

MASSILLON, O.—The ten-year contract which the city of Massillon has with the Massillon Electric & Gas Company to supply the city with electric lighting expired May 1. The city is planning to build a new lighting system.

MECHANICSBURG, O.—The proposed change from direct to alternating current for the town is awaiting the result of negotiations between the authorities and the Long Mill & Elevator Company, which owns the distributing system and has been furnishing direct-current service, regarding the purchase of the equipment which has been used by consumers. The price offered by the company is considered too low, being one-tenth of the original cost of the motors and other equipment. The company is under contract to furnish current for eight years longer, and proposes to furnish alternating current from the lines of the Urbana (O.) Lighting Company.

WASHINGTON COURTHOUSE, O.—H. A. Baber & Company, of Chicago, Ill., has purchased the holdings of the Washington Gas & Electric Company, which include the plant and the electric and gas-lighting and heating systems of the city.

GOSHEN, IND.—The Hawks Electric Company, of this city, will extend its transmission lines five miles to Wakarusa.

INDIANAPOLIS IND.—At an expense of approximately $200,000, the Indianapolis Light & Heat Company proposes to build a new substation in Illinois Street, to take care of electric service required in the business district in the vicinity of the Union Station. The plant will be equipped with two 1,500-kilowatt generator sets, one 500-kilowatt generator set and a storage battery with a capacity of 20,000 ampere hours.

MICHIGAN CITY, IND.—The Common Council is preparing to replace the present arc lamps in Franklin Street with 400-candlepower gas-filled lamps.

WINCHESTER, IND.—The County Commissioners are considering an appropriation for an ornamental lighting system on the courthouse grounds.

BECKEMEYER, ILL.—Electric service will be secured from the municipal electric-lighting plant at Carlyle. A transmission line will be erected.

CHICAGO, ILL.—It is reported that the Middle West Utilities Company has purchased a number of electric light and power plants in Southern Wisconsin, including those in Delavan, Lake Geneva, Genoa Junction, Walworth, Fontana and Williams Bay. A new holding company, the Southern Wisconsin Utilities Company, will be formed to take over control of the properties. The company will issue $300,000 bonds to cover the purchase of the properties. Improvements and extensions will be provided for by a later bond issue.

WAUKEGAN, ILL.—The sale of the Illinois division of the Chicago & Milwaukee Electric Railroad was completed by court order last week, the purchasers being Frank A. Vath and Charles White, who represented the reorganization committee, and who paid $2,500,000 for the property. They also purchased the Wisconsin division for $2,050,000. The railroad has been in the federal courts since 1908.

BELDING, MICH.—At the next meeting of the Common Council a committee composed of the officers of the Board of Commerce will present the urgent need of installing boulevard lights along 11 blocks in the business district.

GRAND RAPIDS, MICH.—The Division Avenue Center Improvement Association contemplates the installation of a number of single-lamp standards in Division Avenue.

CASCADE, WIS.—The Cascade Electric Service Company has been organized by Otto Schlenter and others with a capital of $20,000. The company proposes to furnish electric service here.

ELKHORN, WIS.—The Elkhorn Light and Water Commission is advertising for

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bids for new machinery and equipment necessary in changing the city's plant to use the service furnished by the Wisconsin Gas & Electric Company. One 40-horsepower motor and one 75-horsepower motor will be purchased first. Bids will be opened and considered this week.

LADYSMITH, WIS.—The City Council is considering plans for a white-way system here.

MILWAUKEE, WIS.—F. G. Simmons, Commissioner of Public Works, has asked for an appropriation of $40,000 of the $750,000 bond issue authorized for street lighting, the money to be used for the erection of emergency lights in some sections of the city pending the installation of the proposed new system.

EYOTA, MINN.—An election will be held May 15 to authorize the sale of the electric lighting equipment a connection with the transmission power line to be built from Winona west.

GLYNDON, MINN.—Business men of this city have requested the Union Light, Heat & Power Company, of Fargo, N. D., to extend its transmission lines to furnish service here.

ISANTI, MINN.—Plans are under consideration for an electric-lighting system, power to be supplied by the Eastern Minnesota Power Company, of Pine City.

LAMBERTON, MINN.—The Electric Light & Power Company at Lamberton has been reorganized and incorporated under the name of the People's Light & Power Company. The incorporators are R. F. Wherland, H. L. Wherland and C. W. Wilkinson, of Minneapolis, and the capitalization is $50,000.

ST. PAUL, MINN.—It is reported that the Northern States Power Company will build a transformer substation in Myrtle Avenue costing about $10,000.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs Water, Gas & Electric Company has filed an application with the Public Service Commission for authority to issue $21,500 in bonds, bearing 6 per cent interest and maturing June 1, 1932. The company proposes to make extensions and improvements costing $36,490.

KANSAS CITY, MO.—An investigation of power plant and substations, cables, and passenger traffic of the Kansas City Railways Company is being made by Edward N. Lee and a company of engineers of the Krehbiel Company, which probably will continue until late in May. The recommendations of the engineers are expected to include new or remodeled power plant, substations and distribution system in view of car distribution and prospective traffic. The Kansas City Railways has now a central power plant at Second Street and Grand Avenue, to which additions have been made from time to time, and from which energy is sold to the Kansas City Light & Power Company.

CONCORDIA, KANS.—It is reported that the A. W. Hughes Company, of Chicago, Ill., has purchased or taken options on the electric-lighting plants at Concordia, Abilene, Junction City, Manhattan and Blue Rapids, and is negotiating for plants in other towns in this section and adjacent to the Blue River. There is considerable undeveloped power at Blue Rapids, and there are other power sites on the river of which the company is seeking control, the purpose, it is said, being to develop them and sell the power in towns of Northern Kansas.

DOWNS, KANS.—The Solomon Valley Light & Power Company is planning to extend its service to Harlan, Kans.

ELKHART, KANS.—An election will soon be held to vote on the question of issuing $8,000 bonds for an electric-lighting plant.

FT. SCOTT, KANS.—The City Council has authorized E. M. Stevens and D. W. Stiles to prepare preliminary surveys and plans for a municipal electric-lighting plant, the construction figures to be available this summer, preparatory to an election in September when a proposal to issue bonds for the building will be submitted. The plant is estimated to cost $200,000.

LYONS, KANS.—The holdings of the Lyons Electric & Manufacturing Company have been purchased by Henry L. Doherty & Company. It is reported that the latter company will make an extension of the transmission line to Nickerson northwest to Sterling and Lyons. It is possible that a transmission line will also be built from Salina to Lyons.

PERRY, KANS.—Fairbanks Morse & Company has completed the installation of power-house equipment for the municipal plant here, a 50-horsepower oil engine and alternator being installed. The company is now placing 50-horsepower engines and alternators in the municipal plants at Sharon Springs and Plains, Kans., and was recently awarded the contract for a 75-horsepower engine and alternator at Wilson, Okla.

SEWARD, NEB.—Application has been made to the State Railway Commission by the Blue River Power Company, of Seward, for permission to construct a 22,000-volt transmission line to Utica, and a 2,200-volt line to Pleasantdale.

DATES AHEAD.

American Institute of Electrical Engineers. Annual meeting, New York City, May 16. Secretary, F. L. Hutchinson, 29 West Thirty-ninth Street, New York City.

National District Heating Association. Annual convention, New York City, May 16-19. Secretary, D. L. Gaskill, Electric Building, Greenville, O.

Southwestern Electric and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Electrical Contractors' Association of Texas. Annual meeting, Galveston, Tex., May 17-18. Secretary, Charles W Graham, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock., Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer Rochester, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—Charles C. Foster, custodian of the county building in Louisville, has applied to the Fiscal Court for the installation of a new power plant to generate electricity for light and power in the courthouse, county jail and armory.

WEST MEMPHIS, TENN.—Plans are being made by W. L. Johnson and others here for an electric-lighting and waterworks system. It is proposed to secure energy from the power plant of the Earle Cooperage Company, of which A. Sweaney is manager.

ARKADELPHIA, ARK.—The Arkansas Light & Power Company, H. C. Couch, president, has recently installed two pressure filters in its waterworks system in this city, one 125-horsepower boiler in its Camden plant, one 125-horsepower boiler in its Magnolia plant, and one mile of distribution-system extensions, together with waterworks-system improvements, at Eldorado. The company is now doing the following construction work, for which contracts for the material have been awarded: New power plant in Marianna, in which will be installed one 300-kilovolt-ampere General Electric generator direct connected to an Allis-Chalmels engine; General Electric feeder and generator panel-boards, and new boiler settings. The distribution system in Marianna is being rebuilt and electrically driven pumps installed at the waterworks plant. At Newport the company is remodeling its power plant, installing one 150-kilowatt General Electric generator direct-connected to a Chuse engine, and rebuilding its distribution system. At Paragould the company is remodeling its boiler room and installing three 200-horsepower Brownell boilers. The company plans to begin work in the near future on rebuilding its distribution systems in Malvern and Morrilton, and installing new pumping equipment in its waterworks plant at the latter place.

ALVA, OKLA.—The Town Council has abandoned the plan of installing a municipal electric-lighting plant and has given a franchise to a private concern, the name of which has not yet been made public.

FORGAN, OKLA.—The city is planning to install a municipal electric-lighting plant.

HYDRO, OKLA.—J. D. Palmer is seeking a franchise to build and operate an electric-lighting plant here.

BARSTOW, TEX.—It is reported that the Barstow Public Service Company is planning to install an electric-lighting plant.

GALVESTON, TEX.—The Brush Electric Company is planning to make plant extensions costing approximately $10,000. Charles M. Rogers, of Meridian, Miss., engineer in the southern district for Henry L. Doherty & Company, operators of the local plant, recently made an inspection of the plant.

JACKSBORO, TEX.—The electric-lighting plant of the Jacksboro Light Company has been sold to the Jacksboro Mill & Elevator Company. Manager J. P. Hackley has announced that new machinery will be installed at an early date, extensions made to the distribution system and 24-hour service given.

KINGSVILLE, TEX.—The Texas Southern Electric Company is planning extensive plant improvements.

LOCKHART, TEX.—The Citizens Light & Water Company, organized here some time ago, has purchased the local electric-lighting and water plant for $75,000. W. B. Swearingen is president of the company and will have general supervision over its management.

WESTERN STATES.

MISSOULA, MONT.—Extensions of the electrification of the Chicago, Milwaukee & St. Paul Railway on the west end of the Missoula division, between St. Regis and Avery, are to be made soon, according to an announcement made by M. E. Buck, of the Montana Power Company, in charge of the electrification work, and Superintendent F. E. Willard, of the Milwaukee road.

PRESCOTT, ARIZ.—The capacity of the Fossil Creek hydroelectric plant of the Arizona Power Company has been raised to 10,000 horsepower by the installation of a second unit, just placed in successful operation. The United Verde Company is using 3,000 horsepower, the Consolidated Arizona Smelting Company 1,000, and the balance is absorbed by the power and domestic uses of the city of Prescott and by a score of mining enterprises.

TEMPE, ARIZ.—The Winslow Gas, Light & Heat Company has been incorporated with a capital stock of $100,000, by I. J. Lipsohn, H. M. Harrison and M. A. Pickett. Phoenix will be the principal place of business. Among other things the company proposes to generate and distribute electrical energy for light and power.

SALT LAKE CITY, UTAH.—Construction will begin at an early date on the electric railroad between Midvale and Bingham Canyon as outlined in the franchise granted Harry S. Joseph.

SALT LAKE CITY, UTAH.—H. A. Strauss, consulting engineer, Harris Trust Building, Chicago, Ill., has been retained by the Salt Lake & Los Angeles Railway Company to undertake the design of the complete electrification and extension of this steam railroad system. The bonds providing for this electrification and extension have been underwritten by C. F. Childs & Company, of Chicago. This is the second steam railroad in Utah to be electrified under the designs of H. A. Strauss, the first having been the Salt Lake & Ogden Railway Company.

COEUR D'ALENE, IDAHO.—Estimates are being prepared as to the expense of installing or purchasing an electric-lighting and water system by the city. The matter of issuing bonds will be submitted to vote.

COTTONWOOD, IDAHO.—The Grangeville Electric Light & Power Company is preparing to construct a large plant on the Clearwater River during the summer to care for the increased demand for electric lights in Central Idaho.

HAILEY, IDAHO.—According to reports, the power plant of the Hailey Electric Company, which has been closed down indefinitely, will be repaired and improved in order to provide an emergency plant in case the Bellevue plant, which is supplying energy for both Bellevue and Hailey, is shut down.

WALLACE, IDAHO.—The Washington Water Power Company, of Spokane, plans equipping properties on Placer Creek, in this vicinity, with apparatus to utilize electrical energy.

BEND, ORE.—In order to meet increasing demand for energy for light and power, the Bend Water, Light & Power Company is installing a new 500-horsepower turbine and plans the installation of a 350-kilowatt generator and ten-panel switchboard.

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SEASIDE, ORE.—It is reported that the power plant of the Seaside Power & Light Company has been purchased by the Pacific Power & Light Company, of Portland.

HUNTINGTON BEACH, CAL.—The City Trustees are negotiating with the Pacific Light & Power Company, the Southern California Edison Company and the Southern Counties Gas Company for the installation of 300 additional ornamental lamp posts in the residential district.

LOS ANGELES, CAL.—Additions will be made shortly to the lighting system in the Westgate lighting district in accordance with plans and specifications on file with the Board of Supervisors.

LOS ANGELES, CAL.—It has been announced that E. L. Doheny has contracted privately for lighting West Adams Street with ornamental lights from Figueroa to Hoover Street. The City Council has voted to light Adams Street between Grand Avenue and Figueroa with the same kind of system to preserve uniformity in the lighting scheme.

LOS ANGELES, CAL.—That the city authorities will propose to the Southern California Edison Company and the Pacific Light & Power Company that the city immediately purchase the private distributing systems of those companies without leasing aqueduct power to them for a five-year or ten-year period, was forecast at a recent meeting of the people's power bond committee. The Public Service Commission has sent a report to the City Council recommending that the city make an offer to the companies.

MARE ISLAND, CAL.—The Federal Wireless Company is to supply the navy yard here with a modern 30-kilowatt radio apparatus from its plant at Palo Alto. The yard operators expect to send wireless messages from five to six thousand miles, and the station at Yerba Buena in San Francisco Bay will do the receiving.

RIALTO, CAL.—The Fontana Power Company, of San Bernardino County, has applied to the Railroad Commission for authority to go into business as a public utility, to build a power plant and transmission system, to sell $350,000 worth of bonds, and to mortgage its property to secure this issue. The company also proposes to lease its properties to the Southern California Edison Company for 30 years, and the latter company intends to furnish a number of companies allied with the Fontana company electrical energy from the proposed plant.

RIVERSIDE, CAL.—Chas. H. Dehacour has applied to the Supervisors of Riverside County for a 50-year franchise to erect and maintain a pole, tower and wire system for transmitting electricity along certain public roads of the county. The franchise will be offered for sale on May 17.

SAN FRANCISCO, CAL.—City Engineer O'Shaughnessy is preparing estimates of costs of the proposed extension of the municipal street railway system from the Twin Peaks tunnel down Market Street.

VISALIA, CAL.—The Mt. Whitney Power & Electric Company is now engaged in the erection of a new 33,000-volt transmission line between Visalia and Exeter. Sixty-foot poles are being used to carry the line above the other feeder lines, and the copper is running close to 8,000 pounds to the mile, it is estimated. The work represents an expenditure of about $30,000.

Proposals

ELECTRIC WIRING.—R. H. Thomas, clerk of the School Board, Portland, Ore., will receive bids until 4 p. m., May 18, for electric wiring and conduit work in the second unit of the Franklin High School under construction in Portland.

STORAGE BATTERY.—Sealed proposal will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., May 16 for furnishing, delivering and installing one 44-cell storage battery in new trays, Ironclad Exide or equal, for electric truck, in accordance with plans on file in the office of said off

ELECTRIC DISTRIBUTION SYSTEM.—Sealed proposals will be received May 15 by William Heller, Director of Service, Tiffin, O., for the complete installation of all the poles, wires, posts, underground cables, electric lamps, gas lines and lamps and other construction and appliances necessary for lighting the streets, alleys and public places of the city.

ELECTRICAL WELDING APPARATUS.—Bids will be received by the Bureau of Supplies and Accounts, Washington, D. C., until 10:00 a. m., May 23, for delivering electric welding and cutting apparatus at the Puget Sound Navy Yard, at Bremerton, Wash. Proposals can be obtained from the Navy Pay Office, Lowman Bldg., Seattle, or from the Bureau.

ELECTRIC DISTRIBUTION SYSTEM.—Sealed bids will be received by the town of Guttenberg, Iowa, until 1 p. m., May 22, for a proposed electric distribution system as set forth in plans and specifications prepared by W. H. Grover, consulting engineer, Ames, Iowa. Specifications are on file at the office of the city clerk of Guttenberg and at the engineer's office. Bids will be considered on the city distribution system, labor and material separate. A certified check of five per cent of the bid will be required, all bids to be filed with the city clerk.

ELECTRICAL EQUIPMENT.—The Port of Seattle Commission, C. E. Remsberg, secretary, Seattle, Wash., will receive bids until May 24, for the installation of refrigeration and electrical equipment in the apple storage warehouse, costing approximately $65,000. Bidders are asked to submit alternative figures on plans of their own. Check for five per cent of amount of bid, payable to the Port of Seattle, is required. J. R. West is Chief Engineer of the Port Commission, and plans and specifications for the improvement are on file in his office in the Bell Street Dock.

New Incorporations

NEW YORK, N. Y.—Reliable Electric Motor Company. Capital, $5,000. Incorporators: H. Lippman, S. Lippman and M. Lippman.

INDIANAPOLIS, IND.—Indiana Battery Service Company. Capital, $41,000. Manufacture batteries. Incorporators: H. C. Churchman, G. Taylor and R. L. Brouse.

BOSTON, MASS.—Central Light & Power Company. Capital, $1,000,000. Incorporators: C. C. Guild, Boston; P. T. Stone, Beverly, and G. S. Fuller, West Newton.

NEW YORK, N. Y.—National Current Limitator Company. Capital, $200,000. Electric appliances. Incorporators: J. L. Janover, C. E. Frankel and S. Kaplan, all of 30 Church Street.

NEW YORK, N. Y.—Cities Illuminating Company. Capital, $750,000. Incorporators: Edwin P. Shattuck, W. L. Glenn and W. B. Walsh, all of 26 Exchange Place, New York City.

SYRACUSE, N. Y.—Interchangeable Trolley Switch Company. Capital, $100,000. Electrical devices. Incorporators: W. Dibbs, 400 East Genesee Street; W. A. Wright and C. W. Blodgett.

LOUISVILLE, KY.—Lion Universal Manufacturing Company. Capital, $20,000. Manufacture electrical and mechanical devices. Incorporators: H. J. Wolff, F. A. Lang and R. W. Schanberger.

CLEVELAND, O.—Glenville Equipment Company. Capital, $5,000. Manufacture power, heat and light stations, and distributing systems. Incorporators: M. C. Meyers, C. M. Burke and others.

LOUISVILLE, KY.—Electrical Prepay Meter Company. Capital, $50,000. Manufacture electrical devices and do a general electrical business. Incorporators: N. D. Abell, H. R. Abell and J. D. Sheridan.

NEW YORK, N. Y.—Electrical Talking Sign Company of New York. Capital, $150,000. Electrical advertising systems. Incorporators: O. M. Rogers, 608 Dearborn Street, Chicago, Ill.; A. S. Reid, 1421 Chestnut Street, Philadelphia, Pa., and C. A. Gardner, 52 Vanderbilt Avenue, New York City.

Financial Notes

Westinghouse Electric & Manufacturing Company annual meeting will be held June 14. Books close May 25 and reopen June 15.

Kings County Electric Light & Power Company, at a meeting of the board of directors, held May 1, declared a regular quarterly dividend of two per cent on outstanding capital stock, payable June 1 to stockholders of record at 3 p. m., May 19.

Northern States Power Company has called for payment July 1, 1916, at 105, through the Continental & Commercial Trust & Savings Bank, New York City, the $604,000 first-mortgage six-per-cent bonds of the Interstate Light & Power Company, due serially to July 1, 1932.

A number of Boston bond houses have been asked by the Bay State Street Railway Company to submit bids for an issue of $435,000 Boston & Northern four-per-cent refunding bonds, due 1954, and $550,000 Old Colony Street Railway four-per-cent refunding bonds due 1954.

The Scioto Valley Traction Company has been authorized by the Ohio Public Service Company to issue $200,000 six-per-cent first preferred stock, the proceeds to be used in the purchase of a similar amount of stock of the Columbus Depot Company. The latter company will erect a terminal station in Columbus to cost between $800,000 and $1,000,000. This stock is to be sold at 97.

The Ohio Public Utilities Commission has authorized the Cleveland Telephone Company to sell $2,000,000 common stock at par, and $3,000,000 five-per-cent four-year notes. Proceeds of the stock are to be used to retire notes maturing May 15, and $1,000,000 of the notes are also to be used to retire other notes; while the remainder will be used to pay for extensions and additions to the properties of the company.

The Binghamton Light, Heat & Power Company has sold through W. S. Barstow & Company, Inc., $505,000 five-per-cent first refunding mortgage bonds to N. W. Halsey & Company, and $280,300 six-per-cent cumulative preferred stock to Moors & Cabot, of Boston. The securities of the Binghamton Light, Heat & Power Company were authorized by the Public Service Commission of New York about two weeks ago, settling a controversy of many years' standing. The Binghamton company is controlled by the General Gas & Electric Company.

The New York Upstate Public Service Commission has authorized the Seneca Power Corporation to increase its capital stock from $5,000 to $1,250,000, proceeds of the new stock to be used for the construction of a hydroelectric generating station at the Seneca outlet of the canal at Seneca Falls at which 20,000,000 kilowatt-hours of energy a year will be generated. The construction of this development is made possible by the settlement in court of the water-power claims of a number of mill owners in Seneca Falls. The commission authorized the Central New York Gas & Electric Company to lease and operate the new plant when completed. The cost of the new station and transmission lines will be approximately $2,000,000.

New England Power Company has sold to Kissel, Kinnicutt & Company and William P. Bonbright & Company, New York City, $1,000,000 first-mortgage sinking-fund five-per-cent bonds due 1951, which are being sold on a 5.07-per-cent basis. These bonds are a part of authorized issue of $14,000,000, of which $6,000,000 will be outstanding. In addition to the $1,-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 8	May 1
American Tel. & Tel. (New York)	128	127⅞
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	240	237
Electric Storage Battery common (Philadelphia)	59	59
Electric Storage Battery preferred (Philadelphia)	59	59
General Electric (New York)	163½	163
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	6¼	6¼
Massachusetts Electric preferred (Boston)	32¾	33
National Carbon common (Chicago)	172	—
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	132	132
Philadelphia Electric (Philadelphia)	27½	27⅞
Postal Telegraph and Cables common (New York)	78¾	78¼
Postal Telegraph and Cables preferred (New York)	66	66
Western Union (New York)	90½	90¾
Westinghouse common (New York)	60¾	58
Westinghouse preferred (New York)	70	70

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000,000 bonds just sold, $1,500,000 of these bonds will be offered to holders of bonds of companies to be acquired in exchange for their present holdings and the balance not so exhausted will be sold to other interests affiliated with the company. The proceeds of the bonds are to be used for the acquisition of transmission lines and substations and of a hydroelectric generating station on the Deerfield River with an annual output of 12,000,000-kilowatt-hours of energy.

Dividends.

	Term	Rate	Payable
Cent. Ark. Ry. & Lt. Corp., pf	Q	1.75%	June 1
Illinois Trac., com	Q	.75	May 15
Kings Co. Elec. Lt.&Pw.	Q	2 %	June 1
Mobile Elec., pf	Q	1.75%	May 15
Pac. Gas.&Elec.,first pf.	Q	1.5 %	May 15
Pac. Gas & Elec.,orig. pf.	Q	1.5 %	May 15
Tampa Elec	Q	$2.50	May 15
Wash. Ry. & Elec., com.	Q	1.75%	June 1
Wash.-Va. Ry., pf	S	2.5 %	May 1
White (J. G.) & Co., pf.	Q	1.5 %	June 1
White (J. G.) & Co., management, pf	Q	1.75%	June 1

Reports of Earnings.

ALLIS-CHALMERS COMPANY.

Business of Allis-Chalmers Manufacturing Company for first quarter of 1916 is as follows:

	Sales Billed	Net Profit
January	1,366,203	$219,734
February	1,367,736	232,085
March	1,640,901	288,518
Total	$4,374,840	$740,337

At the annual meeting of Allis-Chalmers Manufacturing Company, Grayson M.-P. Murphy, vice-president, Guaranty Trust Company, and Charles F. Pfister, of Milwaukee, were elected to board of directors to fill vacancies of Col. Pabst and William C. Potter, who had previously resigned. Other directors were re-elected. At the meeting of directors of the Allis-Chalmers Manufacturing Company, retiring officers were re-elected.

PACIFIC GAS & ELECTRIC.

	1916	1915
March gross	$1,515,159	$1,589,999
Net after taxes	592,782	702,897
Total income	625,702	720,445
Surplus after charges	287,229	350,310
Three months' gross	4,877,908	4,749,327
Net after taxes	2,086,222	2,113,606
Total income	2,236,682	2,184,920
Surplus after charges	1,216,183	1,080,689
Balance after preferred dividends	878,607	807,343
Twelve months' gross	18,658,882	17,319,438
Net after taxes	7,917,324	7,261,508
Total income	8,410,349	7,542,276
Surplus after charges	4,348,260	2,956,882

BRITISH WESTINGHOUSE.

Report of the British Westinghouse Electric & Manufacturing Company, for the year ended December 31, 1915, compares as follows:

	1915	1914
Trading profit	£293,989	£267,819
Gross profit	293,989	267,819
Debit interest, etc	69,654	69,654
Expended on surplus, lands, etc.	3,236	2,822
Depreciation	44,347	43,716
Net profit	176,752	151,627
Preferred dividends	75,000	75,000
Rate per annum	7½	7½
To reserve, etc	65,241	75,000
Balance for year	36,511	1,627
Brought forward	8,121	6,493
Carried forward	44,632	8,120

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,884. DRY BATTERIES.—An American consular officer in Italy writes that a firm in his district desires to communicate with American manufacturers of electric dry batteries. Quotations and full information should be sent. Correspondence may be in English.

NO. 20,905. ELECTRICAL MATERIAL.—An American consular officer in an insular possession reports that a man in his district desires to receive quotations, catalogs, and full information from American manufacturers of wiring materials and points, insulating materials, electrical fixtures and incandescent lamps. Quotations are desired c. i. f. destination, based on cash against shipping documents on arrival of merchandise, but before delivery. Correspondence should be in Spanish. The man desires to act as general agent.

NO. 20,906. TUNGSTEN FILAMENTS.—A commercial agent of the bureau writes that a firm in the United States has received inquiries from its agent in Japan for tungsten filaments suitable for 10, 16 and 25-candlepower electric bulbs.

NO. 20,946. ELECTRIC PIANOS.—A man in Spain informs an American consular officer that he desires to communicate with American manufacturers of automatic electric pianos, especially those with slot for coins.

Electrical Patents Issued May 2, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,181,112. Electromagnetic and Vacuum Lifter. J. P. C. Charlebois, Toronto, Ontario, Canada. Article lifted secured by suction and magnetism.

1,181,122. Ignition Device for Internal-Combustion Engines. F. V. Eastman, St. Petersburg, Fla., assignor of one-twentieth to A. M. Ballenger, one-twentieth to A. G. Eastman, St. Petersburg, Fla., and three-fourths to F. R. Eastman, Grand Rapids, Mich. For securing to cylinder, comprising spark, inlet and priming plug.

1,181,151. Circuit Plan and Conduit for Motor Vehicles. W. MacGlashan, South Bend, Ind., assignor to the Studebaker Corporation, South Bend, Ind. Housing and terminals for wires.

1,181,186. Automatic Device for Compensating Magnetic Speed-Indicators for Variations in Temperature. E. M. Thompson, assignor to Stewart-Warner Speedometer Corporation, Beloit, Wis. Bimetallic strips support magnetic mass associated with rotating magnet.

1,181,198. Apparatus for Making Threaded Concrete Pipe. J. P. Zwicker, Berkeley, Cal. Has electrically heated thread mold.

1,181,200. Circuit-Interrupting Device. C. Aalborg, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Double-throw knife switch with quick-break blades.

1,181,207. Polyphase Electric Meter. W. M. Bradshaw, assignor to Westinghouse Electric & Mfg. Co. Relates to adjustment of potential and load coils in relation to movable member.

1,181,211. Electrical Measuring Instrument. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Average voltage of alternating wave indicated by wattmeter mechanism measuring hysteresis losses in core.

1,181,216. Apparatus for Transforming Electric Currents. E. Falkenthal, Friedenau, Germany. Transformer comprising vibratory armature for transforming alternating to direct current.

1,181,217. Elevator-Door Locking and Controlling Device. P. F. Foley, New York, N. Y. Details of latches, switches, magnets, etc.

1,181,226. Indicator. O. A. Kenyon, Hastings-upon-Hudson, N. Y. Temperature indicator; lighting of lamps in column follows variations of temperature measured.

1,181,227. Electric Welding. O. A. Kenyon, Hastings-upon-Hudson, N. Y. Regulation for number of welding arcs in series.

1,181,229. Insulator for Trolley-Wire Supports. F. P. Kobert, assignor to Barnes & Kobert Mfg. Co., New Haven, Conn. Insulating mounting for staple.

1,181,236. Electrical Protective Device. P. MacGahan, assignor to Westinghouse Electric & Mfg. Co. Timed relay device for controlling circuit-breakers.

1,181,237. Circuit-Interrupter. J. N. Mahoney, assignor to Westinghouse Electric & Mfg. Co. Details of oil switch having auxiliary breaking contacts.

1,181,247. Electric Sparking Igniter. H. M. Pops, assignor to Maxwell Motor Co., Detroit, Mich. Mounting and gearing of alternating generator and controlling switch on engine casing.

1,181,250. Switching Device. C. Renshaw, assignor to Westinghouse Electric & Mfg. Co. Structural details of flexible shunt.

1,181,267. Switching Device. P. S. Turner, assignor to Westinghouse Electric & Mfg. Co. Supporting device for switch group.

1,181,270. Electrical Measuring Instrument. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co. Special arrangement of windings in wattmeter comprising magnet having constant field.

1,181,298. Adapter for Cutout Blocks. C. B. Fithian, Philadelphia, Pa., assignor of one-third to A. Gentel, Philadelphia, Pa., and one-third to I. L. Stanger, Pensauken, N. J. Adapts fuse plug to cutout block for cartridge fuses.

1,181,306. Automobile-Use Registering Apparatus. W. S. Graham, Norfolk, Va. Clock-driven register controlled by motor-control switch.

1,181,322. Electric Drive for Hoisting and Boom-Lifting Drums. A. Lambert, Newark, N. J. Details of three-drum hoist.

1,181,324. Motor Controller. W. F. Lent, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. For propulsion motors of ore bridge, etc.

1,181,332. Safety Appliance for Railway Trains. R. C. Millard, Atlanta, Ga. Electromagnetically operated valve in main pipe line of brake mechanism.

1,181,343. Train-Signal System. L. L. Parkhill, Dawson, Pa. Cab signal operated by switches on the cars through circuit formed by car conductors coupled throughout train and telephone sets in cab and caboose connected through one signal conductor and ground.

1,181,348. Dental lamp. H. A. Schwartz, Chicago, Ill. Special lamp casing and arrangement of reflectors.

1,181,349. Mechanical Plating Apparatus. P. T. Sealey, assignor to The Firestone Tire & Rubber Co., Akron, O. Mechanism for manipulating articles in a series of tanks.

1,181,362. Support for Storage-Battery Insulators. C. Ambruster, Philadelphia, Pa. Structure of earthenware device.

1,181,376. Electric Motor. C. H. J. Dilg, New York, N. Y. Pole faces offset and reversible to shift magnetic field axially.

1,181,384. Armature-Shaft Mounting. J. G. Heaslet, assignor to the Studebaker Corporation, South Bend, Ind. For vertical shaft.

1,181,387. Water Cooling and Heating Filter. C. Joerin, Jr., and A. E. Joerin, Detroit, Mich. Heater for hot-chamber controlled by delivery faucet.

1,181,399. Lightning-Rod Connecting Clamp. W. H. McCullough, assignor to J. W. Moorhead, Chicago, Ill. Details of two-part device.

1,181,419. Electric Burglar-Alarm System. J. P. Williams, New York, N. Y., assignor to Duplex Electric Co. Protective-circuit arrangements including high-potential alternating supply, connected through transformer and auxiliary low-potential source.

1,181,420. Electric Burglar-Alarm Protective System for Safes. J. P. Williams, New York, N. Y., assignor to Duplex Electric Co. Base member extending over area of approach has top and bottom members closing circuit an depression or drilling of former.

1,181,423. Apparatus for Measuring Rontgen Rays. K. Bangert, assignor to Siemens & Halske, A.-G., Siemensstadt, Germany. Arrangement of ionization chamber and indicating instrument with switches and circuits therefor.

1,181,425. Spark-Plug. E. Blattman, assignor to Siemens & Halske. Central electrode has bore and other electrode adjustably throttles discharge of gas during expansion.

1,181,427. Means for Signaling Over Electric-Light Circuits or Power Mains. A. C. Brown, Blackheath, London, England. Rapidly oscillating signaling currents superposed on load current.

1,181,440. Insulated Terminal Member. H. R. Edgecomb, assignor to Westinghouse Electric & Mfg. Co. Insulation of conductor at aperture in casing.

1,181,444. Coin Receptacle. J. T. Garton, Toronto, Ontario, Canada. Deposit of coin lights lamp back of transparency.

1,181,445. Annunciator or Signal. C. U. Gammelspacher, Jasper, Ind. Details of mechanism comprising motor-operated reel and radial signal arm.

1,181,446. Electromagnetic Resonator. L. Grubman, assignor to Electric Spark Appliance Co., New York, N. Y. Details of horn having electromagnetically operated diaphragm.

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1,181,451. Swivel Cord-Grip for Electric Fixtures. H. Hubbell, Bridgeport, Conn. Gripping members cammed against cord by encircling nut screwing into fixture member.

1,181,483. Meter-Testing Appliance. J. Sachs, Hartford, Conn. Blade-like connector for association with either testing or switch-operating means.

1,181,484. Meter-Testing Switch. J. Sachs, Hartford, Conn. For connecting meter and load circuit with testing circuit.

1,181,486. Art of Producing Musical Tones. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. For educing a variety of tone qualities from single set of key-controlled tuned sonorous bodies embracing a number of octaves by electromagnetic control.

1,181,505. Magnetizing Device for Wheels. S. D. Colvin, Myrtistown, La. Coil encircling axle has circuit controlled by air pressure from brake cylinder.

1,181,509. Pen. J. L. Devine, Middletown, Conn. Has battery lamp.

1,181,513. Spring Binding-Post. L. Ericson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Push-button-released spring clamp for terminal.

1,181,524. Arc-Breaking Insulation Block for Electric Switches. H. Hansen, New York, N. Y., assignor to Francis Kiel & Son, New York, N. Y. Movable contact moves into arc-breaking pocket.

1,181,533. Bulb Holder. P. T. Kraft, New York, N. Y. Spring clamp released by pressure between fingers for gripping socket and securing to support.

1,181,543. Safety Flashlight for Elevators. I. J. Rachlin, Newark, N. J. For lighting threshold of elevators.

1,181,544. Headlight and Reflector. H. B. Rand, Merrimac, Mass. Structure of reflector throwing light on street and also forwardly.

1,181,549. Electrolytic Cell. H. T. Shriver, West Orange, N. J. Electrolyzer of the filter press type.

1,181,550. Electric-Lighting. W. C. Starkey, Mansfield, O. Regulation of series lamp circuit with varying voltage.

1,181,551. Electric-Lighting Regulator. W. C. Starkey, Mansfield, O. Related to above; device comprising socket and electromagnetically operated shunt for lamp.

1,181,555. Process of Making Tartaric Acids or Their Compounds. M. Vavgouny, assignor to Royal Baking Powder Co., New Jersey. An alkali glyoxylate reduced by electric current.

1,181,556. Means for Producing High-Frequency Currents. G. Von Arco and A. Meissner, assignors to Gesellshaft Fuer Drahtlose Telegraphie M. B. H., Berlin, Germany. Transformer arrangement.

1,181,559. Intercommunicating Selective Lockout Telephone System. F. W. Adsit, assignor to Adsit General Electric Co., Minneapolis, Minn. For party lines.

1,181,576. Broken-Down Insulating-Joint Protection. S. M. Day, assignor to General Railway Signal Co., Gates, N. Y. For insulated rail joints in a block system.

1,181,577. Bonding-Pin. E. M. Deems, East Orange, N. J. Special plug for securing bond wire to rail.

1,181,593. Electric Interlocking System. W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. For remote control.

1,181,603. Spark-Plug. S. N. McClean, assignor to McClean, Sperligh & Uhlig Co., Detroit, Mich. Casing shrunk on insulating core to make gas-tight joint.

1,181,623. Electrical Condenser and Manner of Mounting the Same. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Core of insulated plates gripped by terminal clamps at opposite ends.

1,181,630. Circuit-Closer for Fire-Alarm Systems. E. Barsony, Castleton-on-Hudson, N. Y. Details of thermal switch.

1,181,640. Locking Switch. G. Burkhardt, Chicago, Ill. Rotary snap switch controlled by lock operated by inserted key.

1,181,656. Pole Changer. C. J. Erickson, assignor to First Trust and Savings Bank, Chicago, Ill. Shifting of battery connections controlled by magnetically operated pendulum.

1,181,661. Display Sign. M. H. Harris, New York, N. Y. Arrangement of lamps in duplex eyeglass advertising sign.

1,181,665. Vehicle Electric Signaling Device. H. H. Hirsch, Philadelphia, Pa. Self contained, detachable, battery light and audible signal for mine car.

1,181,669. Combined Counter and Circuit-Breaker. W. C. Kelly, Hastings, Mich. Contact drum rotated by cam-operated ratchet. (See cut.)

1,181,679. Attachment for Calling Devices. E. A. Mellinger, assignor to Automatic Electric Co., Chicago, Ill. Finger engaging stop for dial with finger holds.

1,181,686. Electrical Switch. G. P. Schmidt, New York, N. Y. Two-push-button snap switch.

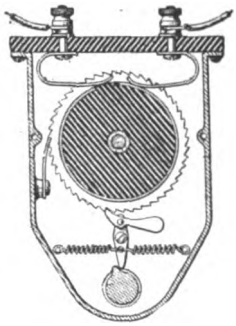
1,181,688. Electric Lamp. A. H. Smith, assignor to Import Sales Co., New York, N. Y. Mounting of socket for candelabra.

1,181,690. System of Motor Control. Halfdan A. Steen, assignor to Allis-Chalmers Mfg. Co. Interrelation of resistance-controlling magnetically operated contactors.

1,181,705. Thermic Circuit-Closer. R. R. Weber, Los Angeles, Cal., assignor of one-third to M. S. Yeager, and one-third to P. F. McKenzie, Los Angeles, Cal. Details of device having contacts held open by heat-affected member.

1,181,706. Porcelain Key-Socket Mechanism. B. C. Webster and G. P. Knapp, assignors to H. Hubbell, Bridgeport, Conn. Switch structure.

1,181,707. Key-Socket Mechanism. B. C. Webster and G. P. Knapp, assignors to



No. 1,181,669.—Combined Counter and Circuit-Breaker.

H. Hubbell, Bridgeport, Conn. Modification of above.

1,181,708. Support and Guard for Telephone Wires. G. W. Welch, Decorah, Iowa. Wires lie between flanges depending from support.

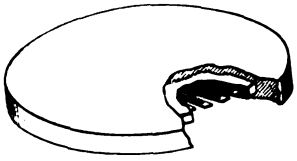
1,181,710. Telephone Receiver. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Diaphragm operating magnet normally neutral and coefficient of self induction of its coil divided by turns between .000094 and .00015.

1,181,711. Electrical-Oscillation System. E. Wilson and W. Hamilton, assignors to Indo-European Telegraph Co., London, England. For producing high-potential discharges.

1,181,722. Broiler. H. P. Ball, assignor to General Electric Co., Schenectady, N. Y. Arrangement of heating unit and switches with oven having adjustable broiler frame.

1,181,723. Manufacture of Armored Wire. H. P. Ball and L. Reichold, assignors to General Electric Co. Protective ribbon is folded about insulation in which conductor is embedded.

1,181,730. Combined Automatic Train Signaling and Control System. J. W.



No. 1,181,800.—Electrical Insulating Plastic Composition.

Buell, Washington, D. C. Normally closed vehicle circuit responds to danger conditions.

1,181,733. Cam-Operated Switch. G. A. Burnham, assignor to General Electric Co. Operating mechanism for double-throw oil-switch.

1,181,736. Venting-Door for Circuit-Breaker Casings. F. E. Case, assignor to General Electric Co. Door opened in response to current flowing through contained electromagnetic switch.

1,181,741. Method of Joining Metals. W. D. Coolidge, assignor to General Electric Co. For securing adhesion of copper to tungsten.

1,181,742. Electrical Contact. W. D. Coolidge, assignor to General Electric Co. Tungsten contact united to ferrous metal base by film of cupreous metal and cupreous metal prevented from creeping up sides of tungsten.

1,181,794. Door. H. C. Osmond, Jr., and A. Peterson, Philadelphia, Pa. For telephone booths.

1,181,800. Electrical Insulating Plastic Composition. C. P. Randolph, assignor to General Electric Co. For heaters; mixture of silica grains and boric anhydrid. (See cut.)

1,181,803. Attachment-Plug. H. R. Sargent, assignor to General Electric Co. Details.

1,181,811. Cored Arc-Lamp Electrode. C. C. Wallace, assignor to General Electric Co. Has separately baked, mineralized core cemented in place.

1,181,828. Spark and Throttle Lever Lock. A. E. Boudreau, Hartford, Conn. Bolt and link arrangement in the segment.

1,181,838. Signal. E. L. Cantrell, Ivy, Cal. Hotel call; clock-controlled circuits set for desired times.

1,181,851. Electrical Indicator for Street Cars. R. M. Craig, San Antonio, Tex. Mechanism for operating reeled name-band.

1,181,867. Timer for Ignition Systems. W. Gadke, Philadelphia, Pa. Details of construction.

1,181,882. Lamp. E. A. Hawthorne, Bridgeport, Conn. Lamp and plug-socket mounting and casing of headlight having rear aperture.

1,181,883. Third-Rail Snow Cleaner. C. F. Henderson and C. D. Winchell, Wampsville, N. Y. Chute on car truck carries scraper at end.

1,181,884. Temperature Alarm. S. I. Hendrix, Crescent City, Fla. Thermometer tube has float-operated contacts.

1,181,894. Vehicle Lamp. T. E. Ivins, assignor to Maunsell Mitchell, Tacoma, Wash. Combination oil-burning and electric lamps.

1,181,896. Lifting Device for Rolling Mills. L. R. Johnson and J. R. Stanley, Zanesville, O. Inclined platform has movable block for holding product received from rolls electromagnetically controlled by product emerging from rolls.

1,181,901. Electromagnetic-Wave Detector. C. S. Lenz, New York, N. Y. Has electrode of lead, copper, iron, aluminum, zinc and magnesia.

1,181,911. Band-Light. J. P. Machovec, Iowa City, Iowa. Battery-lamp structure for detachable connection to music stand.

1,181,947. Telephone. J. O. Cadle, assignor to Telephone & Electric Co. Meridan, Conn. Flush telephone set.

1,181,949. Automatic Signaling and Alarming System for Railways and the Like. O. M. DeMunnick, The Hague, Netherlands. Has balanced vehicle circuits and balanced track circuits; operates by unbalancing of circuits.

1,181,966. Electric Switch. F. W. Cole, Newton Highlands, Mass. Details of magnetically operated switch.

1,181,980. Controlling Apparatus. A. E. Norris, Cambridge, Mass. For motors of grab-bucket hoist.

PATENTS EXPIRED.

The following United States electrical patents expired on May 9, 1916;

624,463. Incandescent Lamp. E. F. Dwyer, Lynn, Mass.

624,472. Submerged Torpedo Tramway. C. T. Finlayson, Denver, Colo.

624,487. Printing Telegraph. K. Himrod, Chicago, Ill.

624,513. Battery Electrode. H. S. Lloyd, Philadelphia, Pa.

624,516. Apparatus Employed in Wireless Telegraphy. G. Marconi, London, England.

624,531. Electrically Operated Rudder-Controlling Mechanism. R. B. Painton, Williamsport, Pa.

624,542. Telephone Register. H. T. Richards, New York, N. Y.

624,552. Composition for Carbons for Electric Lamps. A. O. Simonnier, Vienna, Austria-Hungary.

624,574. Galvanic Battery. J. Sully, New York, N. Y.

624,615. Time Cutout for Electric Lamps. J. H. Boardman, Port Huron, Mich.

624,652. Alternating-Current Motor. A. Heyland, Frankfort-on-the-Main, Germany.

624,666. Telephone System. F. A. Lundquist, Chicago, Ill.

624,696 and 624,697. Telephone Transmitter. J. H. Spencer, New York, N. Y.

624,703. Electric Arc Lamp. C. Tepel, Bennett, Pa.

624,744. Storage or Secondary Battery. H. Blumenberg, Jr., New York, N. Y.

624,813. Means for Regulating Speed of Electric Motors. O. C. Immisch, London, England.

624,815. Commutator Brushholder. G. H. Jantz, Wyoming; W. Leist, Norwood, and O. W. Jantz, Cincinnati, O.

624,824. Adjustable Vibrator for Magnetic Coils. C. A. Keller, Cleveland, O.

624,838. Annunciator for Telephone Switchboards. W. O. Meissner, Chicago.

624,881. Telephone System. D. M. Tuerrell, Atlanta, Ga.

624,895. Automatic Magnetic Circuitbreaker. W. M. Scott, Philadelphia, Pa.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. 68. CHICAGO, SATURDAY, MAY 20, 1916. No. 21.

EDITORIALS

RETURNING TO CHICAGO.

The National Electric Light Association returns to Chicago this year for its convention after an interval of three years. This will be the eighth annual meeting to be held in the City by the Lake, and each return finds the Association bigger and the convention one of greater interest. The local committees have exerted themselves in making the features of the convention attractive in every way and are looking for a record attendance. The general prosperity of the country and particularly of the central-station industry warrants the members of the Association in seeing that this expectation is fulfilled.

The electrical industry has passed through an unusual experience since the last Chicago convention. The period of business inactivity which ushered in this interval was carried to a climax when the European war broke out. Not only was business disorganized, but capital became frightened and money for extensions and improvements became difficult to secure. Even yet high rates of return are necessary to invite investments in utility securities. During the past year, however, business activity has mounted with leaps and bounds, and the income of the central stations has reached the highest point in their history. Some companies have found it difficult to meet the demands for service, and the manufacturers of machinery and supplies have been deluged with orders. Prices of materials have taken record flights; copper and steel, the basic metals of the industry, holding prominent places in the general advance.

The convention program shows a continuation of the gradual change in the subjects of interest to Association members. The Commercial sessions receive greatest attention and are supplemented this year by the Electric Vehicle sessions, owing to the affiliation with the Association of the Electric Vehicle Association of America. The subject of electric vehicles will of course receive more attention than ever before, but the application of electric energy for cooking and industrial heating is giving these subjects a prominence which they have not heretofore attained. Industrial power, which for some years has occupied the center of the stage, is being pushed to one side, and the recent improvements in electric illuminants have stimulated anew a discussion of lighting problems which vies with the newer applications of electric energy for the attention and interest of the central-station men.

THE MODERN POWER PLANT.

The large electric central station of today presents a marked contrast in many ways to the power plant of twenty or even of ten years ago. Not only has the typical form of prime mover changed from the reciprocating engine to the turbine, but the auxiliary apparatus has undergone a remarkable transformation in character, quantity and reliability. The amount of trouble regularly encountered in large stations in former times was truly appalling, but today in well designed and carefully operated plants anything more than minor troubles is to be regarded as the exception rather than the rule. Improvements in the manufacture of feeder cables may be credited with a considerable share in the decrease of trouble, for breakdowns in this link of the system for supplying power were at one time a fruitful source of anxiety on the part of the operating man and the cause of many a hurry call to the maintenance force.

Visitors to Chicago during the convention of the National Electric Light Association will find in the power stations of the Commonwealth Edison Company excellent examples of the modern power plant for urban supply. Units approaching in size the largest yet made, and of different types, may there be seen, while the arrangement of plant and the choice of equipment represent the most modern ideas in power-plant practice. The combined capacity of the Company's stations represents the largest installed for public supply in any city of the world, and the actual yearly output exceeds that furnished to any other municipality. This output amounted in 1915 to 1,198,000,000 kilowatt-hours, and the installed capacity of the power house totals 447,000 kilowatts. The three main power plants, known as the Northwest, the Fisk Street and the Quarry Street stations, have a combined rating of 380,000 kilowatts, and an additional horizontal unit of 36,000 kilovolt-amperes is about to be installed at the Northwest station. The latter, being the newest of the three, represents later practice, and the layout of this plant is a feature in itself. The compactness of the turbogenerator unit makes this, the essential element of the power station, occupy a comparatively small portion of the plant, while the boilers and control apparatus demand large spaces for their installation. The arrangement of these in the modern plant and the safeguards which are supplied to obviate any interruption to the supply of power, are notable features which contrast very favorably with general practice when the industry was young.

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THE GROWTH OF PUBLIC UTILITIES.

With an enormous variety and extent of service ready at hand today, it is hard to realize that public utilities are of very recent origin and are a thoroughly modern institution. A century ago there were very few of them in existence, either in this or other countries. Railroad and steamship lines, telegraph and telephone companies, electric central stations, gas lighting plants and electric street railways have all had their advent within that period. Waterworks are the oldest of the municipal utilities, and yet the origin of these dates but little further back. In 1800 there were only 16 of them in this country, one of which was municipally owned, while the others were in private hands. The following half-century saw an increase of only 67, so that development was slow until the latter half of the nineteenth century.

The latter half of the nineteenth century, and especially the latter quarter, saw a remarkable development and growth of public utilities. Railroad, telegraph and gas service had already been introduced and during this period found their most rapid development. The Western Union Telegraph Company was incorporated in 1851 and has steadily grown. In 1850 there were 30 gas plants for municipal service. By 1900 this number had grown to 877.

With the exception of the telegraph, the electric utilities had their origin in the last quarter of the century. The first commercial telephone exchange was put in operation in New Haven in 1878. At the present time the Bell system alone has over nine million stations and nearly twenty million miles of wire in operation. Over 25,000,000 connections are made daily. Electric railways were started in 1888, as an improvement on previous methods of operating street railways. There are now about 1,300 of them.

The youngest of the municipal utilities and the one which has seen the most rapid growth is the electric light and power station. The year following the installation of the first telephone exchange saw a central station established in San Francisco for operating arc lamps. In 1880 incandescent systems were introduced and since then there has been a steady growth. By 1902 there were 3,620 central stations, and by 1912, 5,221 were operating. Their total investment was over $2,175,000,000 and their annual income over $300,000,000 in the latter year. The number of employees was nearly 80,000, the total generating capacity over 5,000,000 kilowatts, and the annual output over 11,500,000,000 kilowatt-hours. The output for 1915 is estimated at 18,400,000,000 kilowatt-hours, and the income at nearly $400,000,000.

The number of separate operating companies does not now seem to be increasing. The natural growth due to developments in new communities is about offset by the combinations going on between utilities in adjacent communities. This is a period of consolidation and centralization of power production. The transmission line is becoming a familiar sight, and many small communities are, by tapping it, receiving the benefits of electric service which otherwise would not be available to them.

According to the United States Census report of the total wealth of the nation in 1912, the electric central stations represent 1.16 per cent of it, while all of the electric utilities combined represent 4.3 per cent. The electric utilities are rapidly growing, but extensions during the past two years have been seriously handicapped by the high prices for materials and the high rates of interest demanded for new capital. Nevertheless the industry is absorbing all of the steam generating equipment which the manufacturers can turn out, and the continual accession of new loads, even in periods of industrial depression, indicate that the growth is a solid and substantial one, which may be expected to continue into the indefinite future.

SLIDING SCALE OF RATES AND DIVIDENDS.

One of the objections which has been raised to the regulation of utility corporations by commissions is that the limitation of return upon invested capital to definite percentages, regardless of the efficiency of management, removes the incentive of profit to economical and careful operation of the utility by the managing officials. The law-makers of at least two of the states were wise enough to recognize this, and they inserted in the utility laws provisions to the effect that economy and efficiency of management and operation should be recognized in determining the rate of return which should be allowed to the owners of the utility.

One method for accomplishing the desired result is to permit a definite sliding scale of dividends automatically fixed by the maximum rate of charge for the commodity or service furnished by the utility. This method has been used in England to some extent and has been regarded with considerable favor. In 1906 it was adopted in a law by the State of Massachusetts applying to the Boston Consolidated Gas Company, with the idea of giving it a ten-year trial. In 1915 the Legislature directed the Board of Gas and Electric Light Commissioners to investigate the operation and effect of this law, and this has now been done. The Board finds that the results have not been entirely satisfactory.

Two reductions in the price of gas have been made, both during the first two years of operation under this law. Together they brought the price of gas from 90 to 80 cents per thousand cubic feet, and dividends were increased in consequence from 7 to 9 per cent.

The soundness of the principle at the basis of the sliding scale is recognized, but it is claimed that equally good results can be obtained by the more ordinary methods of regulation, and that the principle of rewarding economy and efficiency is actually carried out by the Massachusetts Commission. It is pointed out that the expected operation of the

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scheme assumes that there is no means of distributing profits except through dividends, whereas actually the association of the company with others under the ownership of the Massachusetts Gas Companies affords such means. It is claimed also that the dividends paid were not entirely earned, but obtained through the sale of property, and that inadequate provisions for depreciation have been made by the operators.

The Board concludes that the method has not had a fair trial and recommends that the act be repealed unless the Boston Consolidated Gas Company is entirely dissociated from the Massachusetts Gas Companies. It is greatly to be regretted that the conditions in Boston were not such as to demonstrate conclusively the advantages and disadvantages of this system of public regulation. Further experimentation and experience will be necessary before the sliding-scale method will be applied to any large extent in other parts of the United States, if at all.

DEMONSTRATING INDUSTRIAL LIGHTING.

An interesting departure from the hackneyed display of standard apparatus which the central-station manager is often tempted to make at local exhibitions catering largely to the general public may be accomplished in the field of industrial lighting, provided the exposition draws manufacturers and business men as well as the housewife. In a large textile show in the East one of the manufacturers of electric lamps provided his booth with a box of eight compartments, each compartment being fitted with a special type of illumination carrying a clean-cut lesson to the visitor. In one compartment a 60-watt carbon incandescent lamp was placed, with a neat, printed card pointing out that this type of lamp is still used by many mills whose managers do not realize that it is an old-style, inefficient lighting unit, giving minimum light at maximum cost. Immediately below was a compartment carrying a 40-watt tungsten lamp, with an appropriate printed comparison with the one above. In another section, a 60-watt lamp was shown in a dirty condition, that below being shown clean, and of the same size and reflector, due emphasis being laid in the printed matter upon the inability of even modern equipment in adequate units to cope with a lighting situation where insufficient cleaning is practiced. Other sections showed the unsatisfactory illumination secured by bare gas-filled lamps and the disadvantages of a wrongly selected reflector contrasted with the admirable illumination obtained by fitting a lighting unit with the best type of reflector for the particular work in hand.

Now the comparison of carbon and tungsten lamps is, of course, an old story which has become sufficiently popularized to get into the windows of syndicate drug stores, and it serves its purpose in its place. The real interest of such a display as the one outlined above lies in the fact that the concern which prepared it took the pains to show the visitor the results of poor practice as well as the benefits of good illumination. It is often quite as helpful and instructive to show how not to do things as to show the best ways of accomplishing them, and in working up exhibits which are to appeal to industrial visitors, the central station can turn this to account probably with greater safety than in a purely domestic-appliance exhibition. Men associated with factory plants, mills and large business houses are quick to see the point of such a comparison as a dirty lamp and a clean lamp in adjoining compartments of an inexpensive box afford; it is more impressive than a half hour of discussion about foot-candles, luminous flux and other technical matters which mean little to the industrial public at large.

There is a field for new and original displays here that the progressive central station will find worth cultivating. The old stand-by displays can be pressed into service none the less, but a little deviation from the beaten path of exhibiting only "correct" apparatus in top-notch condition attracts a great deal more attention, makes visitors think and talk, and withal, helps to develop electrical applications along sound and durable lines.

WHY NOT LET THE LINEMAN DEMONSTRATE?

The advertising value of novel practices is so great that if even commonplace things are done effectively in new ways, popular interest is awakened and stimulated into real activity. Here is a suggestion which lately came to hand from an observer of the time lost by central-station line crews in returning to the plant at the noon hour. The thought occurred, why not equip each of the line repair wagons with an electric hot plate which could be connected at noon to the nearest secondary mains, giving the crew the enjoyment and benefits of a warm drink while close to the job and very likely making the noon meal so convenient and comfortable as to do away with the desire to return to the plant for a fresh start after lunch?

Certainly the utilization of one or two simple heating devices in this way by the outside force, combined with the use of a few terse printed cards calling the attention of passers-by to the convenience of the equipment, might be productive of good, and who knows whether the sale of a few of these appliances by the line crew on a commission basis might not work out well? The progressive central station will not hesitate to try out such an idea in striving to make every employee an *ex-officio* salesman and thus add to its desirable load. It is only by keeping these convenient applications of electricity ever and always in the public eye that the full benefits of "Doing it Electrically" will be shared by the central-station company and the community which it has undertaken to serve.

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Happenings in the Industry

Joint Meeting of American Institute Held by Long-Distance Telephone—Report of Missouri Utility Association Convention—Iowa Utilities Hold Joint Meeting in Dubuque—Proposal of Extension of Chicago Street Lighting—Empire Association Meets—Annual Meeting Electric Power Club—Miscellaneous Items of Interest

AMERICAN INSTITUTE HOLDS JOINT MEETING IN SIX CITIES BY LONG-DISTANCE TELEPHONE.

Large Assemblies in Boston, New York, Philadelphia, Atlanta, Chicago and San Francisco Hear Distinctly an Interchange of Greetings and National Songs.

A unique achievement marked the national meeting of the American Institute of Electrical Engineers held simultaneously in six cities on the evening of May 16. About 4,700 members of the Institute and guests attended these meetings and heard by long-distance telephone the proceedings that took place. This was the first time that so many people were enabled to listen by telephone to the human voice and music transmitted from different parts of the country separated by thousands of miles.

The meeting of Tuesday was in two distinct parts. The annual business meeting of the Institute was held in the New York headquarters in the afternoon. The report of the Board of Directors was presented for the fiscal year ended April 30. The result of the letter ballot on the election of officers for the ensuing year was announced as follows: President, H. W. Buck, New York City. Vice-presidents, L. T. Robinson, Schenectady, N. Y.; Peter Junkersfeld, Chicago, Ill.; B. A. Behrend, Brookline, Mass. Managers, John B. Fisken, Spokane, Wash.; Charles Robbins, East Pittsburgh, Pa.; N. A. Carle, Newark, N. J.; Charles S. Ruffner, Webster Groves, Mo. Treasurer, George A. Hamilton, Elizabeth, N. J. The Board of Directors re-elected F. L. Hutchinson as secretary.

The meeting held in the evening was known as the national meeting. It was held jointly at the New York headquarters of the Institute and by the five sections in Boston, Philadelphia, Atlanta, Chicago and San Francisco. There were present at New York about 1,100 persons, Boston 500, Philadelphia 850, Atlanta 500, Chicago 1,000 and San Francisco 750. Each of these persons was provided with a telephone receiver connected with the long-distance lines of the American Telephone & Telegraph Company. Listening in on the line were also some 50 members of the Institute each at Denver, Colo., and Salt Lake City, Utah.

The meeting was opened by President John J. Carty at 8:30 p. m. eastern time. The secretary called the roll of the six cities actively participating in the meeting. President Carty then made a brief address extending his greetings to all of the members of the Institute. A message from President Woodrow Wilson was read. A report of the election of officers was then announced. President-elect Buck made a brief address. A short address was then made by Alexander Graham Bell, past-president of the Institute and inventor of the telephone. Dr. Bell referred to the unique character of the meeting and to his pleasure at being able to participate in so remarkable a development of the very simple instrument that he had worked with. He gave full credit to Mr. Carty and the other engineers who had brought it about.

Theodore N. Vail, president of the American Telephone & Telegraph Company, then made a short address.

Charles D. LeMaistre, British representative of the International Electrotechnical Commission, also spoke, bringing greetings from the British electrical engineers. Thomas A. Watson, who was Dr. Bell's assistant in the invention of the telephone, extended his greetings and expressed his pleasure at the wonderful demonstration being made. Throughout these addresses, made from the New York headquarters, all of the listeners in the other cities heard very distinctly all the remarks made.

Then followed local sessions in each of the six cities at which addresses were made as follows: At Boston, by A. Lawrence Lowell, president of Harvard University. At New York, by John H. Finley, president of the University of New York. At Philadelphia, by Edgar F. Smith, provost of the University of Pennsylvania. At Atlanta, by C. E. Ferris, dean of the engineering faculty, University of Tennessee. At Chicago, by Harry Pratt Judson, president of the University of Chicago. At San Francisco, by Ray Lyman Wilbur, president of Leland Stanford Junior University.

At 9:30 eastern time, the national joint meeting was resumed by an interchange of greetings between the six participating sections of the Institute. Then followed the interchange of transmission of national songs. An eloquent address by Michael I. Pupin on "The Engineering Profession" was then delivered from the New York headquarters. Honorary Secretary Ralph W. Pope then made a short address extending his greetings to all of the members within hearing. Before the close of the joint meeting resolutions submitted by H. J. Ryan at San Francisco thanking all those who had been instrumental in bringing about this wonderful meeting were seconded by D. C. Jackson in Boston and, after being amended in Philadelphia, were submitted to a vote of the membership present in the six cities; unanimous adoption followed. A motion to adjourn was made in Atlanta, seconded in Chicago, and carried. Before breaking up the gathering in some of the cities further ceremonies were conducted locally, including displays by motion pictures showing the building of the transcontinental telephone line.

GENERAL UTILITY PROBLEMS DISCUSSED BY MISSOURI PUBLIC UTILITIES ASSOCIATION.

Committee to Consider Affiliation with National Electric Light Association.

Representing several classes of utilities, including electric light, power, and street-railway companies, gas and water companies, the tenth annual convention of the Missouri Public Utilities Association last week considered a large variety of utility problems. Following the custom of several years, the association held its convention on board the Steamer *Quincy* on a trip up the Mississippi and Illinois Rivers. The convention cruise began at St. Louis, Mo., on May 11. Peoria, Ill., was reached the next day and the return to St. Louis was made late on May 13. Despite cold and damp weather the trip was a very successful one, over 200 persons being in attendance; this was the largest meeting ever held by the association.

The first session of the convention was opened by President G. E. Hayler, Jr., who introduced Mayor Henry W. Kiel of St. Louis, who was again a special guest of the association. Mayor Kiel spoke briefly of the former tendency to overdo utility regulation which has been particularly noticeable as regards the railroads. He was glad to see the dawn of a better feeling between the utilities and the public. President E. W. Lloyd of the National Electric Light Association, who also was a special guest, made an address on the great extent of the activities of

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the National Association and touched on the need for such an organization to consider broad utility subjects, also the need of state or geographical associations to consider local problems. He urged co-operation of the national and state associations.

In his presidential address, Mr. Hayler said that the Missouri association was in better condition than ever. Regarding legislation he said there was need in Missouri for a workman's compensation law. He touched on the great value of the National Electrical Safety Code, which is now being formulated, and spoke in a very complimentary way of the broad policy followed by the Missouri Public Service Commission.

A paper entitled "An Outline for the Determination of Rate Schedules," was presented by J. A. Whitlow, of the engineering staff of the Missouri Public Service Commission. He gave an outline of a method of arriving at a fair rate schedule in a middle-sized city based on the three-charge idea. He gave an analysis of the appraisal cost of the plant. the load of six different classes of customers, the distribution of annual charges, etc., and then showed how the rates were computed for the six classes of business lighting, residence lighting. white way lighting, series arc lighting, flat-rate signs, and power customers.

Another paper dealing with rates was that entitled "The Minimum Charge for Electric Service," presented by V. L. Board, rate engineer of the Doherty Operating Company. He discussed the importance of fixing rates as closely as possible to actual cost of serving different classes of customers, remembering that a utility sells not only electric current, but a service. This involves careful analysis of all the costs. Mr. Board showed that a minimum charge is a fair way to spread the customer charge.

A paper on "Gas-Metering Problems" was presented by F. F. Schaurer, of the Kansas City Gas Company, and a paper on "Gas Appliances for Hotel Service," by E. J. Seely, was read by title in the absence of the author.

At the evening session there was an illustrated lecture by J. C. Thirlwell, of the General Electric Company, on "Electrification of the Chicago, Milwaukee & St. Paul Railway." C. C. Chapelle, of the Railway Improvement Company, read a paper entitled "Car Operation and Efficiency and Methods for Checking Such Efficiency." This paper dealt principally with a description of an instrument for automatically recording coasting. A paper prepared by C. E. Stephens, of the Westinghouse Electric & Manufacturing Company, was read by W. P. Hurley in the absence of the author. It was entitled "The Future Street Lamp" and reviewed the present types of lamps used for street lighting and their relative advantages, pointing out that both the improved arc and incandescent lamps have a field of their own.

On Friday morning the first paper presented was entitled "The Industrial Heating Business as a Factor in Central-Station Development." It was prepared by Henry O. Loebell, but in his absence was read by H. C. Porter, of St. Joseph, Mo. It discussed the use of gas and electricity for industrial heating, pointing out methods by which each of these can be stimulated. Regarding electric heating, Mr. Loebell stated that it has three noteworthy advantages: first, that almost any range of temperature may be obtained regardless of quantity of heat; second, that any quantity of heat can be obtained regardless of temperature, and with very small temperature differentials; third, due to its physical nature, the problem of ventilation is entirely eliminated. The paper was discussed by F. D. Beardslee, V. L. Elbert, F. M. Webber, F. F. Schaurer, Hugo Wurdack, C. S. Ruffner and E. W. Lloyd. Mr. Lloyd spoke of the rapid development of electrical industrial heating business. Considerable data on this subject have been gathered by Mr. Loebell and Dr. Hirschfield. The automobile business in Toledo and Detroit has brought this matter to the front. He spoke of the importance of electrochemical development and furnace heating. He said that industrial heating, electrochemical load, ice making with electric power and similar classes of business must be taken up by the commercial man who is willing to do or at least study the scientific research work done in these fields.

H. C. Kimbrough, of the American District Steam Company, then presented a paper entitled "Some Phases of Central-Station Heating in Connection With Public Utilities." This paper touched on the growth of district heating and pointed out that vast opportunities still are available for future development. Some details of carrying on this business were referred to and it was shown that the profits may be made quite considerable. The paper was discussed by V. L. Elbert, J. H. Van Brunt, E. D. Bell, J. E. Hellerman, H. C. Kimbrough, E. R. Locke, H. Wurdack and J. A. Whitlow.

A paper on "Fallacies of Municipal Electric Light Plants," was read by J. B. Wooten, editor of the *Public Service Magazine*. He showed that the chief trouble with municipal ownership is politics. If there were one class of utility business in which municipal ownership should be particularly successful, it is the supply of water, and yet there are many municipal water plants that are unsuccessful. Numerous cases of municipal electric plants were cited that are a burden to the taxpayers. Such book records as are kept show an apparent profit from the lighting plant, but in scarcely any case are proper allowances made for fixed charges, depreciation, taxes, etc. In nearly all cases general taxation must make up the real deficit in the operation of the plant. Several instances were cited in which, although the book records show a distinct success, actual analysis proved that the plants had been operating at a loss every year since they had been started. The case of the Cleveland municipal plant was given special attention, and it was stated that the fixed charges of the plant are being paid by general taxation. Numerous citations were made from proceedings of public utilities commissions showing the common mismanagement and improper accounting of municipal plants.

The final session was held Saturday morning and opened with the presentation of a paper by W. D. Stuckenberg, of the Commercial Testing & Engineering Company. This paper was entitled "Coal Testing as a Basis for Purchasing Fuel." This dealt particularly with an improved method of sampling and testing coal. The final paper, prepared by A. E. Flowers, professor of electrical engineering, Ohio State University, was entitled "Cylinder Lubrication Testing;" in the absence of the author the paper was read by title.

The convention then took up routine business matters, such as annual reports of several of its committees and officers. An amendment to the constitution revising the dues of members from small towns was adopted. The election of officers for the ensuing year resulted in the choice of the following:

President, Hugo Wurdack, Light & Development Company, St. Louis.

First vice-president, Bruce Cameron, St. Louis.

Second vice-president, J. H. Van Brunt, St. Joseph.

Third vice-president, J. M. Scott, Kansas City.

Secretary-treasurer, F. D. Beardslee, St. Louis.

Executive Committee, two new members for two years. G. E. Hayler, Jr., A. F. Van Diense.

Public Affairs Committee, H. Spoehrer, Edward Smith, S. E. Bronson, C. L. Holman.

Brief addresses were made by President-elect Wurdack and by Secretary Beardslee. The association decided in favor of holding the next year's convention aboard boat.

Throughout the trip numerous entertainment features, including quite a number of contests for the ladies present, were provided. At Peoria members of the association were taken to the Illinois Valley Yacht Club.

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JOINT CONVENTION OF IOWA UTILITY ASSOCIATIONS PROVES VERY SUCCESSFUL.

Meeting at Dubuque First of Its Kind Ever Held in Iowa.

The first annual joint convention of the Iowa Section of the National Electric Light Association, the Iowa District Gas Association, and the Iowa Street and Interurban Railway Association, was held in Dubuque, Iowa, May 10-12. Three joint sessions were held and each organization held three separate sessions. The joint convention proved to be a very successful arrangement and those in attendance benefited by receiving a broader range of information and making a greater exchange of ideas.

The first joint session was called to order May 10 by E. M. Walker, of Dubuque, president of the Iowa Section, after which Mayor James Saul welcomed the delegates to the city, H. C. Blackwell, of Davenport, responding. George McLean, of Dubuque, presented a paper on "The Theory of Public Utility Franchises." The true and safe theory is mutuality, or reciprocity, and should govern the conditions of all public service franchises, the public utility performing the service for the municipality. Limitation of the franchise period, special taxation of utilities, the impairment of credit by legislation, all are indicative of the lack of mutuality. A profit-sharing plan, with a standard rate and dividend, was advocated.

The first session of the Iowa Section was opened the afternoon of May 10 with the address of President Walker who reviewed the year's activities and recommended the establishment of a permanent association office in Des Moines, and also calling attention to the importance of hearings before the Board of Railroad Commissioners on interference of telephone and transmission lines. R. H. Fowler, of Des Moines, assistant secretary-treasurer, in the absence of W. H. Thomson, Jr., secretary-treasurer, presented that officer's report. J. M. Drabelle, of Cedar Rapids, chairman of the telephone interference committee, submitted the committee's report, which was very comprehensive, giving the experiences of Association members, the results of a series of experiments conducted by the committee, court decisions and other data. Messrs. Walker and Rulison, of the Bell Telephone System, addressed the meeting and offered the co-operation of their company in solving the problems of this troublesome question. H. C. Blackwell presented the report of the public relations committee, which brought some very pertinent facts regarding the attitude of utilities and their employees in dealing with the public. In the absence of C. E. Fahrney, of Ottumwa, chairman of the special accounting committee, its report was read by Mr. Ballard, of Ottumwa.

The second joint session was held the morning of May 11, at which Samuel Insull, president of the Commonwealth Edison Company, Chicago, Ill., gave an address on "Some Comments on Public Utility Commissions and Their Relations With Public Utility Companies." Illustrating the importance and growth of public utilities, Mr. Insull quoted figures in gross earnings, taxes and wages paid, and amount of capital stock issued, and pointed out that the capitalization was very conservative. The regulation of public utilities is favored by Mr. Insull, who read from an address he made when president of the National Electric Light Association 18 years ago, stating that the right of the state to regulate public utilities should be recognized. If the laws governing commissions are proper competition will be removed and utilities will be able to reduce rates. If the commission is composed of disinterested parties, public confidence is gained, and utilities have protection as well as regulation. Stress was laid on the necessity of cordial relations between public utilities and the community served, to be obtained by frank and candid dealing.

At the third joint session in the afternoon A. J. Bates, manager of the Bates Expanded Steel Truss Company, Chicago, Ill., gave an illustrated lecture on the manufacture and use of steel poles.

At the session of Iowa Section on the morning of May 12, Dr. Saul Dushman, of the Research Laboratory, General Electric Company, spoke on "The Results of Increased Knowledge of the Nature of Electricity." He explained the extent the world of science has gone to find out what electricity is, giving a discourse on the action of electrons as regards the X-ray. R. E. Lee, of Clarinda, presented the committee report on the "Draft of Model Contract Between Municipalities and Central Stations for Street Lighting," which was recommended as a guide to Association members. J. P. Ingle, of Keokuk, presented the committee report on "Fire Insurance Rates as Affected by the New Law," which covered a comparison between Dean's analytical schedule now used and the central traction lighting bureau schedule formerly used. W. H. Burtis, of Decorah, presented the committee report on "Possibilities of Business From Rural Transmission Lines," which advised the desirability of this class of business.

At the afternoon session M. J. Lyon presented the committee report on the "Draft of Recommended Ordinance Regulating Electrical Construction in the Smaller Towns," and E. S. Soukup presented that on "Collection and Compilation of Rates Charged Municipalities for Street Lighting and Water Pumping." Data from 80 stations were given. Austin Burt, of Waterloo, presented the report of the facts and factors committee, giving statistics on central-station operation in Iowa during 1915.

The following officers of the Iowa Section were elected for the ensuing year: J. M. Drabelle, Cedar Rapids, president; H. Bellamy, Knoxville, vice-president; L. E. Caldwell, Iowa City, secretary-treasurer; R. H. Fowler, Des Moines, assistant secretary-treasurer, and E. M. Walker, Dubuque; W. H. Abbott, Shenandoah; Chris Miller, Claremont, and H. C. Blackwell, Davenport, to serve in conjunction with the officers as the executive committee.

Important Extension of Chicago Street-Lighting System Proposed.

The City Council of Chicago has authorized a referendum vote on June 5 on a proposed bond issue of $3,750,000 to provide for extension and betterment of the municipal street-lighting system. From part of the funds made available by this proposed issue it is contemplated to install electrical generating equipment for street lighting at the new Stoney Island Avenue garbage-incinerating plant, and to use the heat developed in this plant under steam boilers. It is proposed to generate about 2,000 kilowatts here. At the new municipal power and heating plant being built for a group of institutions and shop buildings for the city in the vicinity of the city prison, it is proposed to install about 1,500 to 2,000 kilowatts in generating equipment which will be utilized for street lighting at night. The need for these steam plants arises from the fact that the city is unable to secure more current from the Sanitary District of Chicago which now supplies all of the street-lighting load.

The bulk of the expenditure will go for extensions of the street-lighting system whereby all of the gas and gasoline lamps now in service will be replaced by electric lamps. It is contemplated to add 5,500 600-candlepower, 300-watt gas-filled tungsten lamps and 3,500 100-candlepower, 75-watt gas-filled lamps. About 1,500 arc lamps in the South Chicago district now rented from the Commonwealth Edison Company at $75 per year will be replaced by a larger number of city lamps of the standard types at a considerable saving per annum and also an increase of fully 100 per cent in the light furnished. The very large number of low-wattage lamps will be used on residence streets in a new type of post using either the Novalux or a similar fixture.

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Utah Club Hears Address on Nitrogen Fixation by Electricity.

At the regular meeting of the Utah Electric Club held in Salt Lake City, May 11, Lafayette Hanchett, of the National Copper Bank of Salt Lake City, gave an address on "The Fixation of Nitrogen From the Air by Electricity." Mr. Hanchett reviewed briefly the history of the development of this process and described the principal processes in use. He brought out the rather surprising fact that only eight-tenths of one per cent of the total power utilized for this purpose is in the United States. The fact that this country might find itself in a shocking state of unpreparedness, so far as the supply of raw materials, in case it were forced into war with any world power was emphasized. Nitrates for manufacturing powder must then be secured from Chili and a closure of this trade route would result in a serious situation. He stated that the production of nitric acid from the air is commercially feasible wherever electric power is available at a rate of $9 per horsepower per year, and because this figure is not likely to prove attractive to private enterprises, he considers it important that the government undertake the development of unused water powers for this purpose.

Mr. Hanchett suggested that the club present a memorial to its representatives in Congress urging them to lend their support to such a project, and a committee consisting of Mr. Hanchettt, B. W. Mendenhall and H. T. Plumb was appointed for the purpose.

Various Topics Discussed at Meeting of Empire State Association.

The mid-year meeting of the Empire State Gas and Electric Association was held in the Iroquois Hotel, Buffalo, N. Y., May 4 and 5. J. C. DeLong, president of the Association, presided at both sessions and there were about 60 delegates in attendance.

At the first session H. M. Beugler, chairman of the committee on railroad crossings, submitted a preliminary report containing a memorandum by counsel in which reference was made to many legal decisions. The commercial committee, A. D. Dudley, chairman, reported on a sample form of application card, illustrating the report by showing a picture of the card on the screen. Considerable discussion ensued as to how much in the way of company rules and regulations it was necessary to print on the application form, the consensus of opinion appearing to be that very little of this material was necessary if proper reference were made to the schedule of rates on file with the Commission. Papers were presented by H. L. Coleman, general manager of the Empire Gas & Electric Company on "Personal Work in the Community by Officers and Employees of the Lighting Company"; by T. H. Yawger, superintendent of the electrical department of the Rochester Railway & Light Company, on "Giving Out News Stories to Newspapers"; by E. F. Tweedy, commercial engineer of the New York Edison Company, on "The Use of Charts and Curves for Publicity Purposes," and by C. G. M. Thomas, president of the New York & Queens Electric Light & Power Company, on "Company Bulletins." An interesting discussion followed the reading of these papers.

The second day's session was opened by a paper by M. O. DellPlain, engineer, Syracuse Lighting Company, on "Department Store and Hotel Electric Business." This was followed by a very complete discussion of the "Prepayment-Meter Situation," by G. H. Smith, assistant district superintendent of the Central Hudson Gas & Electric Company. After luncheon L. E. Cass, manager of the coke department of the Mohawk Gas Company, presented a paper on "Marketing Coke," and E. C. Peebles, manager of the Rockland Light & Power Company, read a paper on "Domestic Consumers." All of these papers brought out valuable discussion.

Many of the delegates availed themselves of the opportunity of visiting the offices and show rooms of the Buffalo General Electric Company, the Iroquois Natural Gas Company and the Robertson-Cataract Electric Company.

Kentucky Contractors Hold Annual Convention.

Practically a full attendance signalized the third annual convention of the Kentucky Association of Electrical Contractors held in Louisville during the week. Aside from the local members, representatives were present from Lexington, Owensboro, Paducah and Frankfort. It was a one-day session, closing with a banquet in the evening.

At the banquet addresses were delivered by Frederick Gamut of the General Electric Company, on "Hydro-electric Power;" Carl A. Klemm, of the Westinghouse Electric & Manufacturing Company; Robert Montgomery, of the Louisville Gas & Electric Company, and J. B. Ohligschlager, of the National Concrete Construction Company, who discussed "Closer Co-operation Between the Sub-Contractor and the General Contractor."

Frank Good, of F. A. Clegg & Company, who represented the state at the San Francisco meeting of the national organization, made a report, and was again chosen as delegate to represent the organization at the national convention to be held in New York City in July. Paducah was selected as the next convention city for the Kentucky contractors and officers were elected as follows: John Dabney, Paducah, president; Charles L. Daubert, Louisville, vice-president; H. J. Valnoti, Louisville, secretary; Herbert E. Ottenheimer, Louisville, treasurer.

Ohio Meter Committee Holds Meeting.

The Ohio Electric Light Association Meter Committee held a convention at Newark, O., on May 11. The meeting was held at the Warden Hotel. The morning was spent in an inspection of the new plant and meter department of the Ohio Light & Power Company. Luncheon was served at the Warden Hotel, after which the meeting was called to order. A very hearty address of welcome was given by E. S. Hollingsworth, new-business manager of the Newark company, who emphasized the absolute necessity of co-operation between the men of the meter departments and those of the sales departments, and he suggested that a joint conference of the two committees be held.

Four very interesting papers were presented. The first was "The Value of Meter Accuracy Records and the Cost of Service Testing," by G. E. Snider, of the Toledo Railways & Light Company. It was the purpose of this paper to prove the necessity of periodic meter testing and the proper classification and tabulation of the results of such tests when made.

"The Relation of the Meter Department to Bill Complaints," by Ray Wolford, of the Ohio Light & Power Company, Newark, brought out a great deal of discussion as to the methods of investigating these complaints.

"Care and Use of Instruments and Standards," by O. C. Jordan, of the Columbus Railway, Power & Light Company, outlined methods of maintaining continued accuracy and dependability of testing apparatus.

"Some Important Points for Consideration in Connection with Direct-Current Meter Testing," by W. A. Halliday, of the Cleveland Electric Illuminating Company, dealt particularly with the inaccuracies introduced into metering methods and meter testing by stray magnetic fields and outlined a method of procedure to follow to eliminate as far as possible the effects of these fields.

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OFFICIAL PUBLIC SERVICE REPORTS.

State Commissions Arrange for Official Publication of Decisions.

The public service, railway and corporation commissions of the several states, through the National Association of Railway Commissioners, with which all the state commissions are affiliated, have completed arrangements for the official publication of all state-commission decisions, under the title "Official Public Service Reports," giving it the exclusive advantage of authoritativeness. As a result of its official relation to the commissions, it will have also the advantages of entire completeness and promptness of issuance. The effort is to serve fairly the interests of the public and the public service corporations by nonpartisan editing and digesting and full statement of all points in all decisions.

It is designed as a practical magazine for lawyer, manager, financier and administrator. The problem of keeping currently informed of the progress of regulation and public service activities in every part of the country, without at the same time taxing one's time, labor and patience, is solved by the plan of weekly publication. Each number of the Advance Sheets contains a complete index-digest, simply and effectively arranged, enabling every department head in a public service company or any other person readily to locate from week to week all the current material in which he is interested. This subject-index is thoroughly cross-referenced so that every avenue leading the searcher quickly to the subject matter desired may be open.

The efforts of the state commissions to secure an official publication of all decisions began at the 1914 annual meeting of the National Association of Railway Commissioners, when there was authorized the appointment of a committee to arrange for an official publication. This committee presented to the 1915 annual meeting of the Association in San Francisco, a report which was unanimously adopted, awarding the contract to publish "Official Public Service Reports" to the Law Reporting Company, of New York City, and authorizing it to form a separate corporation to handle the publication. Pursuant to the arrangement, the Law Publishing Company was formed as the business agency of the publication and has established its publishing plant and editorial offices at 74 Broadway, New York City.

After considering all those who were equipped to do the editorial work, by training, temperament and experience in public service matters, the Committee on Publication and the Law Publishing Company united in the selection of J. H. Goetz, then assistant counsel to the New York Public Service Commission, First District, as editor-in-chief, and W. H. Bohling, of the Missouri Public Service Commission, as assistant to the editor-in-chief. They are conducting the editorial work on the publication under the direction of Franklin W. Allen, secretary of the Law Publishing Company, who has been official reporter of the Interstate Commerce Commission since 1908, and subject to the supervision of the Committee on Publication of Decisions of the National Association of Railway Commissioners.

This system of reports and digests is published in weekly advance sheets with headnotes and syllabus digest, and permanent volumes of about 1,200 pages each, standard law style, bound in law buckram, paging the same as in advance sheets, with tables of cases and statutes construed, and complete syllabus digest index for each volume. The publication comprises:

(1) Commission Decisions. All decisions handed down by state or municipal public service, railway or corporation commissions.

(2) Court Decisions. All decisions handed down by state and federal courts reviewing or affecting commission decisions or relating to regulation of public utilities.

(3) Headnotes. Full and complete headnotes to cover each point in each case reported.

(4) Syllabus Digest. A subject index and syllabus digest in each volume and in each number of the advance sheets.

(5) Annual Digest. An annual digest, including all index and digest entries in all volumes issued during the year.

(6) Supplementary Digest covering published decisions of commissions and courts, as described in paragraphs 1 and 2, handed down from 1907 to 1914, inclusive, with references therein to present editions of reports.

(7) Legislative Supplement. All laws and amendments to existing laws, relating to public service, corporation and railway commissions, to be printed in the weekly advance sheets, as they become laws, and to be printed annually in a separate volume, as a legislative supplement.

Conduit Companies in Peculiar Situation.

A peculiar situation has grown out of the litigation of the National Metal Molding Company, of Pittsburgh, Pa., and the Tubular Woven Fabric Company, of Pawtucket, R. I., in the suit over the Osborn patent, No. 652,806, involving infringement of flexible non-metallic conduit. The National Metal Molding Company was the victor in the litigation, but the Tubular Woven Fabric Company announced immediately to the trade that it would continue to manufacture "Duraduct" because of the fact that it had produced an improved conduit construction which did not infringe and was not susceptible to the patent restrictions.

It appears now, according to the Tubular Woven Fabric Company, that the National Metal Molding Company, in circularizing the trade, published certain statements which are likely to lead to a misapprehension as to the scope of the injunction, and likely also to create the impression that the use of the trade name "Duraduct" is enjoined. Therefore the Tubular Woven Fabric Company sought legal restraint and on April 25 the District Court of the United States for Rhode Island issued an order restraining the National Metal Molding Company from sending out letters or circulars similar to those of which the Tubular Woven Fabric Company complained. The court has gone even further and ordered the National Metal Molding Company to supply the other company with a list of the parties to whom the circulars had been sent and ordered it also to send another letter to the parties to whom the original circulars and others were addressed, stating that the injunction order does not prevent the use by the defendant of the trade name "Duraduct" upon any article not infringing the adjudicated claims of the Osborn patent, No. 652,806, in suit.

Manufacturers of Electrical Fixtures to Meet in New York May 25.

There will be a meeting of the manufacturers of electrical fixtures on May 25 at 2:00 p. m. at the Biltmore, New York City, for the formation of a section covering this particular line of the industry in the Associated Manufacturers of Electrical Supplies. This meeting has been called on the request of a number of manufacturers interested, who feel that an electrical fixture section will result in a great good to the trade in general, and from the responses already received the meeting promises to be a representative one.

It has been the aim of the general secretary, Charles E. Dustin, in issuing the invitations to include all manufacturers, whether members of the Association or not, who are interested in this line.

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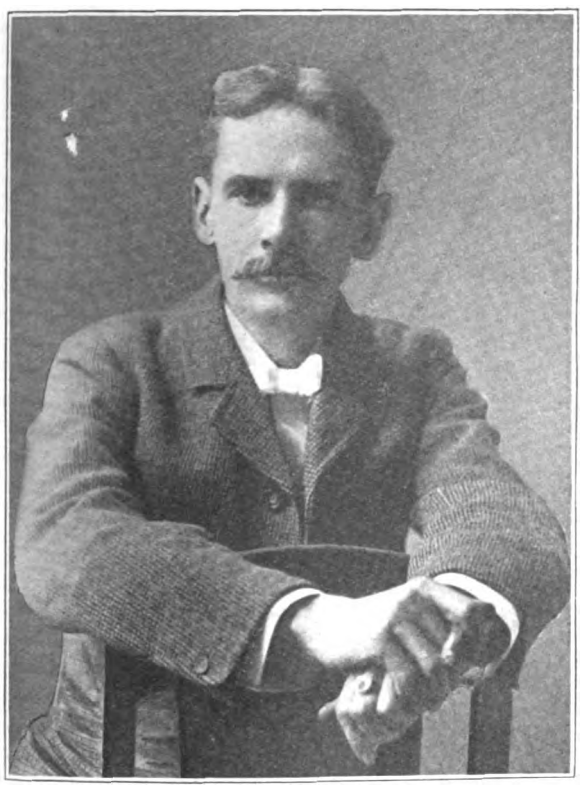
WILLIAM STANLEY DIES.

Noted Electrical Engineer and Inventor Dies at His Home in Great Barrington, Mass., May 14.

William Stanley, one of the foremost inventors and engineers in the electrical industry and former vice-president of the American Institute of Electrical Engineers, died at his home in Great Barrington, Mass, May 14, at the age of 58 years.

Mr. Stanley's most notable invention was the electrical transformer, which made the alternating-current system of long-distance transmission of electrical energy a commercial possibility. For this invention the Edison medal, recognized as the highest honor to be attained in the American electrical field, was awarded to him in 1912 by the American Institute of Electrical Engineers. With Mr. Stanley's discoveries electrical transmission was revolutionized. Where-



William Stanley.

as previously a half mile had been the limit of transmission, by his system energy was transmitted over small wires, without appreciable loss, for distances up to 250 miles.

Among other devices he perfected were the first watt-hour meter, and the first compensated meter, and among the important inventions perfected by Mr. Stanley and others jointly is the inductor type of generator, known as the S. K. C. system, in honor of its discoverers, John F. Kelly and C. C. Chesney collaborating with Mr. Stanley.

Born in Brooklyn, November 22, 1858, Mr. Stanley received his early education at Williston Seminary, Easthampton, Mass. He entered Yale University as a member of the class of 1881. While at college he became interested deeply in matters electrical, and decided to devote his time to developing the practical side of the art, in which he saw great commercial possibilities. Giving up his course at Yale, he became associated with other pioneers in the field of electrical invention. One of these was Hiram Maxim, founder of the United States Electric Light Company, being his assistant. In 1881 Mr. Stanley was assistant to Edward Weston, of the Weston Electric Light Company, and engaged in the development of the Weston arc-lighting system. In 1882 he carried on experiments for the Swan Electric Light Company, of Boston, and invented and perfected methods of exhaustion of incandescent-lamp globes. During 1883 and 1884 Mr. Stanley conducted a private laboratory at Englewood, N. J., devoting his time to experimental work on storage batteries, the perfection of methods for the manufacture of incandescent lamps, and other electrical engineering problems.

In 1885 Mr. Stanley accepted the post of chief engineer of the Westinghouse Electric & Manufacturing Company, of Pittsburgh, retaining that position until 1888, when he moved to Great Barrington. While with the Westinghouse concern Mr. Stanley obtained his first patents on the alternating-current system. In 1890 Mr. Stanley established in Pittsfield, with Messrs. Kelly and Chesney, the Stanley Electric Company, the first concern to develop the alternating-current system. In 1905 the concern was purchased by the General Electric Company, Mr. Stanley being retained on that company's technical staff, but devoting much of his time to inventive effort.

Mr. Stanley was a member of many societies and received a number of diplomas for his work, in addition to the Edison medal. He was a member of the British Institution of Electrical Engineers, and was actively prominent in the American Institute of Electric Engineers. Problems of technical education were of especial interest to Mr. Stanley, and the high ideals which were a part of his nature he imparted to many of the younger electrical students and engineers with whom he came in contact. He possessed a very charming personality, and the high esteem and regard in which he was held throughout the country was evidenced by the numerous telegrams of condolence sent to his widow, six sons and three daughters, who survive him.

Safety Exposition Will Show Preparedness.

Military hygiene and camp sanitation will play a prominent part in the third National Exposition of Safety and Sanitation, which opens May 22 in Grand Central Palace, New York City, under the auspices of the American Museum of Safety. Surgeon-General Gorgas, U. S. A., is sending a unit of a modern field hospital, which can be packed on the back of a pack-animal. Water purification bags used by the army and the method of killing all germs in water will be shown. Experts of the American Museum of Safety have made an exhaustive study of camp and military hygiene and the result of their work will be exhibited in co-operation with the United States War Department.

"The shortest route to preparedness is through safety," said Arthur Williams, president of the American Museum of Safety, in speaking of the plans and scope of the Safety Exposition. "When we are destroying in our peaceful industries an army of 35,000 annually and maiming nearly 1,600,000 every year besides, how can we expect to have anyone left for defense. The purpose of the Safety Exposition is to show how 50 per cent or more of this annual waste of life and limb can be prevented. Lack of preparedness was far more cruel and cost more lives at the time of the Spanish War than did the war itself. We hope to show at the forthcoming Safety Exposition as well as possible in our limited amount of space, how an army is taken care of in the field."

Excessive Tax Refunded to Utility Company.

The state of Kentucky, under a recent decision of the Court of Appeals, must restore to the Louisville Gas & Electric Company $7,850, held to be excessive in the tax paid in connection with organization of the company. The company was incorporated at $10,000,000, about $2,150,000 more than the aggregate capitalization of the consolidated companies. It contended that it should be required to pay the organization tax only on this margin of difference, but finally paid on the whole issue at the rate of one-tenth of one per cent. The highest court in the state has sustained the contention of the company.

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Final Preparations for N. E. L. A. Convention

A very large proportion of the committee reports and papers to be presented at the 22 sessions of the National Electric Light Association convention in Chicago May 22-26 are now in print. Unless something untoward happens, all of the papers and reports will be in printed form ready for the delegates when the convention opens.

Secretary T. C. Martin announces one change in the order of sessions. The first Electric Vehicle session will be held on Wednesday afternoon instead of Wednesday morning. Following this the second Electric Vehicle session will be held on Thursday morning and the third on Thursday afternoon.

Headquarters of the secretary and his staff, and of the general convention committee and the various sub-committees, including the registration booths, the hotel committee and the entertainment committee, will be maintained in the second floor foyer of the Auditorium Theater, Congress Street near Wabash Avenue. An organization of about 50 or 60 of the employees of the Commonwealth Edison Company will be in attendance at convention headquarters in addition to Secretary Martin and his immediate assistants.

Samuel Insull is chairman of the general convention committee, and Louis A. Ferguson is vice-chairman. The secretaries of the convention committee are Ernest A. Edkins and Harry E. Wing. Chairmen of the sub-committees are: Finance, John H. Gulick; Reception, Louis A. Ferguson; Local Industries, William L. Abbott; Hotels, Ernest A. Edkins; Entertainment, Homer E. Niesz; Ladies' Auxiliary, Mrs. Edward W. Lloyd; Local Registration, Oliver R. Hogue; Local Transportation (also N. E. L. A. master of transportation), G. A. Freeman.

Special Train Service.—The "Red Special" train will leave the Grand Central Terminal in New York City at 12:50 p. m. on May 21. This train will pass through Schenectady at 4:57 p. m. and Buffalo at 11:02 p. m. Boston cars, connecting at Albany, will leave at 10 a. m. on May 21, and there will be a special car at Cleveland ready for occupancy at 9 p. m. on May 21. This train will arrive at the La Salle Street station at 11:50 a. m. on May 22. It will be under the personal direction of Ray D. Lillibridge.

The "Pink Special" train will leave the Pennsylvania Terminal in New York City at 11:06 a. m. on May 21. This train will leave the Broad Street station in Philadelphia at 1:25 p. m. and Pittsburgh at 10 p. m., arriving at the Union Station in Chicago at 10 a. m. on May 22. Washington and Baltimore delegates may connect with this train at Harrisburg. The train will be under the personal direction of J. C. McQuiston, East Pittsburgh, Pa.

The "Purple Special" train will leave the Union Station in St. Louis, via the Chicago & Alton, at 9 a. m. on May 22, arriving at the Union Station in Chicago at 4:45 p. m. on the same day. This train will be under the personal direction of Ell C. Bennett, St. Louis.

From the Chicago convention committee cards of wel-

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come will be distributed on each of these trains. The local entertainment committee will meet all special trains with automobiles to convey visitors to their hotels. The cards from the Chicago committee distributed on the trains will give information about this arrangement, and also about the transfer of baggage.

Exhibition.

Secretary McConnaughy of the exhibition committee has been put to it to find enough space for Class D members who want to exhibit. The exhibition will be held in the Auditorium Theater, including boxes and lobbies. It will be opened at 9 a. m. on Tuesday, May 23 (or perhaps on Monday night) and will be open from 9 a. m. to 6 p. m. on Tuesday, Wednesday, Thursday and Friday of the convention week. Possibly the exhibition will be open on Tuesday and Thursday evenings. So far as known at the present writing, admission to the exhibition will be restricted to persons wearing the convention badge.

Entertainment Features.

The formal reception given by President Lloyd and the other officers of the association to delegates and visitors will be held at 9 p. m. on Monday, May 22, in the Gold Room of the Congress Hotel. Following the reception there will be dancing and light refreshments in the Elizabethan Room of the Congress Hotel.

At noon on Tuesday, May 23, automobiles will be in waiting at the Auditorium and Congress Hotels to convey the out-of-town visiting ladies for a drive through the South Side Parks and boulevards. Electric automobiles will take the lead in this procession. Luncheon will be served to the ladies at the South Shore Country Club at 1:30 p. m. This will be followed by an entertainment consisting of music and dancing numbers arranged by Carlos Sebastian. The ladies will also have the pleasure of witnessing a Style Show arranged by Charles A. Stevens & Brothers. This is quite an elaborate feature of the entertainment for the out-of-town ladies. Returning by a different route, the party will reach the down-town hotels about 5 p. m.

At the conclusion of the first general session of Tuesday morning, beginning about noon, there will be a service-installation prize contest between three squads of linemen employed by the Commonwealth Edison Company. This contest will take place in Grant Park at the east end of Van Buren Street viaduct. While it is in progress there will be music by the full Commonwealth Edison band. It is proposed to take a moving picture of this event. There will be three gangs of linemen in the contest, each consisting of a foreman and three other men. The object of the test is to see which gang can first make a connection between a pole line supporting an alternating-current circuit and a section of brick wall about 80 feet distant representing the hear of a house. The first lighting of an incandescent lamp on a section of brick wall will show which squad did the work in the shortest time. The gang that gets its lamp burning first will receive a cash prize of $10 for the foreman and $5 for each of the other men. In addition to this, a bonus will be given to each squad which performs the task in less than 15 minutes. This bonus consists of 15 cents for the foreman and 10 cents for each man for each second under 15 minutes of the elapsed time.

A rejuvenation of the Jovian Order, of which many of the men who will attend the convention are members, will be held at the Palais de Danse, Bismarck Garden, 817 Grace Street, from 5:30 to 7 p. m. on Wednesday evening, May 24. Jovians not registered delegates at the convention may obtain tickets for admission to the Big Frolic of Wednesday evening at the convention headquarters, Auditorium Theater, or at the rejuvenation. Thomas A. Wynne, of Indianapolis, reigning Jupiter of the Jovian Order, will be present and make a short address. It is expected that a large number of other prominent Jovians will be in attendance.

E. W. Lloyd,
President, National Electric Light Association.

The piece de resistance of the entertainment program is the Big Frolic at Bismarck Garden, beginning at 7:45 p. m. on Wednesday evening, May 24. Bismarck Garden is a beautiful amusement park on the North Side. It will be the scene of a mammoth entertainment and carnival, including music, dancing and all sorts of stage shows and side shows, with traveling minstrels and troubadors. There will be a special illumination of the building and grounds and the Frolic proper will end with a grand finale of fireworks with electric-siren accompaniment. Dancing will be continued after the finale of the Frolic.

Bismarck Garden, which is located at Broadway, Grace and North Halsted Streets, is a winter and summer amusement park, having ample inclosed dining halls for inclement weather and a large open garden for the summer season. Therefore, the performance will be given whatever the weather may be. Informal dress is suggested. The total seating capacity of the garden is about 5,000. It is expected that a large number of dinner parties will be arranged for this occasion. Table reservations should be made in advance at the headquarters of the entertainment committee. Taking part in the Big Frolic will be 200 cabaret stars, 50 troubadors and 12 big side shows. About 10,000 favors will be distributed.

Special trains on the Northwestern Elevated Railway will leave the elevated-railway station at East Adams Street and Wabash Avenue at 6:05, 6:10 and 6:15 p. m. on May 24, arriving at Grace Street station, two blocks from Bismarck Garden, in 18 minutes.

A musicale will be given for the out-of-town visiting

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H. A. Wagner,
First Vice-President

W. F. Wells.
Second Vice-President

R. H. Ballard,
Third Vice-President.

ladies at the Blackstone Hotel from 3 to 5 p. m. on Thursday, May 25. Refreshments will be served at the conclution of the musical program.

Convention sessions will be held in the Gold Room and the Florentine Room of the Congress Hotel, and the new Ball Room and Masonic Room of the Auditorium Hotel.

Arrangements have been made by which visitors wearing the convention badge may inspect industrial establishments and other points of interest in Chicago, as the headquarters, stations and substations of the Commonwealth Edison Company, the electrically operated freight tunnels, the Hawthorne works of the Western Electric Company, Fashion electric automobile garage, Pullman shops, Union Stock Yards, etc.

The following is a condensed program:

Tuesday, May 23.

10:00 A. M.—First General Session.

Noon.—Automobile drive through parks and boulevards for out-of-town visiting ladies. The party will take luncheon at the South Shore Country Club, which overlooks Lake Michigan at East Seventieth Street. Other entertainment will be provided.

12:30 P. M. (at conclusion of first general session)—Service-installation prize contest between three squads of linemen employed by the Commonwealth Edison Company. This contest will take place in Grant Park at the east end of Van Buren Street viaduct. While it is in progress there will be music by the full Commonwealth Edison band.

2:30 P. M.—First Technical and Hydroelectric Session.

2:30 P. M.—First Accounting Session.

2:30 P. M.—First Commercial Session.

2:30 P. M.—First Company Section Session.

8:30 P. M.—Second General and Executive Session.

Wednesday, May 24.

10:00 A. M.—Second Accounting Session.

10:00 A. M.—Second Commercial Session.

10:00 A. M.—Third General and Executive Session.

2:30 P. M.—Second Technical and Hydroelectric Session.

2:30 P. M.—Third Commercial Session.

2:30 P. M.—First Electric Vehicle Session.

5:30 P. M.—Rejuvenation of the Jovian Order at the Palais de Danse, Bismarck Garden, 817 Grace Street.

6:00 to 8:00 P. M.—Dinner for those who wish at the Bismarck Garden at $2 a plate.

7:30 P. M.—Big frolic at Bismarck Garden. This is the principal feature of the entertainment program. It is correctly described as a "Mammoth Entertainment and Carnival" with features literally "too numerous for description." The "acts" of the professional performers and the dancing of all who care to dance will continue throughout the evening. Informal dress. Performance rain or shine, as both open spaces and covered enclosures will be available.

R. S. Orr,
Fourth Vice-President.

T. C. Martin,
Secretary.

W. H. Atkins,
Treasurer.

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Thursday, May 25.

10:00 A. M.—Third Technical and Hydroelectric Session.

10:00 A. M.—Third Accounting Session.

10:00 A. M.—Fourth Commercial Session.

10:00 A. M.—Second Electric Vehicle Session.

2:30 P. M.—Fourth Technical and Hydroelectric Session.

2:30 P. M.—Fifth Commercial Session—Power Sales Bureau.

2:30 P. M.—Second Company-Section Session.

2:30 P. M.—Third Electric Vehicle Session.

3:30 P. M.—Musicale at the Blackstone Hotel for out-of-town visiting ladies. Singers and instrumentalists from the Chicago Grand Opera Company.

Friday, May 26.

10:00 A. M.—Fourth General and Executive Session. Adjournment.

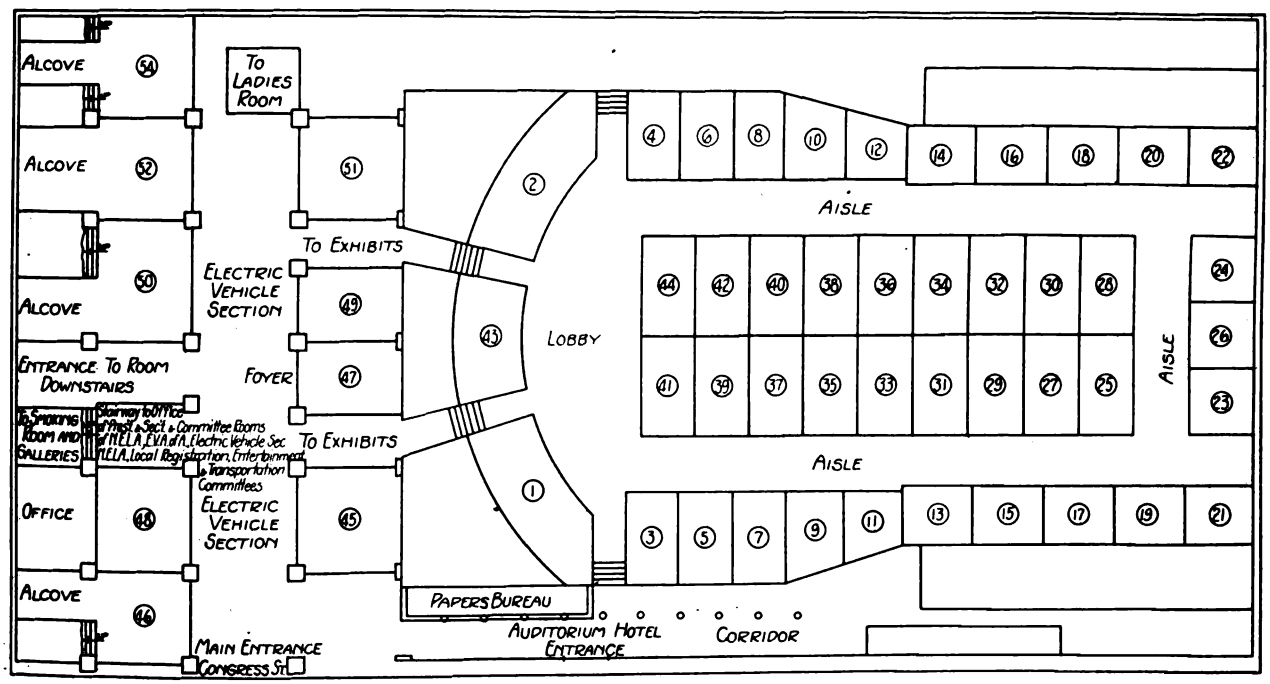
10:00 A. M.—Sixth Commercial Session—Lighting Sales Bureau. Adjournment.

Herewith is given a list of the exhibitors.

American Association of Engineers Discusses Preparedness.

The first annual convention of the American Association of Engineers was held at the rooms of the Western Society of Engineers, Chicago, Ill., May 9 and 10. National preparedness received considerable attention, and resolutions were adopted to call upon the government for blank forms for the registration of the qualifications in order that the engineer may be advised by the government as to where he can best serve his country. The need for accurate military maps of the United States was emphasized.

Reports of the work of the Association during the year were very promising, particularly that done by its service clearing house. The national officers elected for the coming year are Garrison Babcock, president; T. B. Lambert, vice-president; O. F. Gayton, treasurer, and Arthur Kneisel, 29 South La Salle Street, Chicago, Ill., secretary.



Floor Plan of Exhibit Space, Auditorium Theater.

Albert & J. M. Anderson Manufacturing Company, Boston, Mass. 31
American Electrical Heater Company, Detroit, Mich. 25
Anderson Electric Car Company, Detroit, Mich. 50

Bates Expanded Steel Truss Company, Chicago, Ill. 14
Beardesly Electric Company, Los Angeles, Cal. ..... Main Foyer

Century Electric Company, St. Louis, Mo. 29
Chase Electric Company, Chicago, Ill. ..... A
Chicago Reed Ware Manufacturing Company, Chicago, Ill. 57

Delta-Star Electric Company, Chicago, Ill. 22
Detroit Fuse & Manufacturing Company, Detroit, Mich. 10
Duncan Electric Manufacturing Company, Lafayette, Ind. 27

Edison Lamp Works of General Electric Company, Harrison, N. J. 3-5
Edison Storage Battery Company, Orange, N. J. 50A
Electric Products Company, Cleveland, O. 45
Electric Service Supplies Company, Philadelphia, Pa. 35
Electric Storage Battery Company, Philadelphia, Pa. 42
Electrical Record, New York, N. Y. 38
Electrical Review Publishing Company, Chicago, Ill. 13
Electrical World, New York, N. Y. 39-41
Elliott-Fisher Company, Harrisburg, Pa. 30
Eureka Vacuum Cleaner Company, Detroit, Mich. 55

Federal Sign System (Electric), Chicago, Ill. 12

General Electric Company, Schenectady, N. Y. 1
General Vehicle Company, Inc., Long Island City, N. Y. 47
G. & W. Electric Specialty Company, Chicago, Ill. 18

Hoover Suction Sweeper Company, New Berlin, O. 28
Hotpoint Electric Heating Company, Ontario, Cal. 51

Hubbard & Company, Pittsburgh, Pa. 4-6
Hughes Electric Heating Company, Chicago, Ill. 37
Hurley Machine Company, Chicago, Ill. 40
H. W. Johns-Manville Company, New York, N. Y. 9-11

Landers, Frary & Clark, New Britain, Conn. 52
Life Saving Devices, Inc., Chicago, Ill. 8

Metropolitan Engineering Company, New York, N. Y. 32
Moloney Electric Company, St. Louis, Mo. 16

National Lamp Works of General Electric Company, Cleveland, O. 23-26-24

Page & Hill Company, Minneapolis, Minn. 54A
Philadelphia Electrical & Manufacturing Company, Philadelphia, Pa. 53
Philadelphia Storage Battery Company, Philadelphia, Pa. 15
Pittsburgh Transformer Company, Pittsburgh, Pa. 33
Powers Accounting Machine Company, New York, N. Y. 48

Remington Typewriter Company, Inc., New York, N. Y. 59-61
Ruvio Electric Company, New York, N. Y. 54

Sangamo Electric Company, Springfield, Ill. 44
Schweitzer & Conrad, Inc., Chicago, Ill. 20
Standard Underground Cable Company, Pittsburgh, Pa. 7

Tabulating Machine Company, New York, N. Y. 34-36

Wagner Electric Manufacturing Company, St. Louis, Mo. 43
Walker Vehicle Company, Chicago, Ill. 49
Ward Motor Vehicle Company, Mount Vernon, N. Y. 46
Western Electric Company, Inc., New York, N. Y. 17-19-21
Westinghouse Companies, Pittsburgh, Pa. 2

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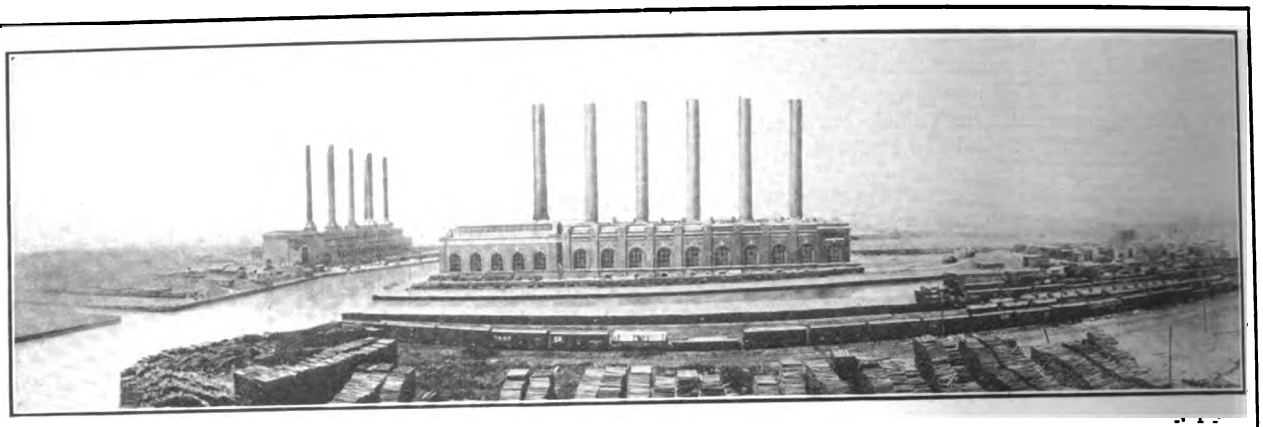


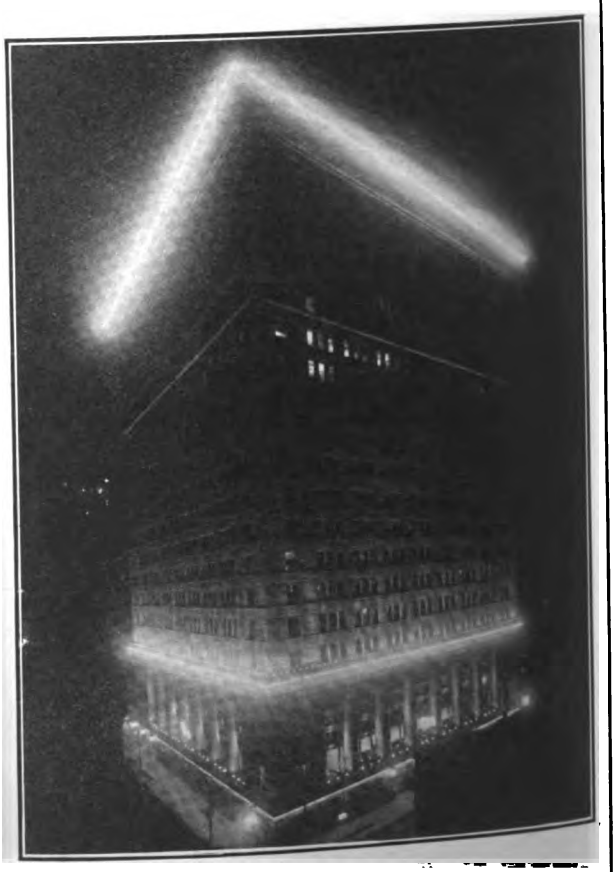
Commonwealth Edison System in Pictures

A Collection of Views Showing Many of the Interesting Features of the Commonwealth Edison Company's Famous Plants and Other Properties—New Units at Fisk and Northwest Stations Shown

With the annual convention of the National Electric Light Association in Chicago considerable interest attaches to the plants and properties of the Commonwealth Edison Company, principally because this company has been one of the pioneers in adopting the most modern and efficient equipment and its properties represent the last word in central-station practice. This progressiveness extends not only to engineering work but also to facilities for serving its customers and caring for its employees.

Detailed descriptions of the various parts of the Commonwealth Edison system have appeared in these columns from time to time. We therefore present herewith, simply a pictorial review of the most interesting points, with the knowledge that the company will welcome all who desire to make a personal visit to any or all plants.

Edison Building.
This mammoth structure, located at 72 West Adams Street, is the new home of the Commonwealth Edison Company.



Night View, Edison Building.
A temporary installation of outline and flood lighting which will be replaced by an elaborate installation.

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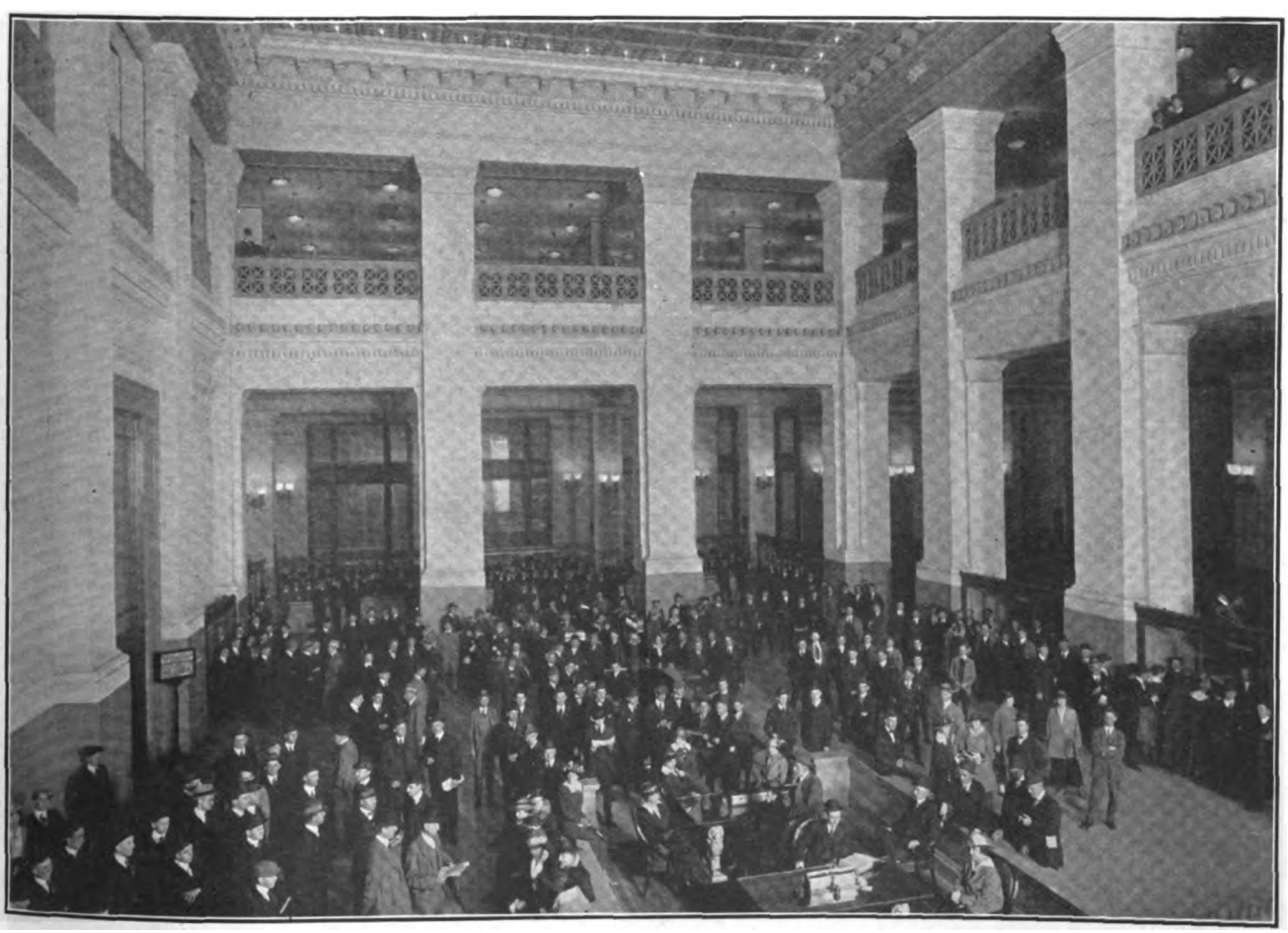
General View of Electric Shop in Edison Building.

This elaborate display room occupies practically the whole of the ground floor of the Edison Building, with entrances from two streets, and is arranged for displaying everything electrical from a cigar lighter to an electric vehicle.



Section of Customers' Hall in Edison Building.

Taking the attitude that a customer's impression of the company is influenced largely by his reception when coming to transact business, the Edison Company spared no expense here in providing every facility for the customer's convenience. Customers' Hall is a dignified, imposing room, yet it appears neither cold nor formal.

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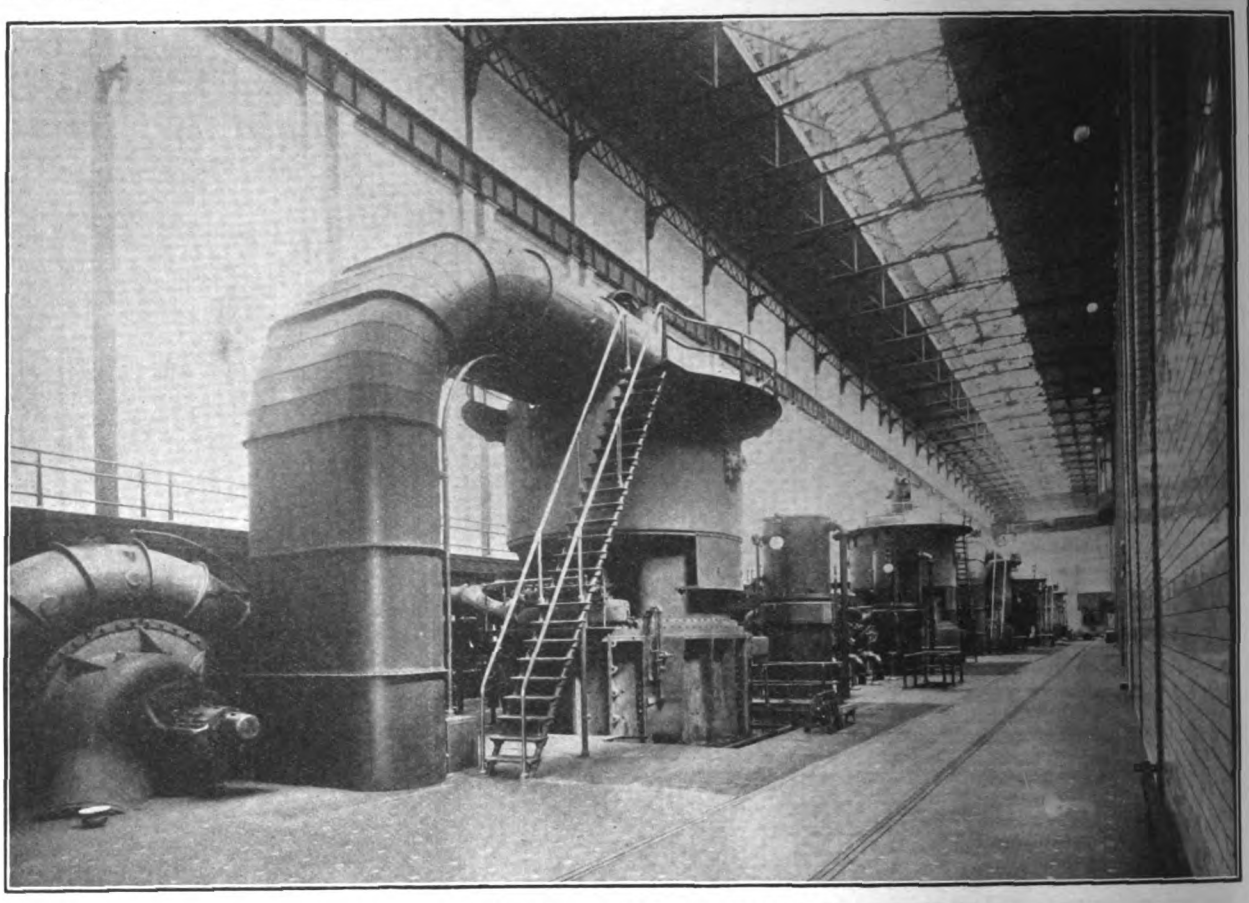
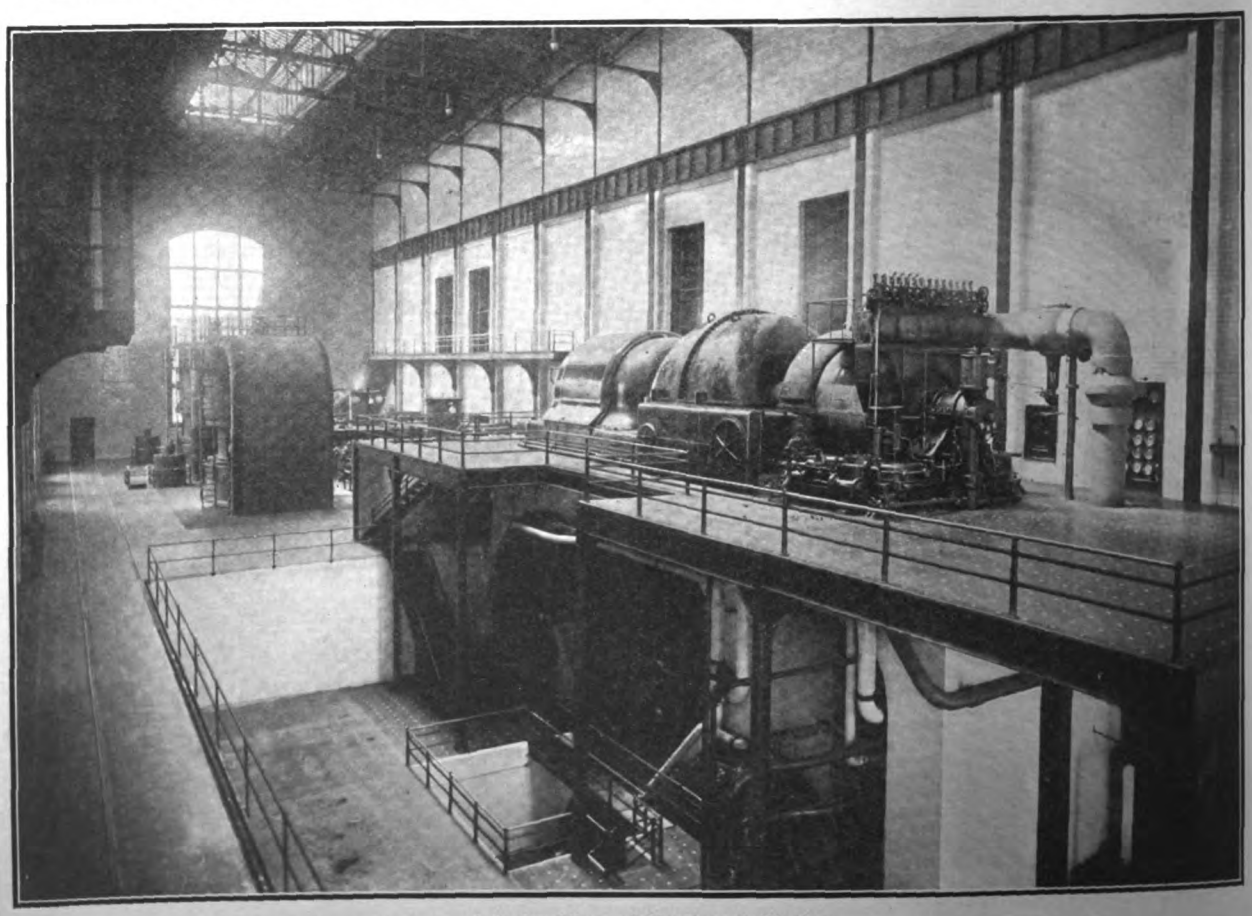


Interior View of Quarry Street Station.
This plant contains six 14,000-kilowatt vertical Curtis turbogenerators, four of 25 cycles and two of 60 cycles.



Interior View of Northwest Station.
This is the newest plant of the Commonwealth Edison Company. In the foreground is shown a 30,000-kilowatt 25-cycle turbo generator and two 20,000-kilowatt vertical units are shown in the background.

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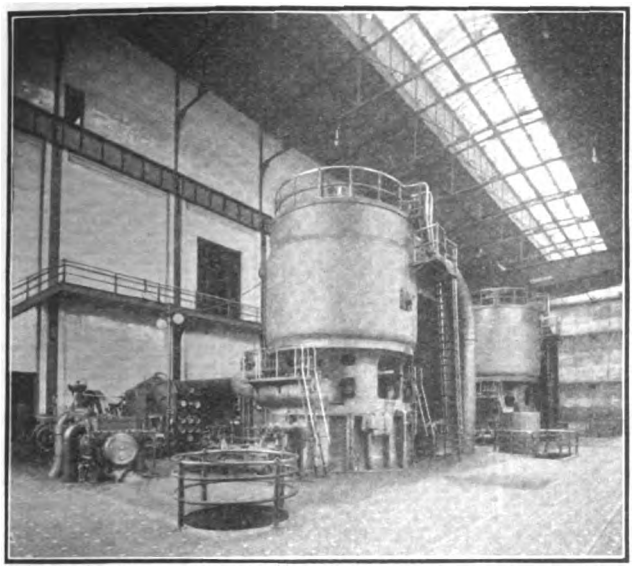
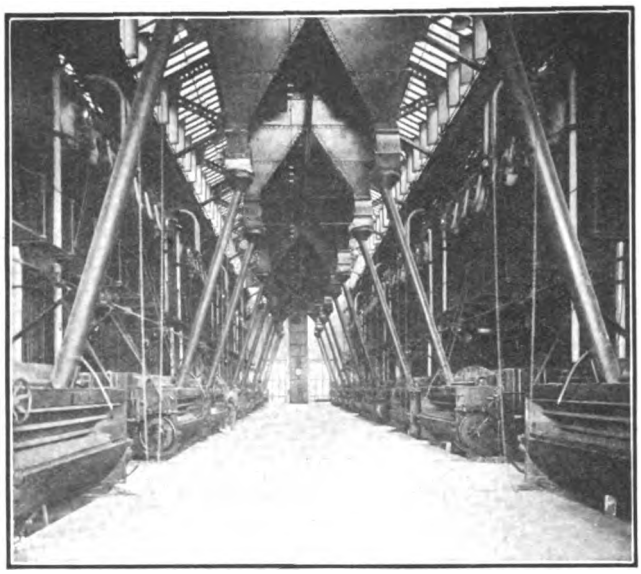
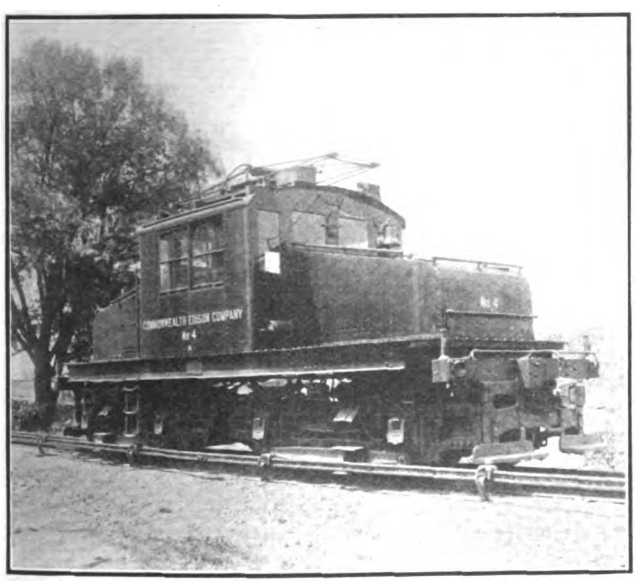


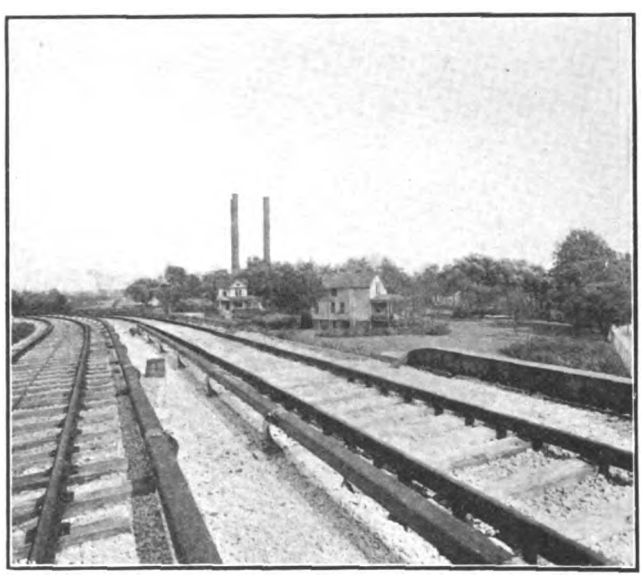
Two 20,000-Kilowatt Vertical Turbogenerators at Northwest Station, Chicago.



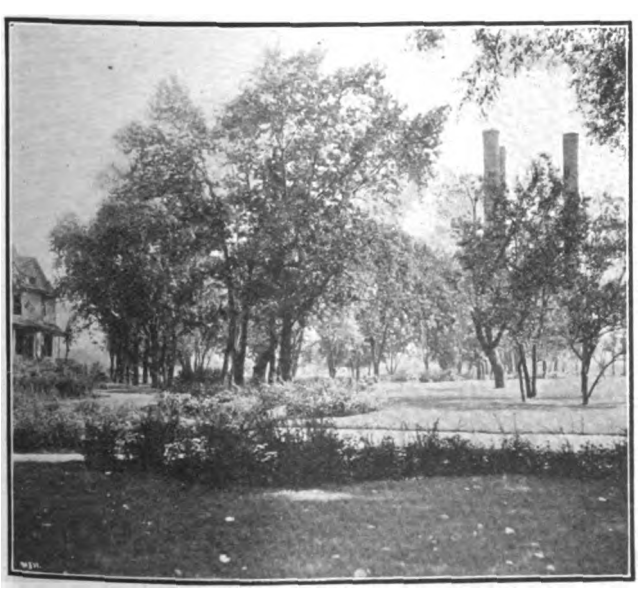
Boiler Room at Northwest Station Showing Overhead Coal Bunkers and Stoking Arrangements.



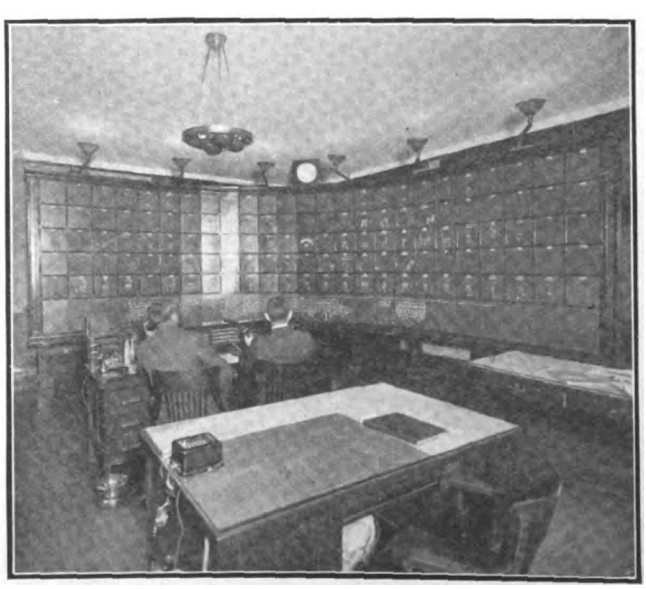
Electric Locomotive at Northwest Station for Handling Coal Cars on Grounds.



Third-Rail System for Electric Locomotive Showing Protected Live Rail.



Recreation Grounds Adjoining Northwest Station Where Outdoor Games and Events Are Held by Employees.



Load Dispatcher's office in Edison Building, from Which Entire Edison System is Controlled.

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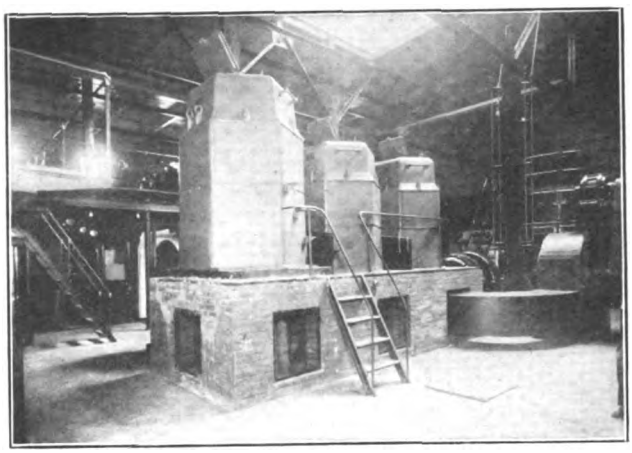
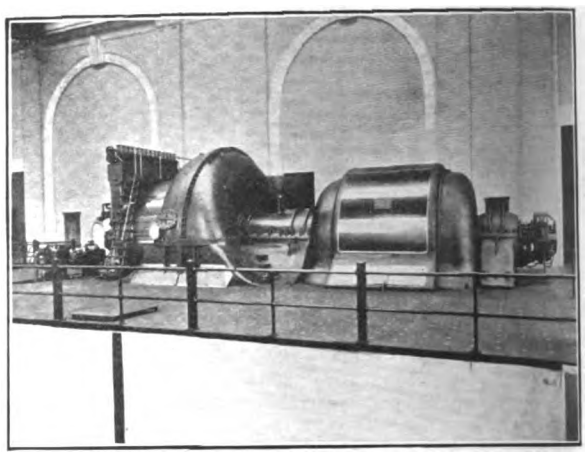
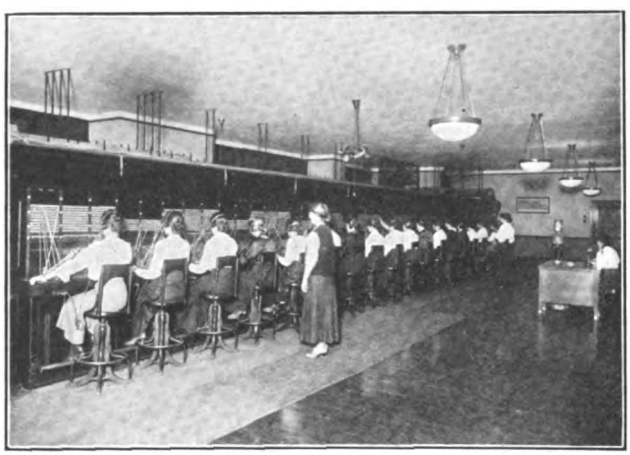


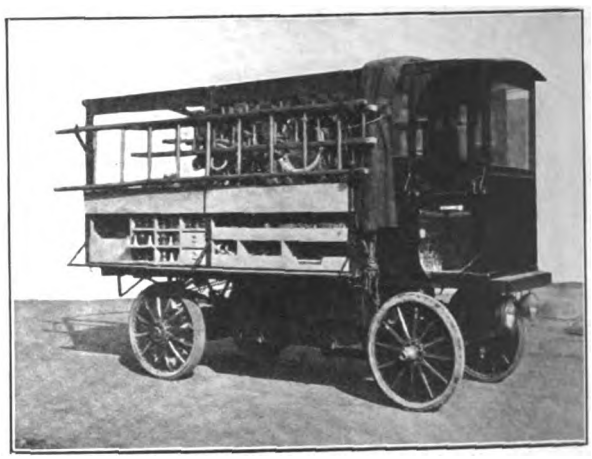
A Bank of 60-Cycle Step-Down Transformers in Lakeview Substation.



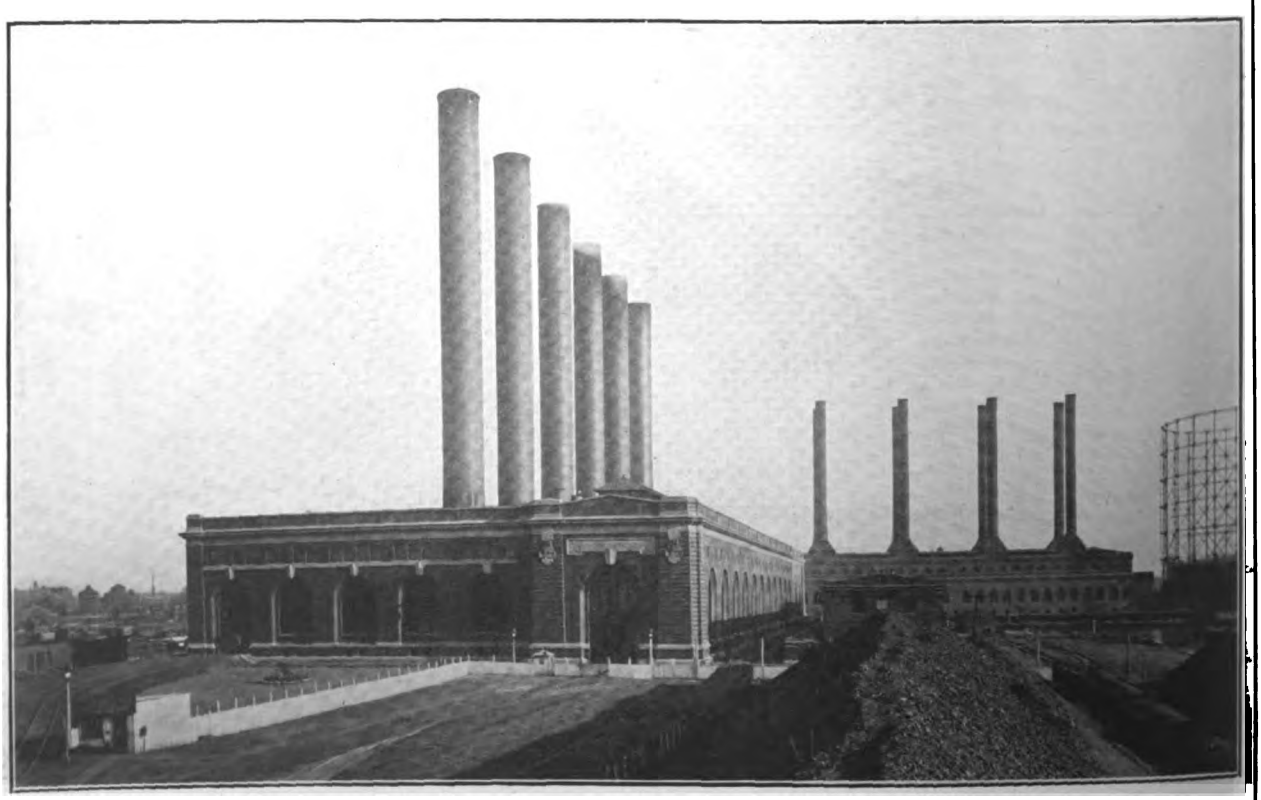
Fisk Street Station, Showing New 25,000-Kilowatt Parsons Turbogenerator.



Main Telephone Switchboard of Edison Company, Said to Be Largest Private Board.



Type of Electric Vehicle Used by Construction Department, Carrying a Full Complement of Tools.



General View of Fisk Street and Quarry Street Generating Stations.

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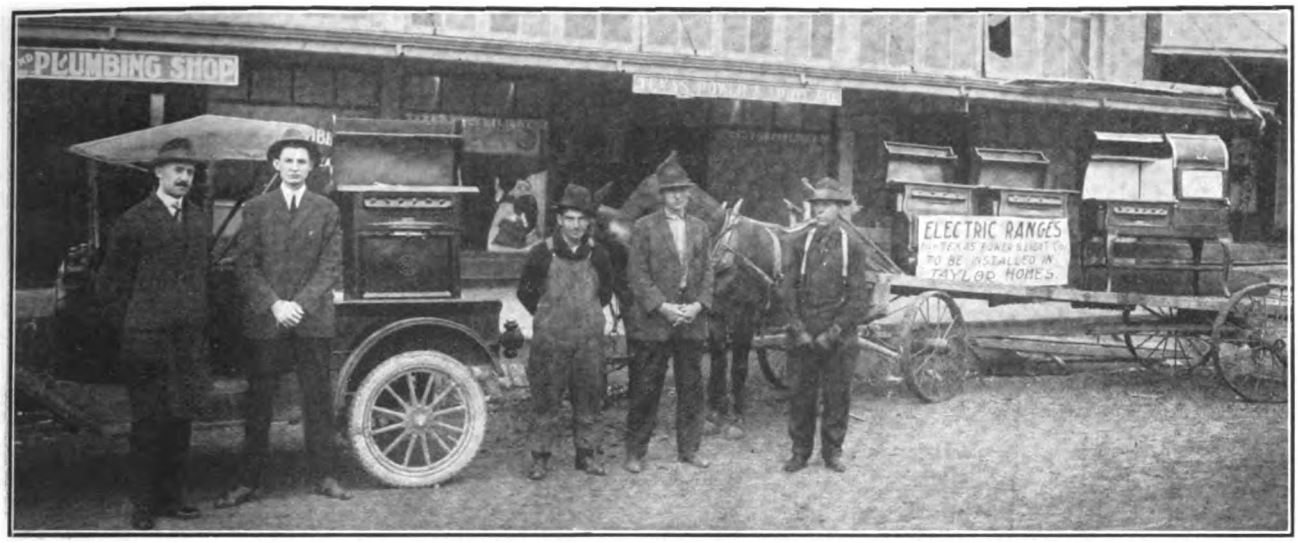

How to Secure Electric Cooking Business

A Compilation of Data Showing the Importance of the Electric-Range Load to Central Stations and Embodying Suggestions for Carrying Out a Comprehensive Campaign

THERE is no field for the sale of electric energy that deserves more consideration at the present time than that of electric cooking. No more conclusive evidence need be presented than the records of many central stations who have made a comprehensive effort to secure the business. While it may seem premature to consider electric cooking in the same light as residence lighting, nevertheless there is every indication that it will ultimately form a very important part of the central-station load.

Every central-station manager believes that there are possibilities in electric cooking, although many feel that the business is still in the experimental stage, and others that conditions are not yet suitable insofar as satisfaction to the customer, rates for energy, etc., are concerned. The first assumption, namely, that electric cooking is still in the experimental stage, is absolutely without foundation. Electric ranges have passed the experimental stage and are giving unqualified satisfaction in thousands of cases. Any central-station manager can easily and quickly obtain sufficient evidence on this point to convince even the most skeptical.

The prime consideration is, therefore, "Will the business be profitable to the central station?"

Is Electric Cooking Profitable?

The answer to this question, of course, depends upon the rate for energy; in fact, the entire question of electric cooking depends very largely on rates. In our issue of April 22, we presented an abstract of a paper by P. L. Miles given before a committee meeting of the Indiana Electric Light Association, which contained an interesting discussion of this subject of rates. Rates for cooking depend upon the hours' use of the demand or load-factor, the diversity-factor, the peak load, the cost of generating and distributing the energy. These factors vary in different

Electric Ranges on Demonstration Platform of School in Salt Lake City.

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localities with the consequent impossibilities of making any set rule for the establishment of any rate.

It was pointed out by Mr. Miles that there is one happy medium in the creation of a cooking rate, namely, one high enough to produce a profit and one low enough to produce the business. A rate of three or three and one-half cents is certainly low enough to produce the business and the

Small Range in Southern California.

question of whether it will be profitable must be settled by local conditions of the lighting company.

As evidence that a low rate can be made for cooking and a profit still made by the central station, attention is called to the accompanying table, which gives a summary of the rates in 2,884 towns. It, of course, goes without saying that these companies have not put rates into effect blindly and with no thought to their profitableness. It will be noted that of the 2,884 towns offering special cooking rates, 835 have adopted a rate of three cents or less.

RATES FOR COOKING.

Rate, Cents.	Number of Towns.
5	640
—5	211
4	692
—4	506
3	540
—3	261
2	27
—2	7
	2,884

The fear of a number of central-station companies that public service commissions would perhaps offer objections to a special low cooking rate seems to be without foundation, as in practically every state in which there is a commission it has recognized and approved special cooking rates. One of the important arguments in favor of the low rate is the high diversity-factor of range installations. In communities such as Billings, Mont., where there is over 3,500 kilowatts of electric range load connected, the diversity-factor approximates 30.

Installation Charge.

The installation charge, namely, the cost of running the wires from the meter to the range, at first semed to be a hindrance to the selling of ranges. Many central stations made a charge of $5 or $10, or the actual cost of the work, based on time plus material, for the installation. This necessitated the salesman making two sales instead of one.

This question of installation charge is one of commercial expediency, rather than one of equity. That the customer should pay for this inside wiring—which after installation becomes his property—admits of no argument.

When one housewife was asked to pay this charge, logic would not appeal to her. It was carefully explained that this inside wiring was on her property and was only between the meter and the range. Her answer was: "I don't see why I should pay for the range and then pay to have it installed."

It appears that the best course to pursue is to include the cost of installation in that of the range. The total to constitute the list price. In this manner, only one sale is necessary, and the price quoted covers the cost of the stove, delivered and ready to snap on the energy.

However, the policy of the majority of central stations today is to deduct the cost of installation from their own margin of profit, namely, the discount allowed by the manufacturer. This policy they adopt as a means of aiding their customers in purchasing electric stoves, and, in the early stages of the cooking game, making their proposition as attractive as possible.

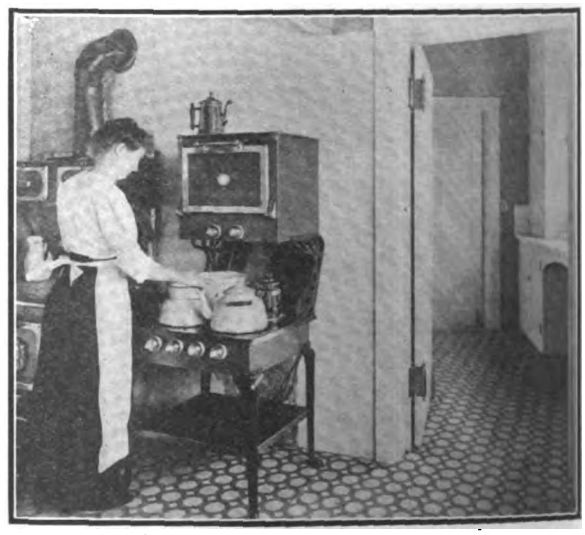
Time Payments.

On a subject which has proven its value in many phases of the electrical business, an endorsement is hardly in keeping. But to those central-station men who are opposed to the practice of giving time payments, let me point out that they have been the means of solving the problems of the distributors of many high-priced articles—such as pianos, furniture, kitchen cabinets, and the like. Even in the electrical business time payments have given great impetus to the wiring of homes and the sale of vacuum cleaners, washing machines, and other appliances. In a sense, time payments offer one solution to the complaint about the high price of the article for sale.

Trial Installations.

A trial proposition on any article, especially those with which the public is unfamiliar, is a sign of confidence that the article will do all that is claimed for it. On the other hand, a refusal to make a trial carries with it an implied statement that the merchant is not willing to give the purchaser an opportunity to verify what may seem like very exaggerated claims.

Put yourself in the place of one of your customers. If you were asked to make an investment of, say, $100, in a



Kitchen Where Electric Is Used in Summer and Coal in Winter.

new, and, in your opinion, an untried article, would you not feel entirely justified in insisting upon the privilege of returning the article in case it does not prove satisfactory? The clever salesman may name a number of people who are perfectly satisfied, yet these people are not yourself, and it is you who own $100 which you are going to spend, and it is yourself who must be satisfied.

The first thought of the central-station man is to lay

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too much stress on the fact that a trial installation requires an investment for wiring, which, in case the range is returned, will prove a dead loss. This fact is certainly true, and should the number of ranges which are returned be excessive, then the trial installation would be out of the question. It would not be the fault of the proposition, however, but rather the fault of the range itself.

First Cost of Electric Ranges.

On every hand are heard the statements of central-station commercial men regarding the large number of ranges which they could sell, were the manufacturers only able to supply them with a range retailing for $40 or $50. In the same breath they tell what a wonderful gas range can be purchased for $40—and they are at a loss to understand the difference in price between the gas and electric. Many of these central-station men earnestly claim that the high price of the electric range is the real reason that is preventing their universal adoption.

Is this not an error in reasoning? Can you point to one single article, placed before a public which is admittedly hard to educate in new methods and things, which has been popularized on the price appeal alone? It is efficient salesmanship which will educate a public to the use of a new article, and not low price. Is the reducing of the price of the range from $80 to $50 going to tell the housewife about the cleanliness of electric cooking? Will it convince her of the convenience and safety of electric ranges? By no means. Is this price reduction in any way going to convince her that all of her cooking operations can be performed in a more satisfactory manner than on any other form of stove? Is a slash in the price going to convince the housewife that electric cooking is past the novelty stage, and that it is practical in every sense of the word? No, indeed. But salesmanship will do these things and will do them efficiently.

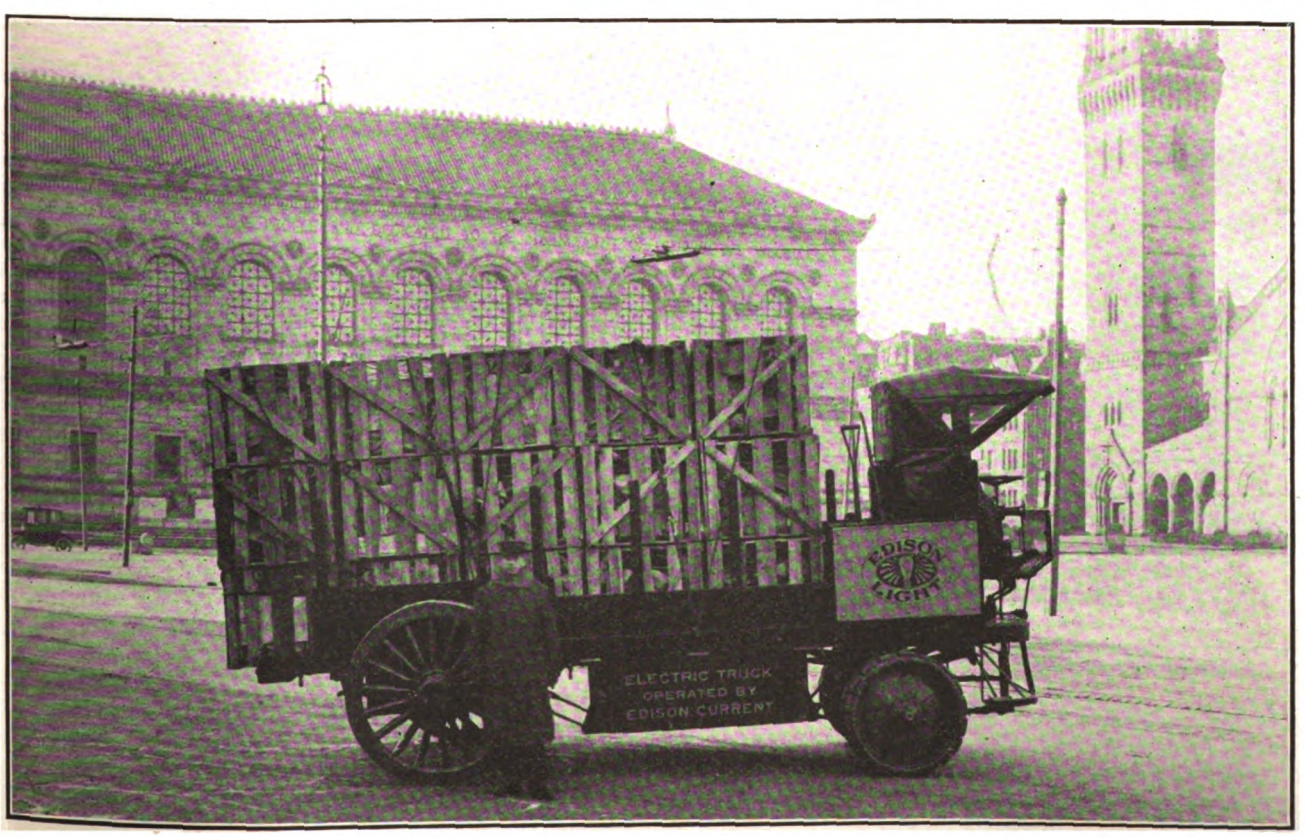
The central-station man calls attention to the price of the gas stove, and states that the electrical manufacturer must put out a stove which will compete in price. Is this true? Do these same men forget the other articles which have been introduced successfully into the homes of the electrical consuming public? Take the toaster as an instance. A gas toaster costs something like 10 cents. But the cost of the electric toaster when it was first placed on the market was somewhere in the neighborhood of $4—40 times as much. How are the two statements reconciled? You can buy an old sadiron for somewhere around 35 cents. The electric iron used to sell for $5 and some of them sell for this price today. Think of it, 15 times as much. Yet has this great difference in price retarded the sale of these articles? Take more expensive articles, the washing machine and vacuum cleaner for instance. Compare their price with the price of the old tub and washboard or the broom. Yet these same central-station men are today doing a good business in these articles. Today the electric range is somewhere about twice as expensive as a gas range.

Electric-Range Campaigns.

In the operation of campaigns to promote the sale of electric ranges, there seems to be a tendency to start the campaign with a great deal of enthusiasm, full-page advertisements, cooking demonstrations and the like. Then because there are not a great many immediate sales the interest wanes, and the campaign is called a failure.

It is the continuity of an electric range campaign which will eventually bring results. The full-page advertisements and cooking demonstrations are all right, only as starters. They arouse a certain amount of interest among your prospects, which interest must be maintained until the sale is closed. People are not educated in a couple of weeks. It takes months, if not years. It means keeping everlastingly at it, hammer and tongs. It means the consistent use of every advertising media at your command—continually telling the public about the advantages of electric cooking. Use small space in your newspapers—but use it often. Ten small advertisements are better than one large one.

Put a man on the work whose business is to develop your electric-cooking load. If he does not sell a range in



Truck Load of Electric Ranges for Boston Apartment House.

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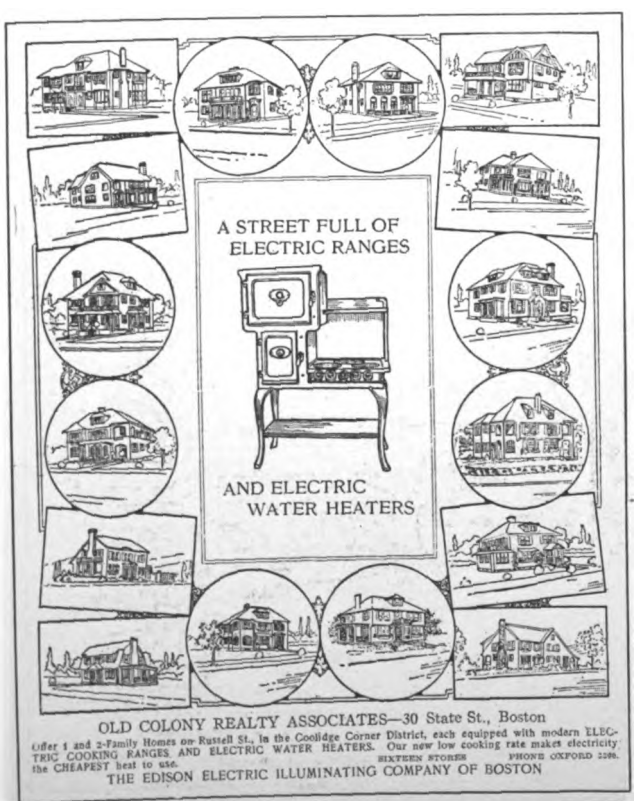
a month, or in two months, keep him right on the job. Eventually his work will show excellent results. Where he only sells one range the first month, he will sell 20 the same month a year later.

In the following paragraphs are given the experiences of a number of companies in securing electric-cooking business. Many valuable suggestions can be obtained from these accounts of successful sales efforts.

WHAT BOSTON HAS DONE

Activity of Boston Edison Company Has Resulted in Over 400 Ranges Being Installed in Only a Few Weeks

The measure of success of the Boston Edison Company's campaign for the introduction of electric ranges is attested by the fact that to May 1 more than 400 ranges have been placed. The special attention of the appliance department, of which W. Graydon Stetson is head, has been directed to the promotion of the electric-cooking idea, a continuous demonstration having been conducted for several weeks at the Boylston Street, Boston, store and demonstrations lasting one to three weeks at each of the 15 other stores of the company. The electric-range division, under A. L. Smith, follows up the prospects, as they are made known through responses to the printed matter issued by the advertising department. Four technically trained range men devote their whole time to the securing of contracts for apartment house and home builders and owners. A large share of the customers for ranges are real-estate owners, many of whom, in building apartment houses or separate homes, are installing electric ranges as the sole means of cooking. Among the apartment houses so equipped to date are the following:



Boston Advertisement in Real-Estate Columns.

Colonna Apartments, Newtonville, 24 ranges.
Park Vale Apartments, Allston, 18 ranges.
Newhall Apartments, Brookline, 15 ranges.
Beacon Apartments, Boston, 30 ranges.

The Old Colony Realty Associates, who build high-class residence properties for sale, have contracted for 25 ranges to be installed in single and double houses on Russell Street, a newly developed street in Brookline, giving it the distinction of being "a street of electrically equipped homes." The same concern is erecting 20 other houses in Brookline, which will also be equipped solely with electric cooking apparatus. These houses are of 10 to 12 rooms each and sell for $10,000 to $15,000, and a large percentage are sold as soon as completed.

The advertising campaign now being conducted consists of the issuance of eight different cards, circulars, letters and booklets, at intervals of three weeks, in the following order:

An Attractive Mailing Card Used in Boston.

(1) A form letter, signed by Mr. Stetson, sent to all applicants for service, pointing out the fact that "Electric cooking is the way today," and that the heart of the home being the kitchen, the best way to make it run smoothly and without waste is to have it entirely electrically equipped. In building a house or apartment, the suggestion is offered to place at least one outlet for flatiron and for dish-washer and other utensils; the dining room should provide for percolator, toaster, chafing dish and samovar, while usual heating devices for chambers, bathroom, etc., should be provided for.

The Boston Edison Company's two-cent rate applies on these services, with separate circuit from those supplying the lights.

(2) The next mailing consists of invitations to cooking demonstrations at either the main or a branch store, according to the prospects' place of residence.

(3) The card in black silhouette, herewith reproduced, is the next step in interesting the range prospect. With it are mailed manufacturers' circulars. The company does not confine its propaganda to one make of range, but pushes a complete line, including the several standard makes. It is noteworthy in this connection that at least four gas range manufacturers are producing electric ranges, some of them manufacturing units in parts which are interchangeable between the ranges of the two types, making for economical production.

(4) A booklet containing testimonials from local users of electric ranges is the next in order.

With it is inclosed a circular showing a range with heating unit disassembled in its various parts, the object being to give the prospective user a fairly clear working knowledge of the apparatus, dispelling the mystery which often enshrouds things electrical.

(5) Another personal letter follows, after which will be mailed in due course three sets of printed matter now being designed and written under Mr. Gibbs' supervision.

A later feature of the range campaign will be the use of stereoscopic views, in demonstrating the advantages of electric-cooking equipment. A series of views is now being

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prepared, which with a collapsible apparatus for viewing them, will be carried by range salesmen and used in interesting the customer-to-be at his home.

Newspaper advertising carried on collaterally with the mailing campaign consists of large display ads in the real-estate columns of the Saturday *Transcript* and all the Sunday newspapers. These show new apartment houses or homes which are electrically equipped, and, though being of value to the real-estate owner in advertising the apartments for rent, are paid for in full by the Edison Company, together with photographs used for illustration. From time to time, a full electrical page is carried by the Boston *Journal*. This usually features domestic appliances in an attractive manner, both in the advertising spaces and in reading notices. One such feature explained the mystery of meter reading and gave in tabulated form the cost of operating various lighting, heating and power devices connected to the lighting circuit, at the maximum rate of 10 cents per kilowatt-hour. This table was headed "What Electricity Costs in the Home," and set forth the following data:

Apparatus	Watts Used	Cost in Cents Per Hour
20-candlepower Mazda lamp	25	0.25
Radiant toaster	600	6
Chafing dish	600	6
Disk stove	600	6
Coffee percolator	450	4.5
6-pound iron	550	5.5
8-inch fan (full speed)	25	0.25
Sewing-machine motor	55 (Av.)	0.55
Ice-cream freezer	400 (Av.)	4
Washing-machine motor	200 (Av.)	2
Small luminous radiator	500	5
Heating pad	22-44	0.5
Tubular air heater (small)	1,200	12
Tea kettle	500	5
Ozonator	15	0.15
Domestic buffing and grinding motor	55 (Av.)	0.55
Radiant grill	600	6

OTTER TAIL POWER COMPANY

This Company Serves Fergus Falls, Minn., and Other Small Towns and Buys Ranges in Car-Load Lots

We have been asked to tell why we have been pushing the sale of electric ranges, how we have done it, and something of the results.

The Otter Tail Power Company began it several years ago because it needed business. Our first water-power plant was new and our transmission line carried energy to only one small city. The commercial lighting field was limited and residence lighting also. All the gasoline engines in town were soon put out of business, but still our load curve was not right. Motor business could not be obtained in sufficient volume to correct the curve. We turned to electric cooking because there was nothing else in sight.

Our first victim was a pair of newlyweds who were induced to buy one of the early types of ranges. The young husband was a lawyer and he prepared a written guarantee for the performance of that range. The range was not entirely satisfactory, but we more than made the guarantee good, finally exchanging the old range for a modern one.

We soon began to try out the then new open-coil type of range, and also established a combined lighting and cooking rate using a single meter. The rate was as follows:

First—A fixed charge of 0.5 cents per candlepower, with a maximum of 100 candlepower. (Maximum fixed charge, 50 cents per month).

Second—An energy charge of 12 cents per kilowatt-hour for the first 32 hours' use per month of the "active lights." (We count lights in living rooms only, and not in bedrooms, basements, etc.)

Third—Six cents per kilowatt-hour for the next 64 hours' use per month of the active lights.

Fourth—Three cents per kilowatt-hour for all current used in excess of above.

A 10-per-cent discount from total bill for prompt payment is allowed.

We soon found we were securing a number of very good

WE WILL BE PLEASED TO ANSWER ALL QUESTIONS ABOUT ELECTRIC COOKING IF YOU WILL CALL AT OUR NEWTON "EDISON LIGHT" STORE AT NONANTUM SQUARE.

NEW STYLES OF ELECTRIC RANGES ARE NOW BEING SHOWN; AND A DEMONSTRATION IS GOING ON DAILY.

THE ELECTRIC RANGE IS LOW IN PRICE, SIMPLE TO WORK WITH, AND INEXPENSIVE TO USE.

INVITE A FRIEND OR TWO TO DROP IN WITH YOU.

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON.

Invitation Sent to All Prospects in Boston.

customers who were using comparatively large amounts of energy and we considered it advisable to make a reduction in rate by limiting the amount to be charged at three cents to 100 kilowatt-hours, and all energy in excess at two cents per kilowatt-hour. The effect was very satisfactory, as we retained the large consumers without lowering the rates for the smaller ones.

We strongly favor selling all energy through a single meter, even though to do so requires a somewhat complicated rate schedule. It simplifies the wiring of residences because it is unnecessary to establish separate circuits for heating appliances, and it induces a more extensive use of them. We advise customers when wiring to install receptacles conveniently arranged for the use of vacuum cleaners, fans, portable lamps, percolators, toasters, radiators, etc. The result is a more liberal use of current for all purposes.

With this form of rate schedule and method of metering it is of course impossible to secure accurate data on amount of current used for stoves only. We can consider a fairly average consumer, however, to illustrate the effect of this schedule.

The lighting installation is as follows, "active lights" only:

		Candle-power	Total Watts
Hall	1 25-watt lamp	25	25
Front room	3 25-watt lamps	75	75
Dining room	1 60-watt lamp	60	60
Kitchen	1 40-watt lamp	40	40
Totals	6 lamps	200	200

The meter reading shows perhaps a consumption of 148 kilowatt-hours. The bill would be as follows:

100 candlepower @ 0.5 cents		$0.50
6 kilowatt-hours @ 12 cents		.72
12 kilowatt-hours @ 6 cents		.72
100 kilowatt-hours @ 3 cents		3.00
30 kilowatt-hours @ 2 cents		.60
148 kilowatt-hours. Gross		$5.54
Less 10 per cent		.55
		$4.99
Average cost per kilowatt-hour		$0.0337

We conclude that the average cooking customer uses about 125 kilowatt-hours per month, that he secures some lighting current at the 3-cent and 2-cent rates, and that the additional revenue due to cooking is about $3.00 per month, or $36 per year.

The earnings per customer increase from about $18 to $24 per year for lighting customers, to about $50 to $60 per year for combined lighting and cooking, an increase of approximately 150 to 175 per cent.

To secure this business requires some increase in investment for transformers, services and meters.

The first range customer in a block may not require any increase in transformer capacity, but sometimes will require a complete rearrangement of transformers in his vicinity, involving considerable investment. When we do this, how-

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ever, we always provide for additional business which we expect to secure and which can then be added without further investment except for larger service wires.

It is of the utmost importance to secure good voltage at the range, and we usually run three-wire services of No. 6 B. & S.

Transformer capacity of about two kilowatts per range customer will ordinarily take care of all the lighting and cooking per block.

The increase in transformer capacity per range customer we think averages a cost of about $10, secondaries about the same, and meters $4.00, or a total of $24. This average cost per range customer decreases as the number connected increases.

The combined demand of all ranges on the system is easily recognized on the daily load curve, showing particularly between 7:00 a. m. to 8:00 a. m. and with a distinct peak at 11:50 a. m. During the summer months we frequently have our daily peak at 11:50 a. m., showing a demand of about one kilowatt per range connected.

So far we have been unable to determine its effect on our evening peak. It undoubtedly overlaps the lighting peak somewhat, but the evening cooking is about done before the lighting peak occurs.

In selling ranges we have placed very little reliance on newspaper advertising or circulars, etc., by mail. We display ranges on the floors of our different offices, and make many sales in that way. We also give demonstrations in each town during the summer, inviting our customers to bring in bread, pies and cakes to be baked. We make a practice of having our demonstrators follow up range sales to instruct purchasers in their proper use and helping them to overcome any difficulties they may experience.

We also place ranges on trial, not asking purchasers to consider it a sale until they are satisfied, and the percentage of ranges coming back is very small.

Our customers are enthusiastic over electric cooking, and ranges sold help greatly in making further sales. We are now furnishing service to about 25 towns, and give the same rates in all. We buy ranges by the carload, and sell them very close to cost, including installation in the price of the range.

We consider electric cooking good business, being an outlet in the aggregate for a large amount of energy at low rates to many customers largely at off-peak hours. It is business which stays with us the entire year, decreasing somewhat during the winter months when our lighting load is heaviest, but never is lost in large blocks like special power business. It seems to offer the largest undeveloped field for the sale of energy at present.

ACTIVITIES IN UTAH

Demonstrations in Cooking Schools Help Salt Lake City Sell Ranges in Its Territory

For the first time in Salt Lake City the electric range has been used exclusively in a special demonstration of cooking and cooking appliances. For several years past various manufacturers of food products and household appliances have conducted special cooking schools and demonstrations and the gas company has always furnished the ranges used. Various attempts have been made by the electric company to get electric ranges into service for these demonstrations without success.

A recent cooking school held at the Auditorium, Salt Lake City, April 17 to 22, for the first time found the electric range as the star performer on the platform. Our illustration shows the Hughes, Copeman and Acorn ranges which were used. The Utah Power & Light Company had a large booth in the exhibit section of the demonstration at which practically all of the important makes and sizes were shown and demonstrators in attendance at all times to explain the features of the ranges and to answer any questions not made clear by the demonstrator with reference to their characteristics of operation and cost. The special lecturer engaged for this school was Mrs. Florence Osborne Chase of Chicago. While Mrs. Chase had had considerable experience with electric cooking some of the ranges used were new to her. However, with her wide, general experience, the demonstration went off smoothly. She had not had time to familiarize herself with the rates in effect in this section of the country and with the current consumption for various operations on different ranges and was unable to answer many questions covering this feature of electric cooking. However, an excellent start was made and the problem for the power company in some other city to induce those in charge of these lectures to use electric ranges has been simplified. As more and more of these special lecturers in household economics become familiar with the operating characteristics and special features of electric appliances for the home their introduction will be much more rapid.

In addition to the Utah Power & Light Company, the Western Electric Company and the Capital Electric Company maintained booths in the exhibition section of the school. All of the companies report that they note a much greater familiarity with electrical appliances exhibited by the public at these demonstrations than was the case a few years ago when many of the appliances which are now common in the home were then regarded as curiosities.

SOUTHERN CALIFORNIA EDISON

Record of How This Company Interests Prospects in Merits of Electric Cooking

Some of the larger central stations on the Pacific Coast are becoming very much alive to the importance of the development of electric cooking. In November, 1915, the Southern California Edison Company commenced an active campaign for the sale of electric ranges among such of its consumers outside of the city of Los Angeles as were unable to secure gas service.

Two letters worded to arouse interest in and create a desire for the ranges, were sent a selected list of prospects, following by a postal card stating that "a representative of

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this company will call upon you within the next few days and tell you of something which we have to offer and which you really need. Look for him. Maybe you are in a hurry. If so, telephone."

Arrangements were made with three of the larger manufacturers of electric ranges and a division of territory made. Expert salesmen followed up the postal card and brought the interested ones to the Southern California Edison Company's offices where lady demonstrators were cooking, baking and explaining the merits of the ranges.

As a result, the Southern California Edison Company had put out over 400 electric ranges by April 15 and confidently expects to have 1,000 ranges on its lines by the end of 1916.

The following lighting and heating rate has been adopted in connection with the campaign:

For all consumption of electric energy in residences and apartments, through one meter, where an electric range is installed and used for cooking purposes:

Class A—Residences of 8 rooms and over: First 40 kilowatt-hours per month, 7 cents per kilowatt-hour.

Class B—Residences of 6 and 7 rooms: First 30 kilowatt-hours per month, 7 cents per kilowatt-hour.

Class C—Residences of 5 rooms or less and apartment house suites: First 20 kilowatt-hours per month, 7 cents per kilowatt-hour.

For all energy used in excess of the number of kilowatt-hours per month designated in any of the above classes, 3.5 cents per kilowatt-hour. Monthly minimum bill, $2.50.

This schedule is proving quite satisfactory to the consumers.

The company has found the average prospect to be in a receptive mood as far as the desire for information is concerned, but the want of knowledge as to the real facts has been the greatest barrier to a large volume of sales. Manufacturers, central stations, jobbers, dealers, contractors and salesmen should thoroughly post themselves on the merits of cooking by electricity and, thus prepared, be alert to convincingly pass such information along at every opportunity.

TEXAS MAKES RECORD

Although Natural Gas is Plentiful in Texas, Many Electric Ranges Have Been Sold

Early last fall one of the utilities companies operating in Texas and serving several towns and communities, in all aggregating in population over 300,000, decided to do some exploitation work in this line and accordingly made preliminary investigations to determine the best method of procedure. Data were obtained from different parts of the country where work had already been done and with these data as a guide a study of the territory to be worked was made. In going over the field it was found that the following conditions would have to be met:

Form 195 ELECTRIC RANGE PROSPECT. 200-11-22-15.

Mrs._____ Type of Range
Address_____ R-1____ S-1____
Town_____ S-2____ S-3____

Number in family_____ Adults_____ Children_____
Circumstances: Excellent_____Good_____Poor_____
Probable number of payments 3_____6_____9_____12_____
Present fuel: Wood_____Coal_____Gas_____Oil_____
Demonstration promised _____
Given_____Probable date of sale_____
Has prospect an automobile? Yes_____No_____

Personal friend of,
Mrs., _____Town_____
Why a prospect? _____
_____
Date of calls _____
Literature sent _____

Card Used by Texas Company to Record Data on Prospects.

Oldest Residence in Dixon, Ill., Now Equipped With Electric Range.

(1) Low cost of fuel in the majority of towns served. Many of these towns have cheap natural-gas fuel.

(2) The extensive use of inexpensive negro-servant labor.

(3) General lack of education on the part of the people of this section to the advantages of electricity in the household.

(4) Natural prejudice as to cost of operation of electric ranges due to small size of towns served and consequent rate for lighting purposes.

(5) High first cost of electric-range installation.

(6) Season of the year bad on account of fact a certain amount of heat needed for warming kitchen.

Viewing the whole situation it was decided that a regular campaign, in the usual meaning of the word, was not feasible and so the word "exploitation" was suggested as offering the best way to make a start. Accordingly, during the first few months' operation of the plan, no attempt has been made on a hard selling campaign, but on the other hand the company has tried to put in a few ranges in each town served and in this way lay the basis of a comprehensive campaign for the summer, naturally the best season of the year to push this business.

As a preliminary step and with the hopes of getting in touch with some live prospects a demonstration was held in October at the State Fair in connection with the other exhibits of the company. Two demonstrators were placed in charge here and everyone manifesting any interest in the subject was talked to and a considerable number of active prospects in various towns thus secured. These were followed up later.

Demonstrators Teach Use of Ranges.

The second difficulty, that of educating the servant, has been found to be not so hard as first imagined. In each branch town a local demonstrator, who works on commission, has been secured. It is the duty of these demonstrators, in most cases domestic-science instructors, to develop prospects and to make actual sales where possible. Their main work, however, is to keep in touch with prospects where ranges have been installed on trial and teach these prospects the proper use of the range. These ladies receive a commission for placing a range on trial and receive another commission if the sale is made. In connection with the servant problem some difficulty was met in preventing the servants from doing "boiling" on the top of a range. Boiled dinners are prevalent in many parts of

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the state, especially in the fall. To overcome this tendency which results in excessive current consumption, all ranges being sold are equipped with what is known by the manufacturer as "vegetable cookers." These cookers are sunk into the top of the range and have a steam casing around them. They take very little current and operate in a manner similar to the ordinary "fireless" cooker. All ranges sold have at least one of these cookers and many of them have three. The type which has three is more suitable for this territory.

Installation No. 1.—Wattage of range 4,500, number of persons in family 3, months installed 4, average monthly kilowatt-hours consumption 81, average monthly net bill $2.48, no servant, has water heater, meter is near range. Average net rate per kilowatt-hour 3.1 cents.

Installation No. 2.—Wattage of range 3,500, number of persons in family 4, months installed 5, average monthly kilowatt-hours consumption 204, average monthly net bill $4.42, servant does cooking, has no water heater, meter is not installed near range. Average net rate per kilowatt-hour 2.2 cents.

Installation No. 3.—Wattage of range 4,500, number of persons in family 4, months installed 3, average monthly kilowatt-hours consumption 43, average monthly net bill $1.75, no servant, has no water heater, average net rate per kilowatt-hour 4.1 cents.

Installation No. 4.—Wattage of range, 4,500, number of persons in family 3, months installed 2, average monthly kilowatt-hours consumption 123, average monthly net bill $3.45, no servant, no water heater, average net rate per kilowatt-hour 2.8 cents.

Installation No. 5.—Wattage of range 3,500, number of persons in family 4, months installed 5, averge monthly kilowatt-hours consumption 51, average monthly net bill $1.94, no servant, no water heater, average net rate per kilowatt-hour 3.8 cents.

Installation No. 6.—Wattage of range 3,500, number of persons in family 3, months installed 5, average monthly kilowatt-hours consumption 116, average monthly net bill $3.42, no servant, no water heater, meter is not installed near range, average net rate per kilowatt-hour 2.9 cents.

Installation No. 7.—Wattage of range 4,500, number of persons in family 3, months installed 3, average monthly kilowatt-hours consumption 106, average monthly net bill $3.22, no servant, no water heater, meter is not installed near range, average net rate per kilowatt-hour 3.0 cents.

Installation No. 8.—Wattage of range 3,500, number of persons in family 8, months installed 5, average monthly kilowatt-hours consumption 114, average monthly net bill $3.08, no servant, no water heater, meter is installed near range, average net rate per kilowatt-hour 2.8 cents.

Installation No. 9.—Wattage of range 3,500, number of persons in family 9, months intalled 5, average monthly kilowatt-hours consumption 114, average monthly net bill $2.51, no servant, no water heater, meter is installed near range, average net rate per kilowatt-hour 3.0 cents.

Installation No. 10.—Wattage of range 3,500, number of persons in family 3, months installed 2, average monthly kilowatt-hours consumption 100, average monthly net bill $2.80, no servant, no water heater, meter is installed near range, average rate per kilowatt-hour 2.8 cents.

Installation No. 11.—Wattage of range 3,500, number of persons in family 3, months installed 6, average monthly kilowatt-hours consumption 78, average monthly net bill $2.41, no servant, no water heater, meter is installed near range, average net rate per kilowatt-hour 3.2 cents.

After practically five months of active solicitation work in Texas the following facts have been developed: The trial plan which was put into effect when work was first started is still being used and is meeting with success in almost every particular. The very liberality of the offer creates confidence and makes the way easier for a sale or trial installation. During the period stated 204 ranges have been placed. Out of this number 114 sales have been actually closed and most of the remainder of the ranges are still in on trial periods which have not expired. Of the 114 sales made, 93 per cent were made on trial installations. Of the total number of ranges placed 95 per cent were on trial and the balance outright sales. Trial period has been set as one month with possible additional trial where there is doubt as to whether the customer is familiar with all the equipment will do.

A number of objections have been raised and a number of these are common to all prospects. The first and chief objection is the cost of the range. As previously stated, this argument has been overcome partly by the installment plan of payment and the argument is answered by stating that the probable life of an electric range is greater than the coal, gas or gasoline range due to the superior type of construction and due to the indestructible type of heating elements used. In other words the prospect is induced to value the range by the possible years it will last and to divide the cost by the years. This is still a stumbling block that is hard to get over and the introduction on the market of a less expensive range will do much toward the universal adoption of this method of cooking.

Heating of the kitchen is another point which is brought up consistently, especially as most of this campaign has been in the colder months. Prospects are told that the kitchen may be heated by leaving the oven door open, but this method is not advocated due to consequent high bills and dissatisfaction. A small wood or coal stove is the best means of heating the kitchen where steam heating is not used.

Water heating has also been the subject of much discussion between salesman and prospect. A three-kilowatt water heater is being used for this purpose, this being connected on a double-throw switch so that it can be connected only when the range is out of service. In this way no fixed charge is required for the heater and the current is obtained at a net cost of approximately 1.8 cents. The average net rate for an entire installation usually runs under 3 cents. The water heater should be connected to the bottom and to the extreme top of the boiler and not one-half or two-thirds of the way down. Improper connection has been the cause of a number of complaints. When properly connected this size heater will heat enough water for a bath tub in approximately 20 minutes.

Another complaint is that the hot plates do not heat up quickly enough. A range with a metal-top hot plate is being used and there is little doubt but that the average person is so accustomed to seeing the fire that when they look at the top of an electric range and do not see anything that looks like heat, they get the idea that the device is working slowly. This is no doubt more psychological than real, but regardless of this analysis, the objection is there and must be overcome.

Local lady instructors are still being used to teach new customers how to use the range and this plan eliminates a great many complaints that would otherwise be made, due to the fact that the customer is encouraged to ask questions and learn more about the device. It has been found necessary in most cases to install a transformer for each range.

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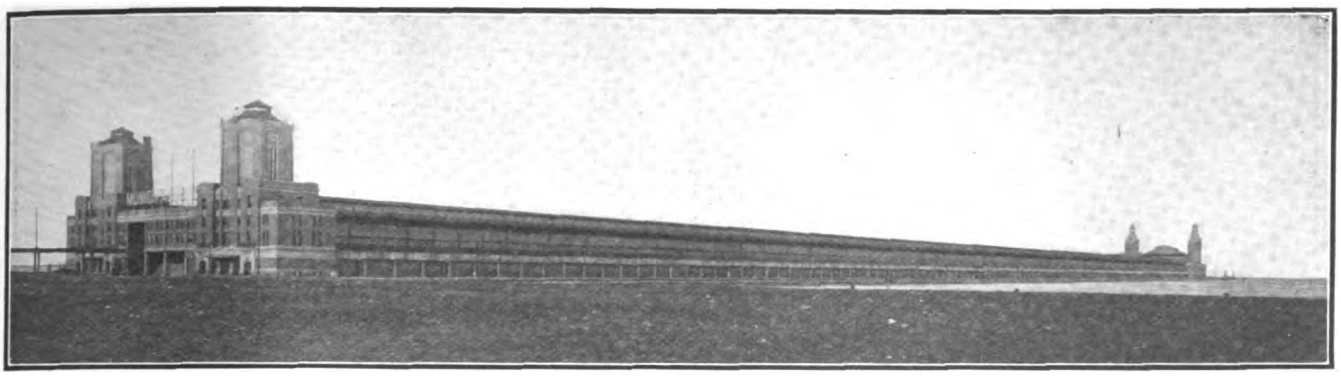


The New Chicago Municipal Recreation Pier

Construction and Electrical Features of Gigantic Pier Which Is Illuminated With 10,000 Lamps and Has a Power Installation of 1,000 Horsepower

ONE of the newest and most interesting places in Chicago to those bent on sightseeing is the new municipal pier, which projects into Lake Michigan for more than a half mile just north of the mouth of the Chicago River. The verdict of all who have made a preliminary inspection is that it is a stupendous undertaking and far ahead of anything of its kind that has been ventured by any other city in the world. One must see the pier to realize its immensity and diversity.

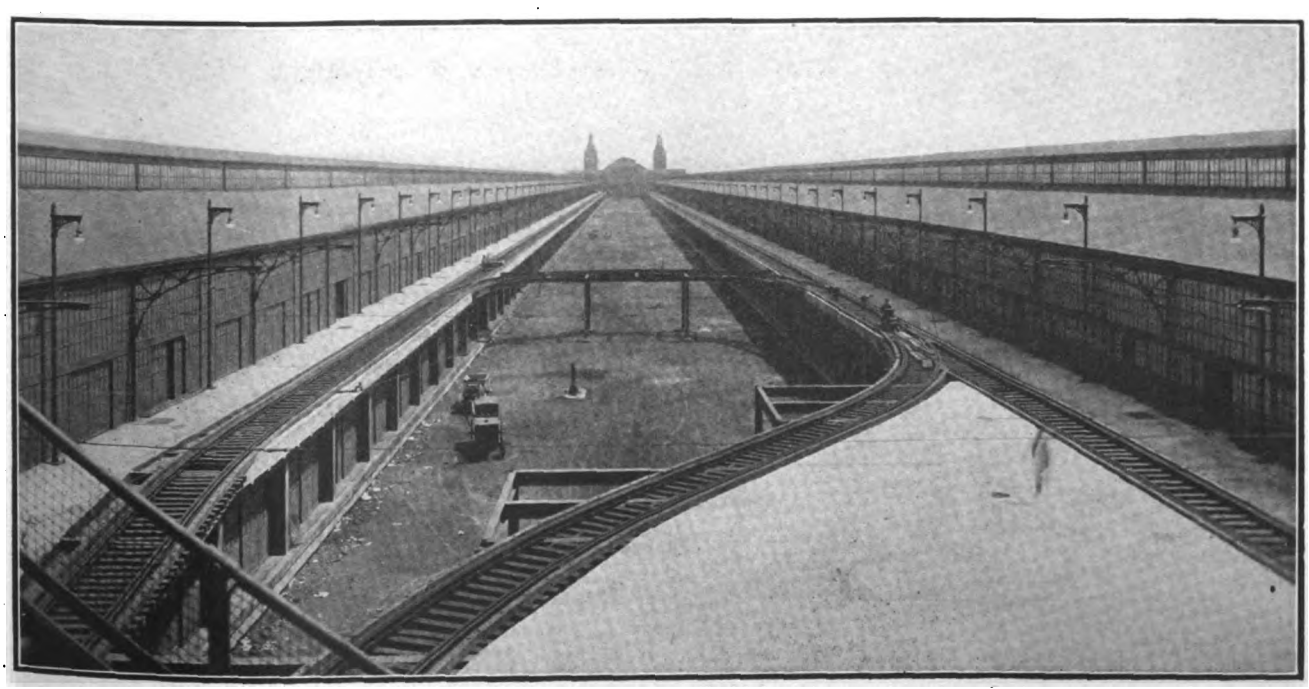
To men of the electrical industry the pier is interesting because of the elaborate lighting system, the service installation and the power equipment. Central-station service is secured from the Commonwealth Edison Company, the lighting load amounting to 21,000 50-watt equivalents and the power load 500 horsepower with provision for 500 additional horsepower.

In 1911, by an act of the Illinois Legislature, the city of Chicago secured authorization for municipal harbor work and accessories and enabled the city to set aside districts for future harbor construction. Under this act the city authorities during the same year created five separate harbor districts. The immediate development of the first district was agreed upon, following which the appointment of a Harbor and Subway Commission was made. In February, 1912, this commission submitted plans for the development of the first harbor district, which included the municipal pier now nearing completon. The plans were adopted by the City Council and the voters approved a bond issue of $5,000,000, the proceeds to be expended in initial outer harbor developments. This pier will cost approximately $4,000,000 and is only the first of a number to be erected for the development of a great commercial harbor.

The pier is designed to be used for passengers, package freight and summer recreation purposes. It is 3,000 feet long and 292 feet wide, has a total dockage of 8,500 feet, and consists of four buildings.

The head house, at the west or shore end, contains the administration offices, large public rooms, and ramps leading to the passenger floors of the freight and passenger buildings. The two ornamental towers contain gravity tanks with a capacity of 60,000 gallons each.

East of the head house, and connected therewith, are two freight and passenger buildings, each two floors, 100 feet wide and 2,340 feet long. There is an 80-foot roadway between these two buildings, and between each building and the outer line of the pier is a six-foot dock. The main



View From Head House Showing the Two Freight and Passenger Buildings, Trolley Loops and Roadway, With Recreation Buildings in the Distance.

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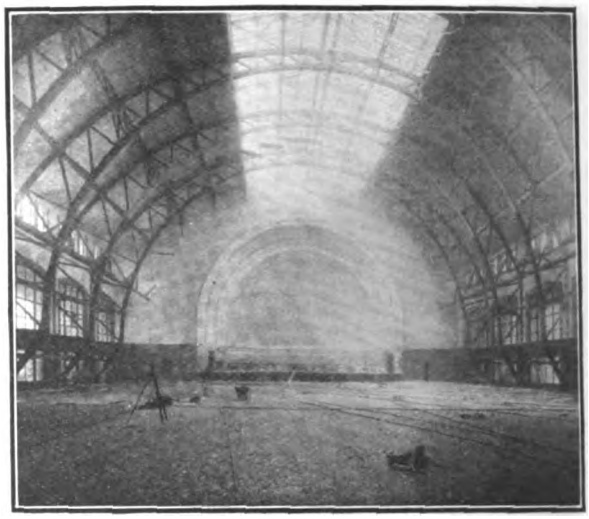
General View of the Recreation Buildings.



Interior of the Concert Hall.

floors, on the dock level, of the freight and passenger buildings, each of which has an area of 228,150 square feet, will be used for the handling of freight. The second floors, each of which has an area of 154,440 square feet, will be used for passengers only, who will embark and disembark at these floors to the upper decks of the steamboats, or may use inclined stairways to the lower decks. The freight and passenger buildings will be leased in sections to the different passenger and freight transportation companies.

Between the passenger buildings tracks for street-car service have been laid on an elevated structure level with the passenger floors. These tracks form an extension of the Grand Avenue line, and loops are provided near the head house and the terminal building.

Connecting with the two freight and passenger buildings is the terminal building, which, with its main lobby and three other floors, will be devoted to restaurant and other concessions. Eastward from the terminal building is a shelter, provided for picnickers, and which connects the former building with the recreation building with its rest rooms, and the concert hall. The latter is provided with a stage and will be used for band concerts and public dancing. It will seat 4,000 people, there being no balconies or columns in the hall. Around the recreation building will be provided promenades, space for children's playgrounds and other amusement uses. The landing space at extremity of the pier will be used by passenger steamers only, including the smaller pleasure excursion boats.

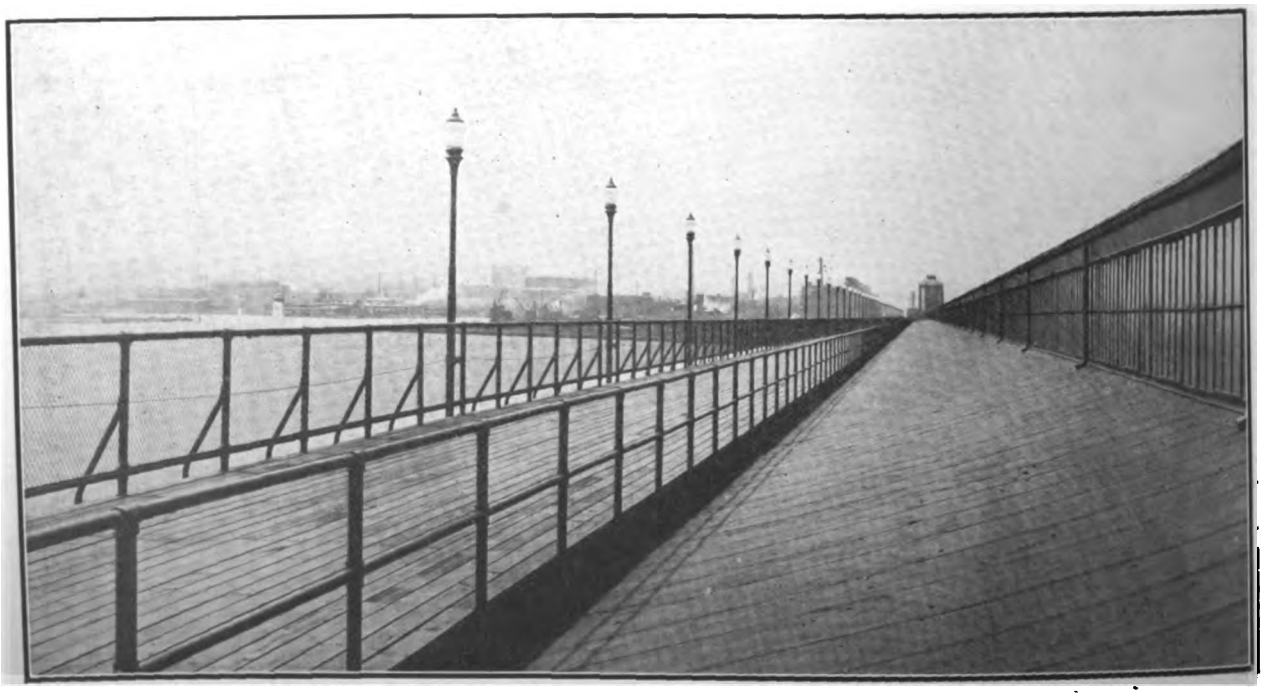
What promises to be a popular feature of the pier is a board walk, which extends from the head house down the water side of the freight and passenger buildings at what would be the third-floor level of those buildings. The walk also encircles the recreation-pier buildings, and its total length is about 6,500 feet.

Electrical Installation.

The design of the electric-lighting systems and the power equipment necessarily involved many considerations, and it may be said that the construction, from electrical, as well as other viewpoints, is ideal in many respects.

Central-station service is used, the Commonwealth Edison Company, of Chicago, furnishing the electrical energy for all lighting and power installations on the pier. Two separate 4,000-volt, three-phase, four-wire, grounded-neutral service feeders enter a substation in the head house. These feeders terminate in two separate interlocking oil switches from which connections are made to the switchboard buses.

The distribution system was designed to facilitate control



The Board Walk, Looking Toward the Head House and the City, Showing the Ornamental Standards.

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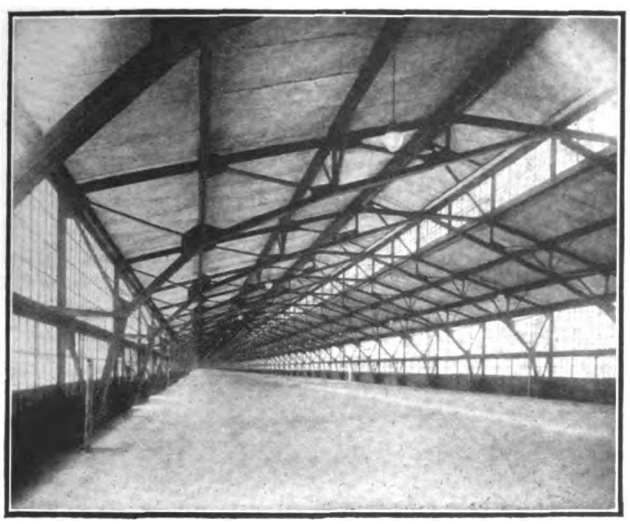
and branch-feeder arrangements, the main feature of which is a complete feeder loop installed in fiber conduit from the head-house substation along the north freight and passenger building to the terminal building, then to a substation located at the east end of the south freight and passenger building, and from this substation along the south building



View in Passenger Building, the Floor Area of Which Is Said to Be the Largest in the United States.

back to the head-house substation. This loop is approximately 7,000 feet long and at ten different points along it there are installed manholes where the energy is transformed from 4,000 volts to 110 and 220 volts for lighting and power.

For the illumination of these buildings the circuits are brought from the manholes through fuses to a four-pole subway box, then to the transformers and the distribution and metering panelboards. There are 1,500 40-watt porcelain units on each freight floor, and there are 236 porcelain pendant units with 400-watt, nitrogen-filled lamps, on each of the passenger floors.

Separate transformer stations have been provided for furnishing power to the sump pumps, there being installed four 5-kilovolt-ampere and two 20-kilovolt-ampere transformers, the high-tension sides of which are fed from the 4,000-volt main feeder loop.

The terminal building, shelter, recreation building and concert hall are served from the substation at the east end of the south freight and passenger building. Connections from the main service loop to the substation buses are made through a remote-controlled oil switch. From the buses the circuits lead to a transformer which steps the voltage down to 110 and 220 volts, three-wire system. Separate sets of feeders controlled from the substation switchboard serve each of these buildings. Three sets of series lighting circuits around the east end of pier are also controlled from the substation switchboard by an oil switch.

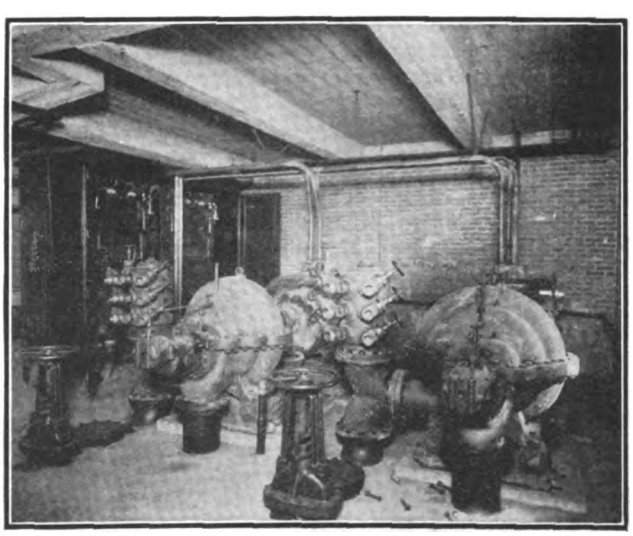
The terminal building is illuminated by 200 100-watt lamps, the shelter by 108 100-watt lamps, and the recreation building by 200 100-watt lamps. In the concert hall there are 4,000 outline lamps grouped in various circuit arrangements and distributed on the trusses, proscenium arch, stage wainscoting and foot strips. There are six circuits on the trusses, six on the arch, three on the wainscoting and three on the foot strips, these being grouped to obtain color effects. On the lower struts of the trusses there are 456 specially designed 60-watt six-inch globe fixtures. These lamps are controlled from a main switch and from sectionalizing switches. At the spring of each of the 18 trusses there is an ornamental cast bracket supported at a height of 16 feet from the floor and consisting of four 12-inch globes and one 16-inch globe, 100-watt lamps being in the smaller globes and a 200-watt lamp in the larger globe. The two promenades leading around the concert hall are illuminated by porcelain, ceiling-type, 100-watt units. There are 72 60-watt lamps of the same type in the passageways and landings in each of the two towers. At the extreme top of the towers there are installed two 500-watt nitrogen-filled lamps. For illuminating the space around the shelter, recreation building and concert hall there are 77 1,000-candlepower, 20-ampere, Type-C, series Mazda lamps on 17-foot standards. At the base of each standard there is a 2,300-volt, 20-ampere, type-IL series transformer.

The board walk is lined with 222 300-watt, nitrogen-filled lamps mounted on 13-foot standards, spaced about 40 feet apart. Energy for providing this illumination is controlled from the head-house switchboard. A complete loop of 4,000-volt four-wire feeders, taking the same course as the main feeder loop for power and lighting, is provided and separate transformers step down the voltage to 110 and 220 volts, three-wire and neutral, for the board-walk lamps. These lamps are controlled from the substations at either end of the pier and the circuits are sectionalized along the freight and passenger building for the purpose of cutting out various sections by means of panelboard switches.

For lighting the passenger deck leading from the street-car platform into the passenger rooms, there is provided a separate series lighting circuit. There are installed 118 600-candlepower, 20-ampere, type-C, Mazda lamps mounted on 22-foot standards. The circuit is controlled by an oil switch which can be operated from either substation, and it is divided into two sections, alternating lamps being on the same circuit. At the base of each standard is a 15 to 20-ampere type-IL series transformer.

The remote-control apparatus is operated by means of two sets of storage batteries which have a capacity of 15 amperes at 125 volts. These batteries are installed in a room near the head-house substation and a motor-generator set and panelboard is provided for charging them. The remote control is provided on the main feeder and series lighting circuits to facilitate the lighting-system operation.

Power for operation of the fire-pump installation is derived from a separate set of feeders which are connected



Fire Pumps Driven by Two 150-Horsepower Motors.

to the head-house substation buses between the two main feeder interlocking switches. The fire pumps are located in the south end of the head house, together with the transformers, control panels and two 150-horsepower alternating-current motors.

We are indebted to Mr. H. J. Marlott, supervising electrical engineer, Harbor and Subway Commission, who designed the electrical installation, for the data in regard to this work.

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Electricity in Raw-Water Ice-Making

A Comprehensive Discussion of the Advantages of Raw-Water Ice Over the Natural Product and Some Valuable Data On the Electrical Operation of Typical Plants Purchasing Power

By C. J. Carlsen

THE operation of artificial ice plants from the central station is no longer an experiment, but an assured fact, for after nearly five years of practical service it has demonstrated its superiority over any other form of prime mover.

Central-station interests had for years been attempting to procure such business, with its splendid "off-peak" tendencies, but without avail; then came a revival of the raw-water ice-making process, this time a success. This proved to be the opportunity or opening for which central-station men had been seeking, and they were not slow in taking advantage of it.

Mr. Carlsen has specialized on ice-plants for the Commonwealth Edison Company and is chairman of a subcommittee on Ice and Refrigeration of the N. E. L. A., Power Sales Bureau.

Raw-water ice manufacture is the natural complement to simplified equipment. And where can more simple equipment, both as to installation and operation, be obtained than motor drive operated from the lines of some central station? The only plant requirement is a service switchboard to receive and distribute the energy received from these lines; rather simple power-plant equipment as compared to power self-produced with its greater space requirements, added investment costs, higher maintenance and repair expense, as well as the element of risk and danger and lack of emergency facilities not present under purchased-power conditions.

The first raw-water ice plant operated from central-station lines was installed in Buffalo, N. Y., in 1910-11, to be followed almost immediately by three such plants in Chicago, Ill. Since then, Chicago has far outstripped any other community in the number of such plants, having a total now of 21, ranging in size from 60 tons to 180 tons of ice per day, all operating from central-station service. Three of these are just being completed, to be put into service the coming season.

Because of the great possibilities of central-station service in the operation of raw-water ice plants, central-station men should concentrate their efforts on this particular type and interest themselves to the fullest extent in obtaining all information possible, in order to be of the greatest service to the customer, as well as the prospective customer. A few of the more pertinent facts pertaining to raw-water plants may be of interest.

From our present knowledge of raw-water ice manufacture and its product there is but one reasonable excuse for the installation of any other type, that of available water supply being such as to make a distilling process absolutely necessary in order to procure suitable or acceptable ice. Here however, haste should be made slowly, for no matter how bad, apparently, the water supply may be, there may be some inexpensive method of treatment, filtration, etc., that will make it suitable for raw-water ice manufacture; a distilled-water plant should become necessary only as a last resort.

Contrary to general opinion, the quality of raw-water ice is the equal in every respect to the best distilled-water ice, and in appearance far more attractive than the average distilled-water ice we see distributed through our streets.

If there is any doubt as to this statement, do as I have done many times; investigate the product as you find it in distributing wagons on the streets daily, then knowing the manufacturing process of the different companies, draw your own conclusions as to which has the better appearance.

As to quality, I would refer you to articles in *Ice and Refrigeration* of January, 1915, by H. D. Pownall and by George H. Fisher, both very clear on that subject. Abstracted, both these articles prove conclusively that raw water is the equal, if not superior, to distilled ice.

Almost invariably all such raw-water ice is manufactured from the general water supply, which, if good enough for domestic purposes, certainly should be good enough for the manufacture of ice, the very process of which tends to eliminate over 95 per cent of the existing impurities, these impurities being drawn off in the core water, with a resulting product much purer than the raw material from which it is made.

The relationship between the distilled and the raw-water ice plant is very clearly set forth by George H. Fisher, of Leavenworth, Kans., in *Ice and Refrigeration* for January, 1915:

"We are manufacturers of both distilled and raw-water plants, and while the distilled-water plant is the more profitable from an ice-machine manufacturer's point of view, yet as all the small towns are demanding ice plants and cannot afford to put in a distilled-water plant, we, like others, were encouraged to invest, improve and place on the market a perfectly hygienic raw-water ice plant. And while this may place a hardship on the manufacturers who have installed larger ice plants in their community than the local consumption demanded and are relying upon the smaller adjoining towns to consume their output, and no doubt your writer had this point in mind when he made the assertion he did (referring to Mr. Solliday's article relative to unfitness of raw-water ice), yet the small raw-water plant is a recognized fact, and we might as well adopt them now as later on, for they have come to stay."

There may be more or less contamination in natural ice, especially in certain locations, and some states are protecting themselves against such supply, so far as posible. Illinois has just passed a law covering this point, to the extent that the commission must pass on the localities from which such natural ice will be allowed.

There is no thought or intention of setting up as a prophet, yet the day is coming when natural ice will be a thing of the past, excepting what is termed winter or water ice, where ice is cut and delivered directly to cars for shipment, and not stored. We have daily evidences of this

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gradual change which is taking place. Storage houses destroyed by fire, falling, etc., are seldom rebuilt, and very few new houses are going up. On the other hand, we read almost daily of new artificial-ice plants being installed in all parts of the country, in Canada as well as in warmer climes, and following the trend of the times over 95 per cent of these are raw-water plants.

The ice requirements for this territory for the past year were approximately 2,000,000 tons, about 800,000 tons being artificial ice, and the balance, or 1,200,000 tons, natural ice. Of the 800,000 tons of artificial ice, roughly 300,000 tons were raw-water ice, manufactured from central-station service, the balance, or 500,000 tons, being distilled-water ice, manufactured by steam-operated plants.

This 500,000 tons of distilled-water ice represents about ten plants, as against 18 plants manufacturing raw-water ice, the installed tonnage capacity being about the same in both cases. Thus it will be seen that the plant load-factor is much greater with the steam than with the electrically operated plants.

Operated from central-station service with such high load-factors, the earnings rate of the average of these distilled-water plants would be from 10 to 15 per cent less than the guaranteed rate on standard ice-making contracts, with a resultant saving in plant operation, due to such service, of 20 to 30 per cent over present methods of operation.

These distilled-water ice plants and this 1,200,000 tons of natural ice, coupled with the natural increase due to growth and education, are all classed as prospects for central-station service. The total kilowatt-hour consumption of the 18 raw-water ice plants last year was 15,466,912, and the addition of this prospective load would bring the figures well within a consumption of 100,000,000 kilowatt-hours per year—and for ice manufacture only.

A glance at the map of Chicago, with its raw-water ice plant locations, will indicate where these present plants are located and the great possibilities for growth for community plants. (See Fig. 2.)

Now just what constitutes a simplified, properly balanced raw-water ice plant? It may differ in detail, but not in essentials, and will always remain a question for debate when all forms of prime movers are taken into account. To the central-station man, however, it can mean but one thing—the simplest plant possible for efficient operation under the form of contract applicable to such service.

The first thing to be taken into account is location, and this should be as near as possible to its center of distribution. Here central-station service stands in a class by itself, having the choice of location, whether it be in a restricted residential territory or a manufacturing district.

The second consideration is the size of the plant to serve that community. In determining the size the question of delivery must be taken into account, which is a very vital one if plant profits are to be considered. This involves also the most economical distribution of labor. From a close study of the situation it would appear as though the limit of profitable haul would not exceed a radius of one and one-half miles with horse-drawn vehicles, or two miles with motor-truck delivery. The requirements for such a territory would range from 15,000 tons to 24,000 tons of ice per year, depending on the class of business to be served, the higher figure being the point of saturation.

From the viewpoint of labor, the engineering force would be practically the same for a small as for a large plant,

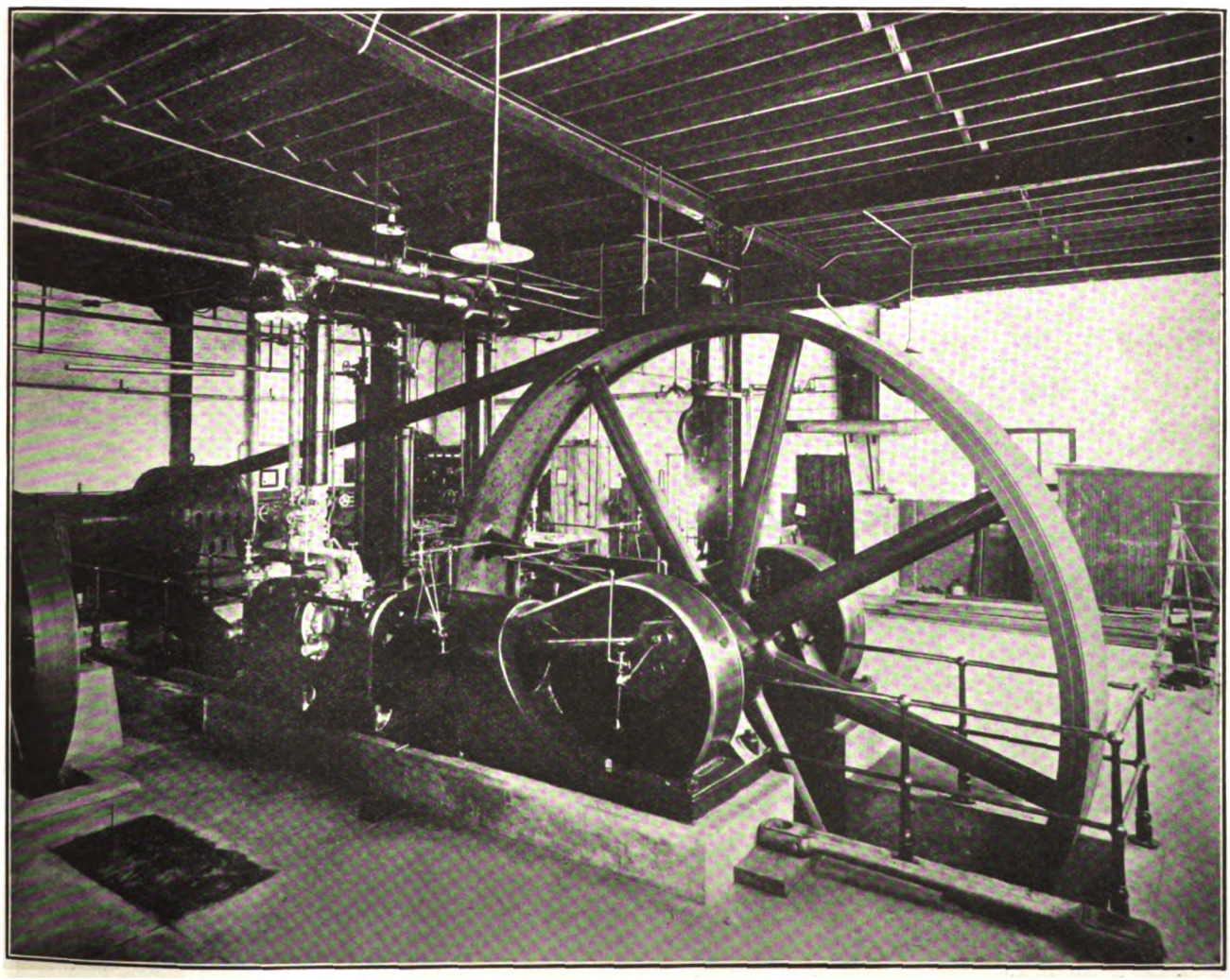

Fig. 1.—Compressor Room, Showing Duplex Compressor, Motor and Switchboard.

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although the time could be used to better advantage in the small plant. With harvesting labor, however, the most economical labor distribution appears to be about 100 tons

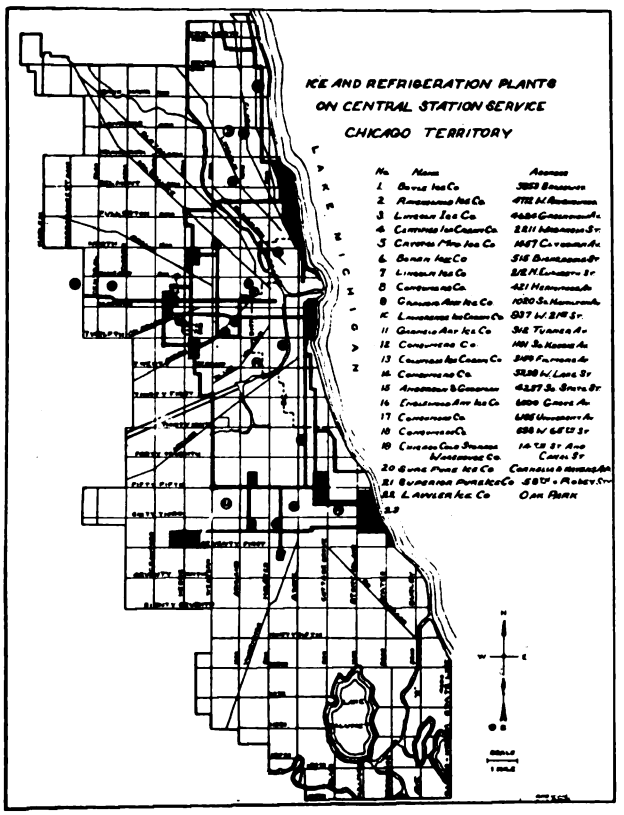

Fig. 2.—Plat of Chicago Showing Location of Ice Plants Using Central-Station Service.

of ice per day, any material change acting as a penalty against the most economical performance of the plant.

Judged from the basis of a typical ice-plant load-factor, being 47.7 per cent one year and 40.5 per cent the year before, and average seasonable requirements, it would appear as though a plant with a production capacity of 100 tons per day would be the most economical unit, both for investment and operation, and this is the size recommended for a community plant.

Most plants are weak on the side of storage, yet this is one of the most important items in successful plant operation, and, what is more to the point, is the least expensive side of the plant from the viewpoint of investment and returns. For the size of plant referred to, the general storage capacity should be at least 3,000 tons, and the daily storage capacity should be 200 tons, to act as the flexible units between supply and demand. Both should be well insulated and piped for refrigeration, so a temperature of about 30 degrees Fahrenheit can be maintained.

For the plant there are all kinds and conditions of equipment, but the one giving the greatest returns on investment is the simplified, properly balanced plant, stripped of all complications. The more simple the plant, within reason, the less will be the requirements for maintenance, repair and general upkeep, the less the difficulty to procure suitable labor and to locate and remedy defects and faults.

This statement is not intended as a criticism or opposition to any form of labor-saving device or plant complication, but represents results only as found. It is intended as a caution to prospective ice manufacturers that they thoroughly investigate before reaching a final decision on any plant equipment.

Compressor Equipment.

The compression side of the plant should preferably be in two units, one large and the other small; one a duplex, the other simple. Then with two sets of pulleys for each driving motor, high-efficiency variation can be accomplished almost at will, and plant output varied from month to month to suit requirements, both as to season and to service contract. The small compressor would be used for parallel operation during the run in heavy seasons, and for winter runs and refrigeration purposes at other times.

Under proper conditions of installation and operation a compression system having a rated daily ice-tonnage capacity of 80 tons will produce 100 tons of ice and over per day on what is termed the slow-freezing process, and this process will produce better and cheaper ice than any other method of artificial-ice manufacture. It is accomplished by keeping the head pressure down and suction pressure up.

This may sound paradoxical, but it is true, nevertheless. The head pressure can be kept down by having sufficient condenser capacity and an abundance of condenser water, neither of which is prohibitive. Many plants are weak on the condenser side, being installed initially on the basis of 185 to 205 pounds per square inch head pressure for hot and humid weather. This part of the equipment is not expensive, and the installation of a few more stands of condensers would add but little to first cost, but be a mighty factor in daily operation expense. With an effective method for freeing from foul gases and by keeping condensers free and clear, most efficient results can be obtained at all times. The low-pressure or suction side of the system can be kept up and nicely balanced by having sufficient freezing surface in the freezing tanks, and by not bleeding or coasting tanks in harvesting. This higher suction pressure enables the compressor to handle more ammonia gas, by weight, per stroke, and gives greater refrigerating effect. The slower freeze makes a much purer product, as well as helping to minimize plant losses. It is possible to maintain pressures not to exceed 165 pounds per square inch on the

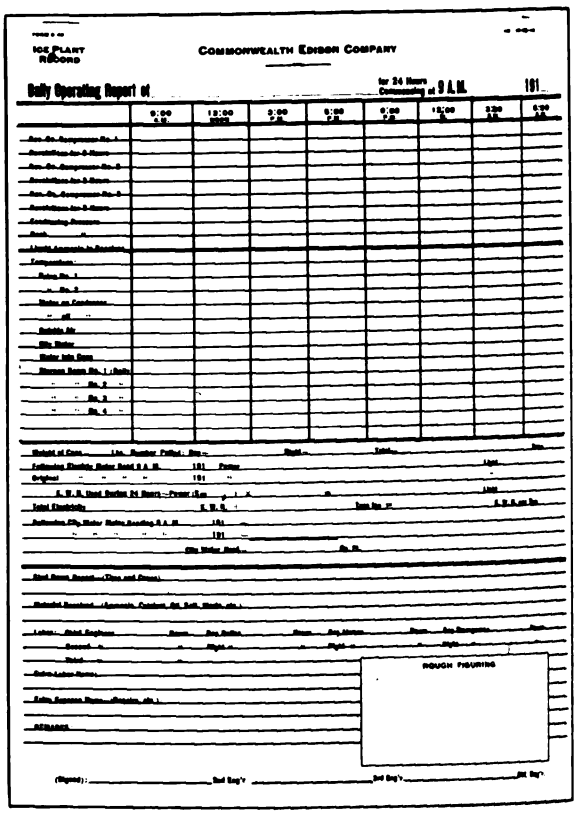

Fig. 3.—Daily Operating Record.

high side, and 23 pounds per square inch on the suction side.

One great mistake made in the past has been to install a small receiver, located in any old place, but usually in a warm place on the roof or in a hot engine room. The

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receiver should be large—very large—located in a cool place and insulated.

Freezing Equipment.

The freezing tank should contain the equivalent of at least 15 400-pound cans to the ton of installed compressor capacity, or at least 1,200 400-pounds cans for a plant pro-

Fig. 4.—Type of Ice Plant in Residential District.

ducing 100 tons of ice per day by the slow-freezing process. It should be thoroughly insulated against earth and other heat losses and provided with coils for direct expansion on the flooded system. A King valve should control the ammonia supply to coils, rather than a multiplicity of valves for the engineer to watch and regulate. Tank coils are given preference over the shell cooler system, only because results so far obtained prove their superiority. Other things being equal, the amount of heat to be removed in the freezing process is the same, regardless as to which system is used, and considering the simple plant there is no difference in the labor requirements between the two.

When energy consumption will average from 10 kilowatt-hours and upward per ton of production more with one system than with the other, covering the same amount of work done, then the measure of efficiency certainly cannot be the same, and even though the shell-cooler equipment be cheaper than direct-expansion coils, as to first cost, it must show a much better performance before it can hope to displace the coil system.

With direct-expansion coils in the tank these coils are located in the clearance space between the can rows and take up but very little space. With a shell-cooler installation the shell cooler is usually installed in the tank or deck space or in the open, clear of the tank, but in either case taking up additional space over coil requirements.

The statement is not made that the shell-cooler systems cannot give the equivalent performance that coil systems can. There is no good reason why they should not, but the results obtained so far show they do not, and it is up to the manufacturer and to the advocates of this system and not to the central station to prove it.

Naturally from what has preceded, the inference is that the simple drop-pipe, low-pressure air system of water agitation is the one recommended, and this is correct. The best average results, everything considered, have so far been obtained in such plants.

Electric cranes handling four 400-pound cans at a time with motors for lift and travel, are recommended as utilizing harvesting labor to the greatest advantage. It practically reduces to one-half the time necessary with a two-can crane and allows the harvesting force time for ordinary ice adjustments in the storage rooms.

Of utmost importance is the circulation of brine in the freezing tanks. This, of course, depends upon the brine level or head, but circulation should be made as rapid as possible. This brine is the medium of heat exchange between sweet water in cans and ammonia circulation in expansion coils, and this heat exchange represents the measure of efficiency for this part of the plant equipment.

Core water should not be wasted to sewer, but should be utilized over the condenser or in pre-cooling fresh core water, unless it should be found to be too foul or impure for such use. The former contains an excellent measure of cooling effect that will help materially in maintaining low head pressures.

From numerous tests made it is shown that there is no advantage in pre-cooling sweet water before it goes to the cans. The most efficient and effective heat exchanger is the freezing tank. Water and ammonia should be delivered to one location, and then that place should be watched. Neither is there any advantage gained in cooling and washing the air for agitation, but results only in added complication to a system, without beneficial results. On tests made the difference in air temperature at the can outlet between air pre-cooled and a simple air system was less than two degrees Fahrenheit.

There is one place where a material saving may be made, and some experiments made seem to point strongly in that direction. This is the pre-cooling of fresh core water. This core water, when introduced, must be cooled to a temperature of 32 degrees Fahrenheit and then have 142 British thermal units per pound abstracted. This involves a delay since we know that the insulating effect of the ice due to the core being removed from direct contact with the freezing zone calls for a greater refrigerating effect. If this fresh core water could be cooled to near 32 degrees Fahrenheit before delivery to the core section the time required for closing the core would be materially reduced, resulting in an increased tonnage output per day at nearly the same cost for energy as the preceding output. Several plants are planning to try out this idea this season.

Water for releasing ice from cans should be taken from the hot side of the condensers and then returned from the sump to the tower for use over the condensers again. Such a statement might appear superfluous, nevertheless, several

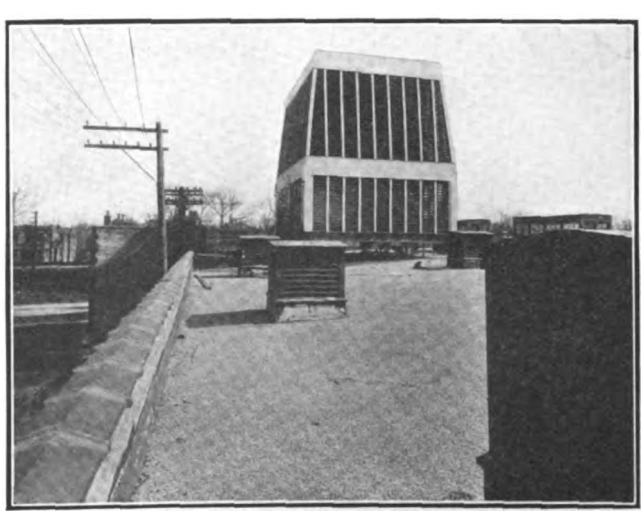

Fig. 5.—Close-Up View of Tower Shown in Fig. 4.

plants have been found using city water direct from the mains for this purpose.

Other Equipment.

For a proper balance the water-cooling equipment should be installed, not in duplicate sets, but of sizes suitable for seasonable runs, one large and the other small. The same is true as regards condenser-pumping equipment.

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For water-cooling medium there probably is no better equipment possible than the properly designed, constructed and operated natural-draft wood tower, taking into account investment costs. At least that conclusion is derived from the results obtained from numerous records and tests. The subject of deep-well water for condenser purposes should receive the most careful investigation from every angle before deciding in its favor as against a cooling-tower installation.

Extreme care should be used as regards insulation. The machinery side of all suction lines between compressors, ice tanks and ice storage rooms should be well covered.

In the preceding pages it was only possible to deal in generalities, to merely outline in a broad sense the necessity for central-station men to acquaint themselves with the characteristics of this class of business.

Ice-Plant Comparisons.

In making comparisons between plants operated from central-station service and power self-produced, the basis of comparison has always been the kilowatt-hour per ton, and invariably it was 60 kilowatt-hours per ton of ice produced, and this high cost for production compared with the power equivalent for steam, gas and oil-operated plants. There can be but one true measure of comparison, and setting aside the fact as to whether a plant can or cannot be located in a certain territory, it must be based upon equivalent plants, including all items of investment and operation and covering a period of at least 10 years.

In a recent paper several such plant comparisons were made. Let us repeat one of these comparisons and analyze it. The following, by Robert P. Kehoe, engineer of the De La Vergne Machine Company, is exactly reproduced as published in *Power* for October 19, 1915, being a comparison between steam, oil and electric operation, of a 100-ton ice plant.

INVESTMENT AND OPERATING EXPENSE.

		Distilled-water Plant (300-pound cans)	Raw-water Plant (300-pound cans)	
		Steam Engine	Oil Engine	Electric Motor
Investment, mechanical equipment, complete		$62,000	$70,000	$52,000
Building		37,500	35,000	35,000
Total investment, excluding land		$99,500	$105,000	$87,000
Daily operating expense:				
Chief engineer	(1)	$ 6.00	$ 6.00	$ 5.00
Assistant engineer	(1)	3.50	3.50	3.50
Oilers	(2)	4.00	4.00	4.00
Firemen	(2)	4.00	.....	.....
Tankmen	(4)	8.00	(6) 12.00	(6) 12.00
Storehouse men	(2)	4.00	4.00	4.00
Fuel:				
Coal @ $3.50 per ton; oil @ 3½c per gal.; energy @ 1c per kilowatt-hour, 60 kilowatt-hours per ton		38.50	15.00	60.00
Ammonia, oil, waste, etc		10.00	10.00	10.00
Net operating expense per day		$78.00	$54.50	$98.50

TOTAL YEARLY COST OF OPERATION.

Total cost of operation per year on basis of operating full capacity four months, one-half operation four months and one-quarter operation four months, equivalent to full operation for 216 days (60-per-cent load-factor):

	Steam	Oil	Electric
Operating cost of equivalent 216 days of full operation	$16,848	$11,772	$21,276
All labor expense for balance of year	4,248	4,248	4,104
Five-per-cent depreciation on cost of mechanical equipment	3,100	3,500	2,600
Three-per-cent depreciation on cost of building	1,125	1,050	1,050
Five per cent on total investment for repairs, taxes, water and incidentals	4,975	5,250	4,350
Total annual expense	$30,296	$25,820	$33,380
Number of tons of ice produced annually	21,600	21,600	21,600
Total cost per ton of ice per annum	$1.40	$1.19	$1.55

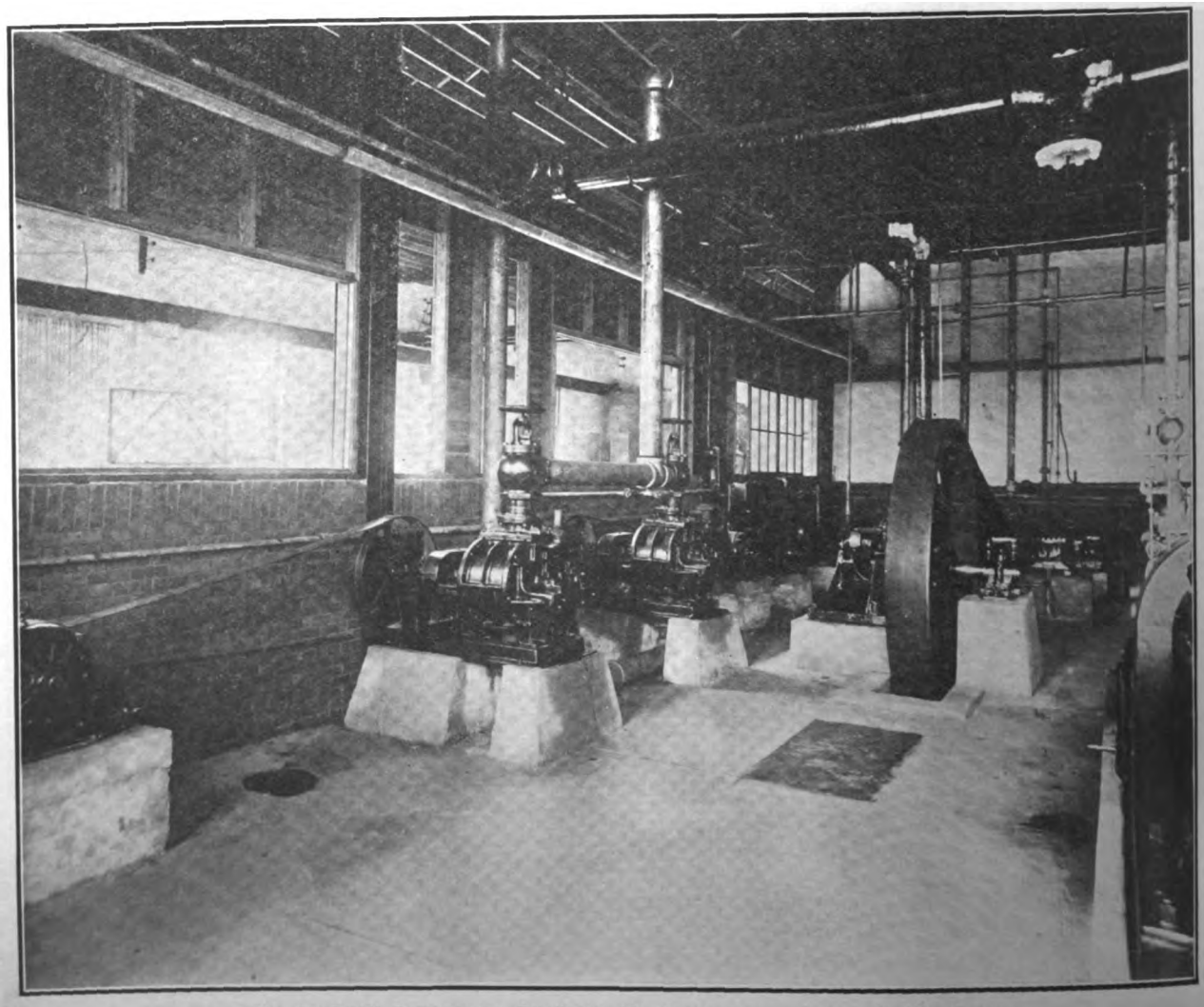

Fig. 6.—Small Compressor, Duplicate Air Compressor and Core-Sucking Pump.

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This is all as published; let us make our comparisons on actual operating costs from central-station service, but making use of the same investment figures as before:

	Steam	Oil	Electric
Operating cost of equivalent 216 days of full operation	$16,848	$11,772	$17,928
All labor expense for balance of year	4,248	4,248	.....
Five-per-cent depreciation on cost of mechanical equipment	3,100	3,500	2,600
Three-per-cent depreciation on cost of building	1,125	1,050	1,050
Five per cent on total investment for repairs, taxes, water and incidentals	4,975	5,250	3,150
Total annual expense	$30,296	$25,820	$24,728
Number of tons ice produced annually	21,600	21,600	21,600
Total cost per ton of ice per annum	$1.40	$1.19	$1.145

In this comparison investment figures have not been changed from the original as published, although the comparison estimate is high for electric plant.

Figures under electrical operation are actual, not estimated, being based on the average of several plants. Had the best plant figures been used this amount would have been reduced nearly $2,000 for the year. They are based on a load-factor, actual, of 47.9 per cent, as against this comparison estimate of 60 per cent. Corrected to an equivalent load-factor basis the results would still have been improved by 25 per cent in form of central-station operation.

Under the item "Five-per-cent depreciation on total investment for repairs, taxes, water and incidentals," the same figures have been used as in the original comparison reduced only by the actual amounts for water, repairs and incidentals. Comparing these items, as listed, for the operation of steam and oil-engine plants, as against an electric plant on the same basis of 5 per cent, is absolutely unfair to the electric plant; its true value is more nearly represented by the ratio of 5 per cent for steam and oil engine operation, as against 3 per cent for electric operation.

Compared with labor conditions in this territory the labor item is far from correct. For ice-manufacturing plants the union requires three engineering shifts per day at a rate of 49 cents per hour. The chief engineer is, of course, at a higher rate, and the hour or day rate for oilers, firemen, tankmen and storage men is much higher than estimated, being from 22 cents to 25 cents per hour.

These higher labor rates are already included in the

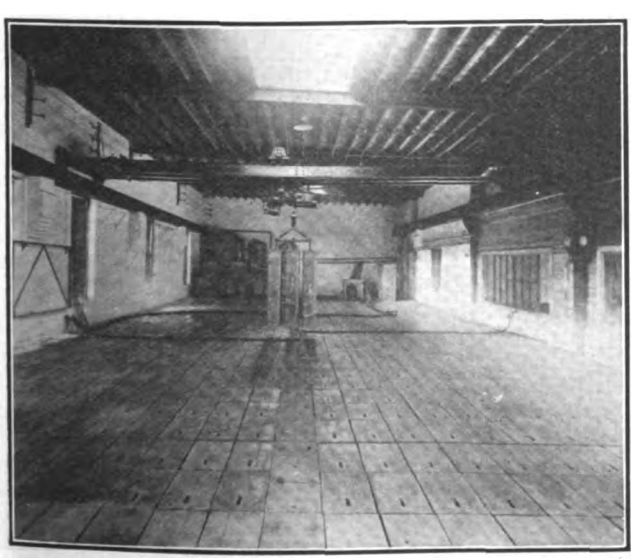

Fig. 7.—Tank Room, Showing Filters and Storage Tank.

operating costs for a central-station-operated plant. If steam and oil-engine-operated plants be corrected, for these items, to a comparative basis with the electric plant, the results will still further increase the lead a central-station-operated plant has over the other two forms of prime mover.

In the main, the results of this comparison are very satisfactory, but only to be expected by anyone who has made a close study of the subject from all of its angles. Without changing any of the comparison figures for steam and oil-engine plants and by using actual figures for an

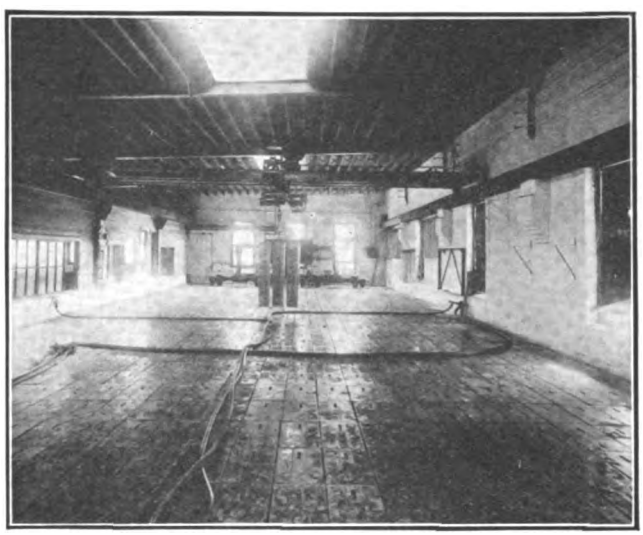

Fig. 8.—Tank Room, Showing Expansion and Accumulator Sides.

equivalent electrically operated plant, the result is a difference of 4.5 cents per ton of production in favor of the plant operated from the central station. By making the needed corrections, as suggested, for a true comparison this difference would be increased to about 15 cents per ton.

The following plant record for two years shows conclusively the advantage of ample freezing surface in tanks, this being only one of several plants that are now operating on the slow-freeze basis.

	1914			KWH.	1915			KWH.
	Max. KW.	KWH.	Tons of Ice	per Ton	Max. KW.	KWH.	Tons of Ice	per Ton
Jan.	.....	.....	.....	.....	3	480	.....	.....
Feb.	.....	.....	.....	.....	.....	.....	.....	.....
Mar.	.....	.....	.....	.....	38	8,640	.....	.....
Apr.	.....	.....	.....	.....	150	82,080	2,388	34.4
May	253	13,760	.....	.....	147	70,880	2,104	33.7
June	346	171,680	2,600	66.	186	113,600	2,881	39.4
July	336	227,200	3,620	61.5	189	122,400	2,592	47.2
Aug.	320	205,920	3,554	58.	189	124,000	2,600	47.7
Sept.	192	117,760	2,564	46.	163	100,480	2,128	47.
Oct.	179	92,800	2,511	37.	147	67,040	1,824	36.7
Nov.	26	1,920	240	.....	147	53,440	1,770	30.2
Dec.	22	960	.....	.....	.....	.....	.....	.....
		831,680	15,089			743,040	18,287	

Total water average per ton 1914 ..... 2.47 cents
Total water average per ton 1915 ..... 1.82 cents

Notice the great differences in the column marked "Max. KW." for the two years. In operation there has been a gain of 3,198 tons of ice produced, and a decrease of 88,640 kilowatt-hours in energy consumption for the year 1915 over 1914.

Advantages of Central-Station Service.

There are many distinct advantages in favor of central-station service in the operation of such a plant over any form of power self-produced. As to location, there are practically no restrictions; the plant can usually be located at its most economical center, which is not true in the large majority of cases with any other form of prime mover.

The advantages of simplicity, low first cost and hence lower annual investment charge, low maintenance and repair expense, flexibility, high plant efficiency and the possibilities of a continued check on plant operation place it in the front rank as a power equivalent reducing the items of supervision and clerical labor to a minimum.

The overload capacity of both lines and motors as well as service continuity and reliability, combined with the element of emergency, are items not to be lost sight of, ren-

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dering needless the excessive expense of plant duplication necessary in any other type of plant on a comparison basis.

Service contracts for central-station service are usually for five years or longer and based on a fixed unit price or earning capacity with a guarantee against any increase during the term of contract. The same cannot be said of

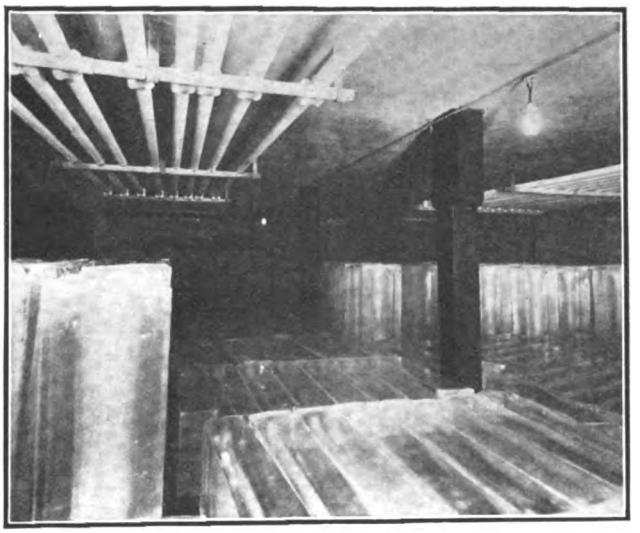

Fig. 9.—Day Storage Room.

a privately operated plant, for both coal and oil and the necessary labor for handling them are increasing in cost.

The average kilowatt-hours per ton of ice for five well operated plants with an average production of a little over 100 tons per day per plant for the last season was 41.6 and for all 18 plants 51.12 kilowatt-hours. The average ice load was 47.7 per cent. Had this been 60 per cent instead, results would have been much better.

The "off-peak" service contract under which these plants operate calls for a guaranteed 50-per-cent load-factor on a 200-kilowatt plant during the months of June, July, August and September, with "off-peak" hours from 4 p. m. to 8:30 p. m. during November, December and January, and 4:30 p. m. to 8:30 p. m. during February (Sundays excluded), with a penalty for any load on the service during that period reduced to standard contract rate for that particular load.

In the operation of a raw-water ice plant a continual air supply for water agitation is absolutely necessary, as otherwise white ice would result. It is also essential that brine in the tank be kept in circulation. These two items for the low-pressure air system will amount to from 15 to 20 kilowatts, or about 10 per cent of a 200-kilowatt plant. At present there is a penalty attached to this load when operated during the "peak" period, as noted above.

In operation most of these plants keep daily records similar to the sample herewith and in this way are able to keep a very close and continual check on all operating conditions.

Most of the pictures shown herein have appeared in other publications, yet they will lose none of their interest by repetition. Fig. 4 is a splendid type of residential or community plant, with its cooling tower showing to good advantage. Fig. 5 is a close-up view of this same tower as viewed from the roof. Condensers are located in the lower section with water-cooling effect in the upper section of tower. A pan in the lower section of tower beneath the condensers catches the water as it comes from them and returns it to the pumps, which, in turn, deliver the water to the top of tower to be cooled by the process of drop and splash. Although pumps and motors are located in the engine room, where they can receive proper supervision by the engineer, they are so connected as to take advantage of the differential water head, the actual head pumped against being practically only the height of the tower plus the pipe and pump friction losses.

Fig. 1 is an illustration of the compressor room, showing the large duplex compressor and motor, with switchboard in the extreme corner. The flywheel of the small compressor is seen at the extreme left. Fig. 6 shows the small compressor, the duplicate air compressor on the left, with core-sucking pump in the rear of the second compressor, while the tower water pumps are in the extreme rear.

Fig. 7 shows the tank deck with all covers in place. The filters and storage tank are shown to the left, at the rear, and the vertical brine agitator at the right. The crane is shown handling three 400-pound cans. Hose lines extending across deck are for core sucking and can filling.

Fig. 8 shows a view looking towards the expansion and accumulator side of the plant, Fig. 9 the day storage room partly filled with ice, and Fig. 10 shows the high grade of the raw-water ice product. Note the thinness of the core section. The photograph from which this cut was made had not been retouched.

In conclusion, there are enough distinct advantages connected with plant operation from central-station service as to demand a hearing under any conditions of plant or operation. In practical operation central-station service can give an account of itself second to none, as evidenced by daily records from many plants.

Electric Company Inaugurates Employees' Stock Plan.

The Turners Falls Electric Light & Power Company, Turners Falls, Mass., a large hydroelectric company generating energy at a newly constructed plant on the Connecticut River in Central Massachusetts, has decided to inaugurate a plan by which any employee who has been in the service of the company one year shall be entitled to purchase from the corporation not to exceed 200 shares of employees' stock, to be issued at $10 per share. It is provided that such stock shall be sold, assigned or transferred only to an employee of the company, or to the company itself. The corporation shall purchase any stock offered by an employee or his executor or administrator, payment not to be required in less than 30 days. Employees' stock shall be entitled to one vote for each 10 shares. After the

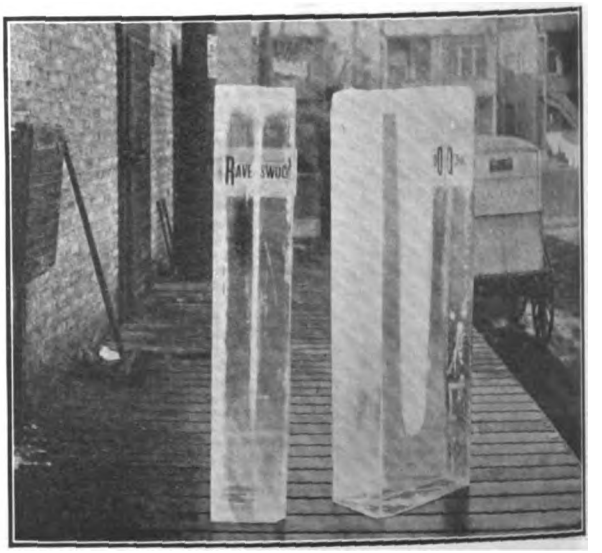

Fig. 10.—Samples of Raw-Water Ice.

death of an employee, or after he ceases to be in the company's employ, his stock shall be sold to the company, or to another employee, at par. If at the end of two years after the employee's death, or three months after the termination of employment, the stock has not been sold and transferred the dividends and voting right shall cease.

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Selling Municipal and Highway Lighting

There Are 35,555 Miles of National Highway Alone That if Lighted Would Afford Central Stations an Annual Income of $5,000,000 —Other Big Fields Available in Urban and Rural Communities

By Thomas F. Kelly

EVERYBODY, who has given the commercial phase of municipal and highway lighting any consideration, is satisfied of the wonderful opportunities for development. The revenue derived from the electric lighting of the streets of most communities is not nearly so great as it might be if proper attention was given to this branch of the business. Any person who has made a study of the situation has found out that in a great number of cities, towns and villages, the revenue derived was originally obtained from an arc lamp located at possibly each street intersection or possibly every other street intersection, and in many communities the old conditions have been allowed to continue, no increase in revenue occurring because no effort was made to improve things.

Happily, however, for the good of the electrical industry and for the revenue of some central stations, some are alive to their opportunities and making the most of them.

Mr. Kelly is commercial manager of the Dayton (O.) Power & Light Company and chairman of the Committee on Municipal and Highway Lighting, of the Lighting Sales Bureau, N. E. L. A.

General Street Lighting.

There are instances where contracts covering the lighting of streets in municipalities with an obsolete type of illuminant improperly located, were still in existence, but where the central station, with a vision of greater satisfaction to the citizens and possibly slightly increased revenue, approached the governing body of the community with a plan of properly lighting the streets with a modern lighting unit and has secured a new contract on terms, entirely satisfactory, covering systems which have possibilities for growth, while receiving proper attention.

In one community the installation of a proper system of general street lighting was followed by the installation of a very effective installation of ornamental street lighting.

Effective co-operation at all times with the local Chamber of Commerce and Merchants' Association has demonstrated itself to be an immense help in securing the maximum results from street lighting.

Ornamental Street Lighting.

Communities—large and small—continue installing ornamental standards. Adequately lighted streets have demonstrated their value and now the merchant and the "live" citizen of any community is anxious to see the business section of his town attractively lighted, which means, in most instances, ornamental standards.

Most citizens look with pride on their ornamental street-lighting systems, and in one community that I am familiar with, enjoying an exceptionally extensive ornamental system, this is the case, and the citizens are constantly reminded of its existence through reference being made to it in newspaper interviews with visiting celebrities. Such publicity is good business and a factor in the growth of such systems.

The installation of an ornamental system in one community is generally followed by a desire on the part of the merchants of a neighboring community to do likewise.

There are various types of ornamental standards—the present tendency being to install single-lamp standards of a design in keeping with its surroundings, such as in Cleveland, O.

Personally, I am heartily in favor of the plan covering the installation of such ornamental street-lighting systems that provide for the system being installed at the expense of the central-station company, the company supplying the current and maintaining the system and being paid for this service by the city direct at a stipulated price per standard per year.

Highway Lighting.

Much business can be obtained through the lighting of highways and paid for through our state, county or township authorities.

I, personally, believe that if there was the proper effort put back of the movement that legislative bodies would be prepared to co-operate with county authorities in paying a portion at least of the expense of lighting the principal highways in the state, possibly in the same manner, as they are doing at the present time in a great number of states in respect to the building of roads.

Some central stations have obtained considerable business by the lighting of highways in their territories and for which they are paid by county or township authorities.

The most satisfactory way to handle this business is through the proper county authorities and the Dayton Power & Light Company with the idea in mind of eventually lighting all the principal highways in its territory, installed and is lighting at its expense as a sample installation, about 1.25 miles of brick highway south of Dayton. This installation consists of 15 80-candlepower series Mazda C lamps, spaced 450 feet apart. The brackets are located on the poles carrying the distribution circuits of the company.

In some instances county and township authorities are paying for highway lighting out of their general taxes and yet there are instances where it applies as a special tax against the owners along the highway that is illuminated.

I would therefore suggest to the commercial manager, considering developing his territory, to first ascertain the proper procedure as required by the laws of his particular state.

In Ohio the county commissioners have the authority to contract for such lighting and pay for same out of the general taxes, and the laws of Ohio also provide that the lighting of highways may be obtained in this manner. "Lighting Districts" may be formed by a petition presented to the trustees of any township, signed by owners of more than 50 per cent of the property fronting on the highway to be lighted. Upon receiving this petition the township trustees serve a 30 days' notice of a public hearing on all property owners affected, to receive arguments for and against such lighting. The trustees, after listening to all arguments, decide as to the necessity of such lighting, and upon deciding in favor of the lighting, go over the highway and decide upon the number and candlepower of lamps required, location of same and hours of burning. Specifications are then prepared with an advertisement for bids to be received at the end of 30 days, when

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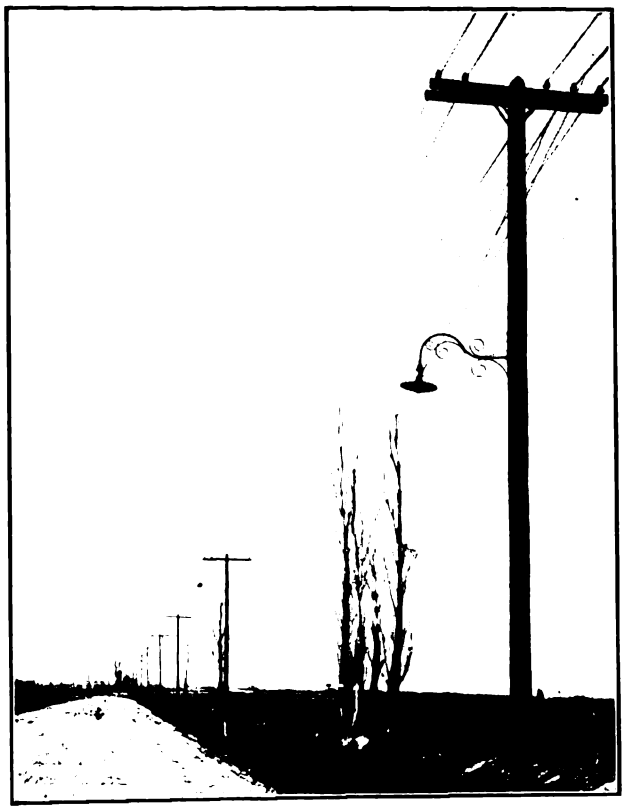
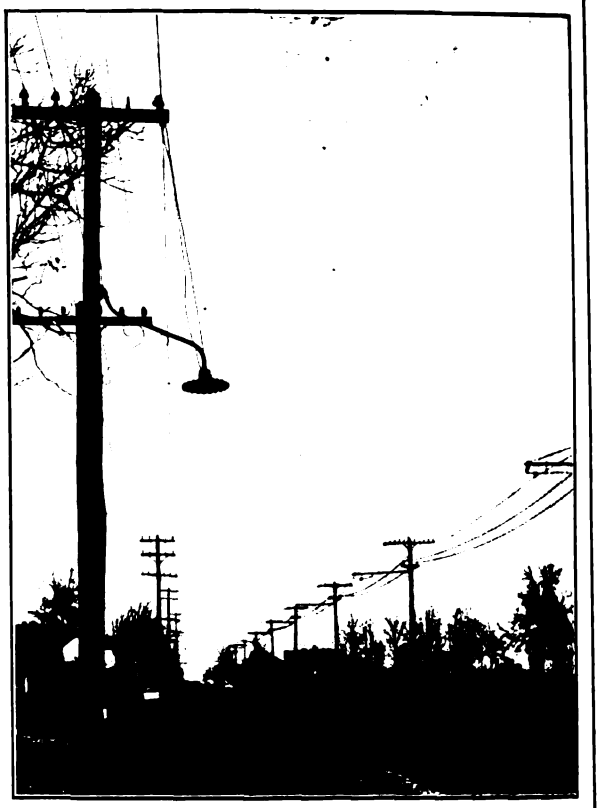


An 18-Mile Stretch of Lincoln Highway in Utah Lighted by 100-Candlepower Type C Lamps Spaced 270 Feet Apart.



Type of Fixture and Lamp Used by Dayton Power & Light Company in Lighting Highways Between Towns it Serves.

Highway Lighting in Central Part of New York State Using 25-Candlepower, Four-Ampere Series Lamps. Lighting is Paid for by Townships.

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the trustees meet and award a 10-year contract to the lowest bidder. The cost of this lighting is assessed against the owners of property along the highway to be lighted, in proportion to the value of their property.

The Dayton Power & Light Company has three contracts that were secured in the manner described in the preceding paragraph—one being 0.5 mile, another 1.5 miles and the third 2.4 miles in length.

When we realize the wonderful results that would be obtained if all of the main highways in every state were electrically lighted and traveling at night would be as safe as in the day-light hours, it seems a pity that more central stations are not more active in going after and securing this business.

The revenue that can be secured from this source is considerable and it is interesting to mention the revenue that might be obtained from the principal 14 transcontinental highways with a very modest system of illumination.

The following table contains the names of these highways, together with their terminals and distance:

	Miles.
North-West Trail, Olympia, Wash., to Boston, Mass.	3,571
Lincoln Highway, San Francisco to New York	3,389
Midland Trail, San Francisco to New York	3,759
Pikes Peak Ocean-to-Ocean Highway, San Francisco to New York	3,533
National Old Trails Road, Los Angeles to Washington, D. C.	3,034
Southern National Highway, San Diego, Cal., to Washington, D. C.	3,203
Southern National Highway Gulf Atlantic Division, El Paso, Tex., to Salisbury, N. C.	2,171
Trail to Sunset, San Diego, Cal., to Chicago	2,677
Pacific Highway, Blaine, Wash., to San Diego, Cal.	1,703
Oregon Trail, Seattle, Wash., to Salt Lake City	1,101
National Parks-Gulf Highway, Yellowstone National Park, Wyo., to Galveston, Tex.	1,849
Meridian Road, Pembina, N. D., to Galveston, Tex.	1,856
Dixie Highway, Chicago to Miami, Fla.	1,438
Atlantic Highway, Calais, Me., to Miami, Fla.	2,271

While it is true that for short distances some of these highways cover the same ground, by far the greatest portion of the total mileage, namely, 35,555 miles, might well be electrically illuminated. While the 100-candlepower series Mazda type C lamp would perhaps not be satisfactory for the entire distance —figuring on using that lamp spaced 450 feet apart, 417,179 lamps would be required and if these lamps were illuminated 4,000 hours per year and we received a net return of four cents per kilowatt-hour for current only—a yearly revenue of $4,972,-800 would be obtained.

The lighting of the transcontinental highways is only a small part of the available business that can be obtained with a little effort and I believe that the time has come for the live commercial manager to interest his local good road and automobile clubs in this movement and "light up" the highways in his territory.

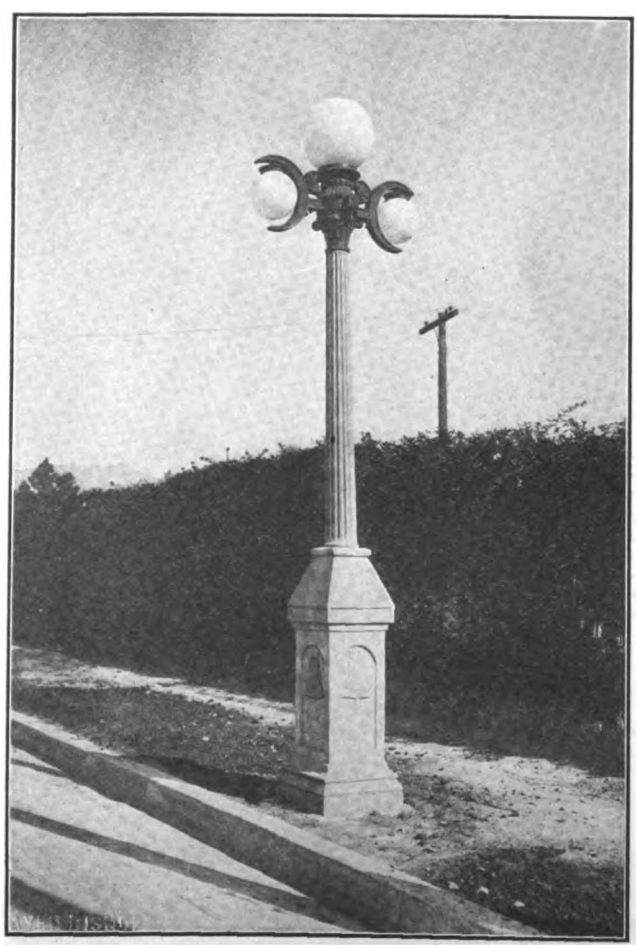
Electric Range Demonstrated in Modern Home.

One of a number of campaigns on electric ranges the Interstate Public Service Company of Indiana is conducting at present throughout many of its properties is taking place at Columbus, Ind.

In order to make the display and demonstration of electric ranges as attractive as possible, a "modern home" was furnished with the aid of other business houses of the city. The electric range was made a feature of the exhibit, demonstrations being given at all times and lunches and dinners cooked to convince every one of the many advantages of electric cooking.

Special items of interest relative to the campaign are that time payments were allowed, trial installations made, and the ranges connected free of charge. The Interstate company is using Globe electric ranges in its present campaign.

Type of Fixture Used by the Southern California Edison Company in Lighting of Highways Which Are Paid For by Special Tax on Property Owners.



Ornamental Fixture Used in Southern California and Paid for by Special Tax Levy Upon All Property Owners in "Lighting District."

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The Lighting of Stores and Public Buildings

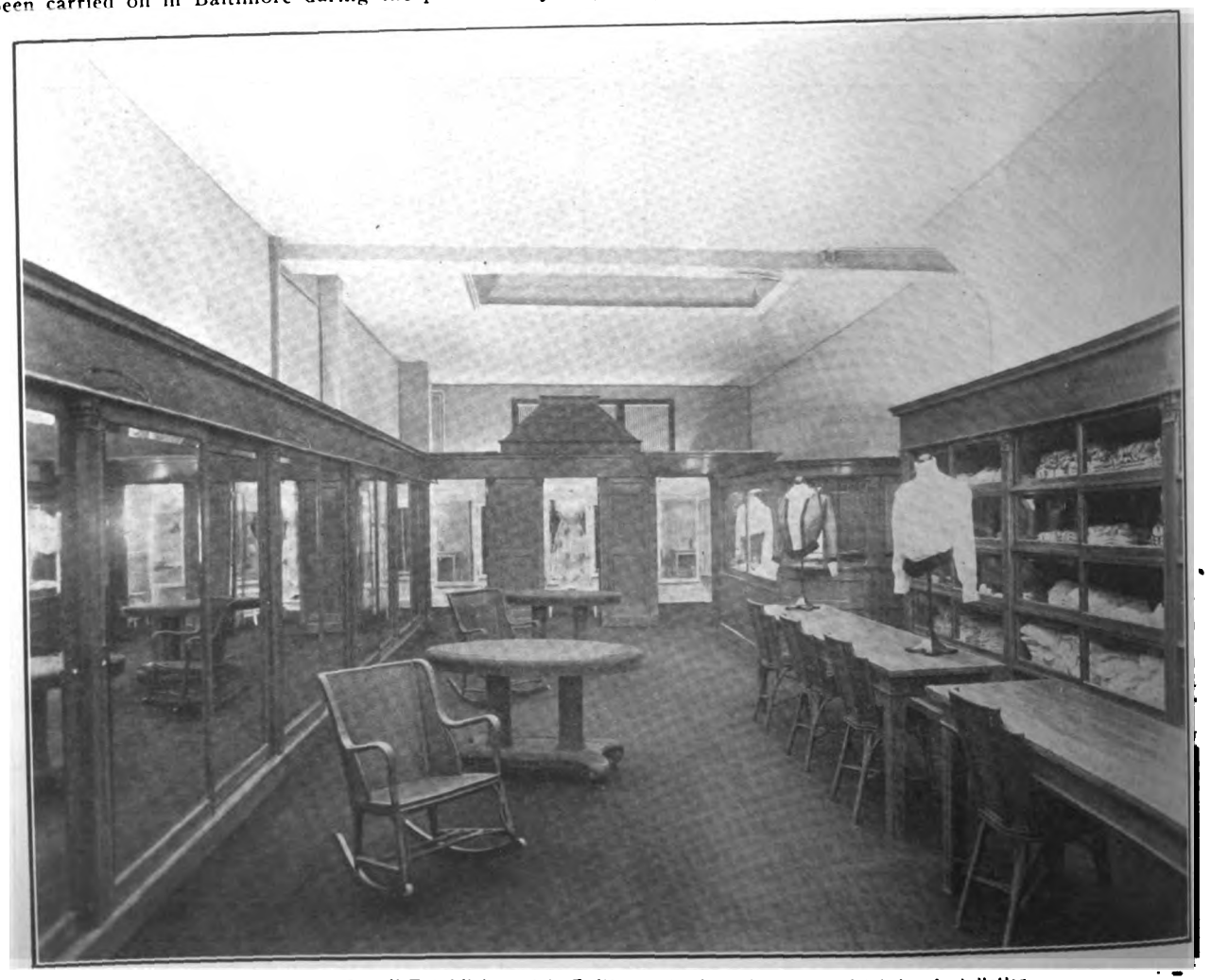
A Consistent, Comprehensive Campaign for Store and Public-Building Lighting Business Has Been Carried On for Three Years by the Consolidated Company of Baltimore, Resulting in Over 7000 Installations

By W. R. Moulton

THE new-business, or commercial department, of a central-station company has a double duty to perform. It is to help the customer in every possible way to obtain the best results from the service which he buys, and at the same time it must produce profitable business for the company. Lighting work offers possibly the best opportunity to produce these results, and stores are undoubtedly the most profitable of any one class of lighting. They are to be found in large numbers in all cities and vary greatly in character, individual business and degree of prosperity. The average small store can be dealt with as a group. They require good lighting results at comparatively small expense. Their lighting equipment must be neat in appearance and economical and efficient. There is no special objection to duplication of fixtures in a number of stores and as this class of business must be handled in large quantities to be profitable, it offers especially good opportunities for campaign work. A definite style of fixture can be selected, to be applied according to predetermined rule and sold at a definite campaign schedule of prices.

A continuous campaign for this class of business has been carried on in Baltimore during the past three years, resulting in satisfaction to both the customers and the central station. Newspaper advertising has been indulged in for a couple of months in the spring and fall of each year. Special circulars and pamphlets are mailed to a selected list throughout a slightly longer period and these are followed by personal solicitation of district salesmen.

About seven thousand stores have been served in this manner. A plain type of fixture was selected, having a capacity of 1, 2 or 3 lights. These fixtures were equipped with an efficient type of opal reflector and Mazda lamps. The reflectors were of deep-bowl type, sufficient to conceal the filament of the lamp, and the lamps supplied were always bowl-frosted. A definite effort was made to raise the standard of illumination by using practically the same amount of current as the customer previously used, but increasing the illumination by means of more efficient lamps and equipment. Window lighting was given special attention as a most necessary part of store lighting equipment. Mirror-glass reflectors of the most efficient type were used exclusively and advantage was taken of a trade name and reputation by featuring this strongly. Clear Mazda lamps were always furnished for the window lighting.



An Exclusive Retail Establishment in Baltimore Lighted from Cove-Lighting Installation.

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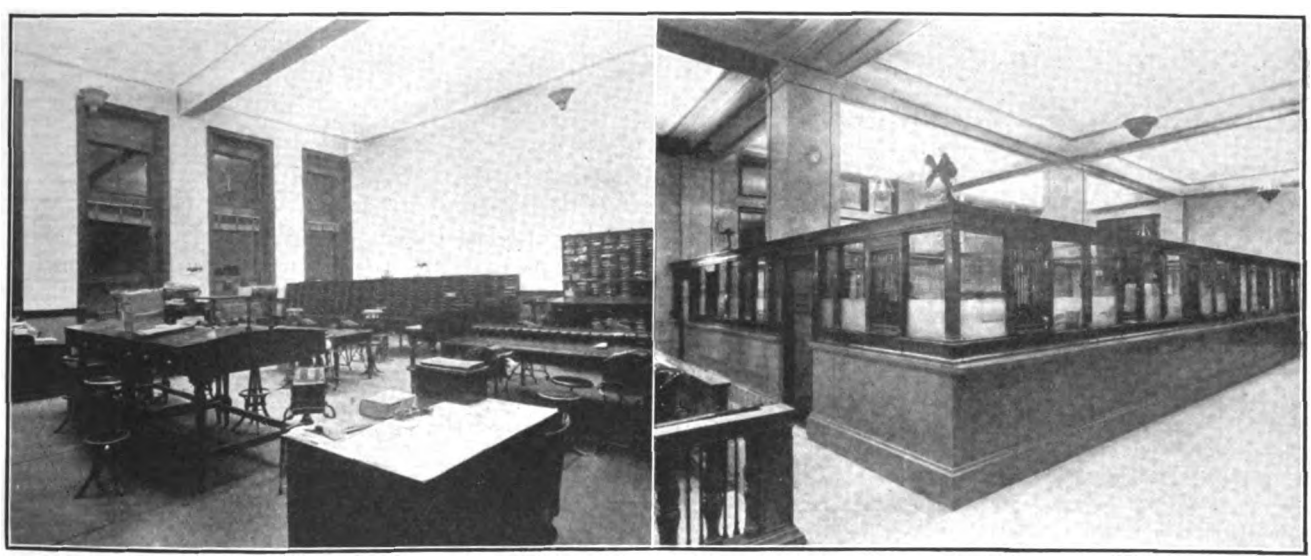
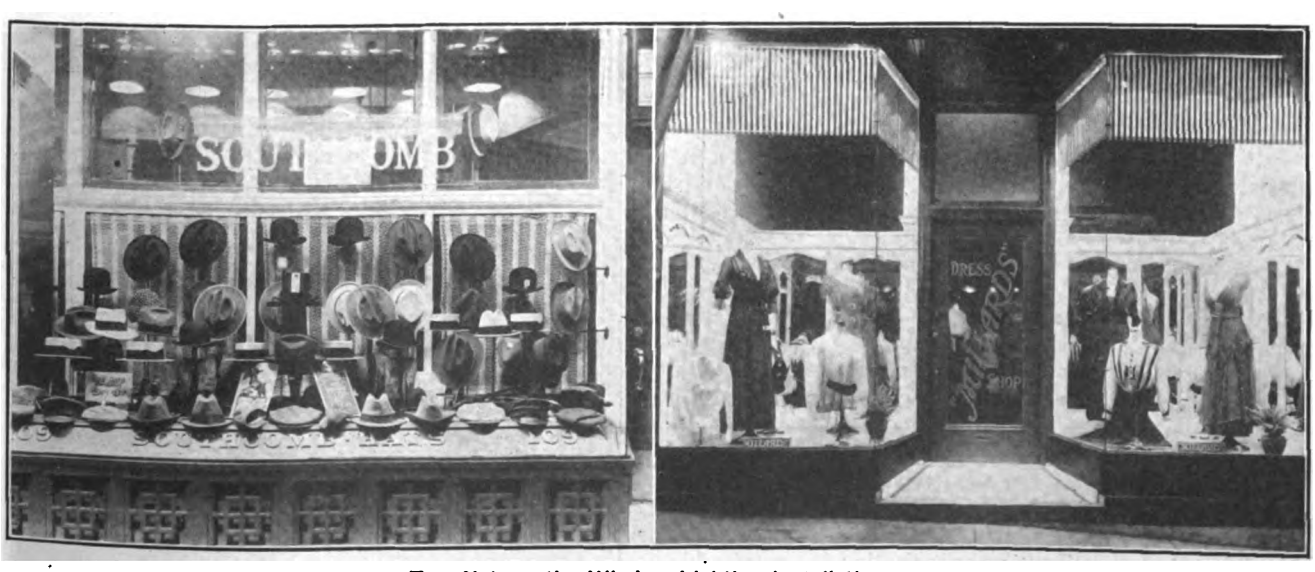
Two Excellent Examples of Grocery Store Lighting in Baltimore.
Store Shown on Left is Equipped with Indirect Lighting Units and One on Right is Equipped with Two Types of Semi-Indirect Units—No Direct Lighting is Employed.



Typical Lighting of Bank and Office.
Accounting Room on Left Lighted by Means of Indirect Units and Public Room of Baltimore Bank on Right Also Equipped with Indirect Units.



Two Noteworthy Window-Lighting Installations.
The Baltimore Company has Carried on a Special Window-Lighting Campaign for Three Years, with the Result that Many of the Stores in Baltimore are Using Approved Methods of Lighting for Properly Displaying Their Goods.

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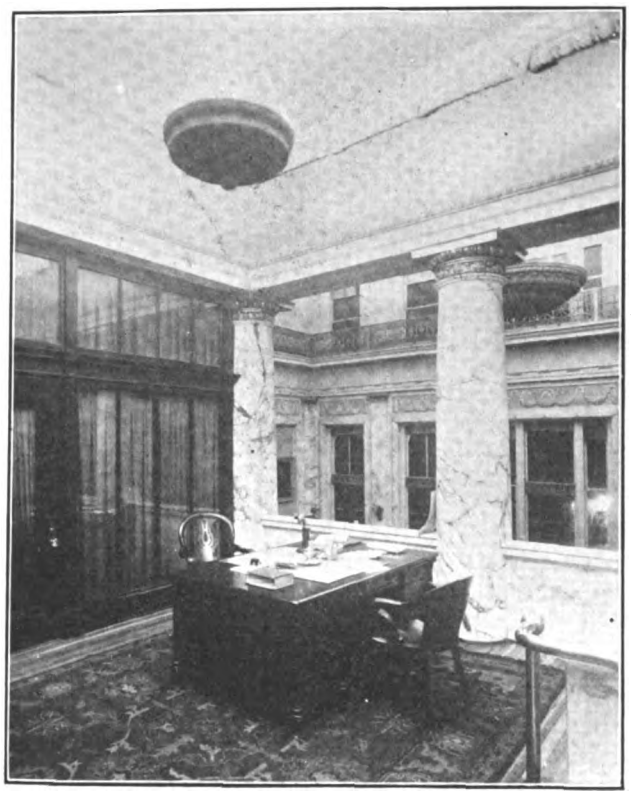


Vice-President's Office in Baltimore Bank.

The burden of this improvement was made as light as possible for the small store owner by allowing twelve months' time in which to complete payments for the lighting equipment, after making a small cash payment upon placing the order.

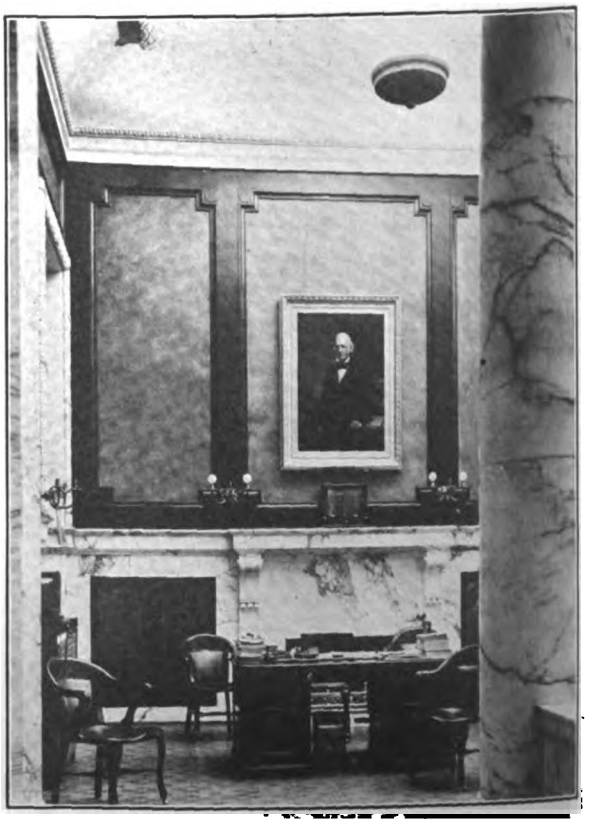
Stores of larger sizes and better grade vary widely in individuality and requirements and could not well be handled by a campaign. While a great many prospects have resulted from store advertising during the campaign for small stores, much more has come as a direct result of the personal solicitation of the district men. These men have endeavored to keep in touch with developments in their districts and are constantly on the lookout for rumors or indications of changes or improvements in a store. Each prospect is given special thought and study, and recommendations made which would seem to most nearly meet with the requirements of the business involved and the individual taste of the owner or proprietor. Such customers are primarily interested in making their establishment attractive to the public, and they also require that the light shall show their goods to the best advantage. First cost of the equipment and the method of paying for same is not of serious consequence. Time payments are allowed wherever the customer desires them, but many take advantage of the cash discount allowed for payment of the entire amount the first month.

Banks have proven a very profitable source of business. Those located in the congested section of the city are forced to make use of artificial light all of the day during the busy winter months, and some part of the day even in the bright summer months. A large number of people are directly connected with such an establishment and the general public are constantly entering its doors to transact business. This class of customer therefore is not only a good revenue producer, but an excellent source of general publicity and education. Personal acquaintance of the various employees or officials of banking institutions with members of the central-station organization has resulted in many valuable prospects. These have always been given the closest attention by the new-business department and good business has resulted. In some cases the mere changing of the lamps or glassware used with the lighting fixtures has produced marked improvement. At other times the fixtures have been remodeled and reconstructed, and often entirely new lighting equipment installed throughout a bank. No doubt the results so far produced can be made to bring further business and it is proposed to make up a pamphlet illustrating work that has been done and touching on the necessity of good lighting. These would be mailed individually to various officials of the banking institutions, practically all of whom are now customers of the company.

Churches have always been recognized as an excellent field for educating the public along the lines of good illumination, although they are not very large revenue producers. The N. E. L. A. bulletin on church lighting and also lighting-fixture manufacturers' bulletins have been mailed to the various ministers and these have been followed up by personal solicitation. The results here have also proved worth while, as the lighting of a great number of churches has been brought about. This has been done in a variety of ways, from changing of lamps or glassware to rewiring and supplying new fixtures. Direct lighting, semi-indirect lighting and total indirect lighting have all been used, the individual conditions of the building and preferences of the committee always being taken into consideration.

One especially gratifying result to be noticed throughout all of this work is the fact that it is possible to do the customer a great service in producing better results in proportion to the current which he purchases, by improving the appearance of the interior lighted, or raising the efficiency of his working force, and in practically every case maintaining the income to the central station for about the same amount which it had been under the old conditions or in many cases increasing same. There has never been one instance where the customer has objected to the increase of cost, as the results produced have more than offset this.

In the accompanying illustrations are shown several examples of well lighted interiors, which have been brought about by the activities of the central station.



Indirect Lighting in Private Office.

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Methods for Securing House-Wiring Business

There Are Approximately 15,000,000 Unwired Houses Within Reach of Central-Station Service Which Can be Secured by the Application of Approved Selling Methods Such as Outlined Here

By F. H. Scheel

THE subject of wiring existing residences has taken two steps forward recently. This is true not because of any additional importance becoming attached hereto. It is due simply to the fact that in the past three years various companies have demonstrated that this business can be secured, by proper procedure at a cost of securing that is not prohibitive. Further, that the effort involved and the expenses incurred more than justify the immediate revenue, notwithstanding the further possibilities of development to follow in the further sale of electrical household appliances.

Companies whose activities in the past have demonstrated these possibilities have accordingly enjoyed the returns accrued by such effort. I have in mind one electrical energy supply company which in the past five years wired 11,000 old residences. This business now represents 20 per cent of the total number of meters connected to its lines.

When speaking of unwired residences we are most vitally concerned with those on existing lines. The number of residences wired and connected in round numbers is given as 5,500,000—and as 15,000,000 not at present connected.

Mr. Scheel is contract agent of the Public Service Company of Northern Illinois at Streator and chairman of Residence Lighting Committee of the Lighting Sales Bureau, N. E. L. A.

Specific Campaigns Productful.

It is therefore apparent that there is enough business under this classification to justify considerable attention from central stations in the future. In going over the results of the various companies who have put considerable effort on this work, we find that the largest results are obtained through campaigns. There are probably more campaigns in progress at the present writing than at any previous time in the history of central-station business. This is, in a measure, due to the nation-wide campaigns inaugurated by the Society for Electrical Development, known as "Wire-Your-Home" month. Results so far reported are very gratifying and emphasize the success of campaign methods. When we campaign house wiring we are simply adopting a procedure that has proven a success in other lines of endeavor. The successful merchant or department store have long proven the value of offering our American public a bargain. Such methods have been the support of nearly all large merchandising schemes. Why should not the central station take this path of least resistance? A campaign properly conducted simply means that we are merchandising our house-wiring proposition in the same manner in which a merchant sells his wares. In a few words we have brought the subject of wiring existing buildings down to a basis of plain business. The natural question then is: What constitutes a sucessful house-wiring campaign? In the first place, a company planning a campaign should have at hand an analysis of its field. Probably the most successful method of securing this is by personal solicitation; a record of these calls should be kept in card file, cards giving necessary information as shown in the accompanying illustrations. With this information at hand a certain period should be selected for your campaign limiting a special offer to certain dates. This period should be preferably in the spring or fall of the year. Advertising of this campaign would then follow in the regular channels consisting of form letters, house-wiring booklets, newspaper advertising and display advertising. The point to remember in the advertising of a house-wiring proposition is not particularly the space in the mediums utilized, but rather the copy. It should be borne in mind that the offer is a bargain and that "Now" is the psychological time to wire a home. Explicit emphasis should be put on the fact that "Now is the Time," and of course it follows that your advertising should carry forceful arguments supporting this contention. "Our club offer affords you a bargain," making the point that a very large number of houses are to be wired within a short period of time is a good phrase. The aggregate business amounts in reality to a single huge job which obviously would be less expensive than a number of small individual jobs. It should be explained that within the next 30 days all contracts for house wiring will be considered as a unit and the material and labor involved figured on the lowest possible basis. This can only be done when large quantities are concerned. People making contracts during this period will, of course, enjoy the benefit of this low figure. Another plan is to take a given house of, we will say, seven rooms, let your advertising show cut of houses, sample of fixtures, and give price of terms in plain figures. It is a good plan to explain in plain terms the method of estimating the cost of wiring a house, using preferably, because of its simplicity, a fixed price per outlet basis.

Suggestions for Advertising.

Newspaper advertising on this feature should be specific and in concrete form so that the average layman can use the scheme in figuring his own house. We learn from various companies that nearly all results are secured from personal solicitation, therefore it follows that your salesman's approach should be along the same lines as your advertising. A salesman soliciting this class of business should be equipped with data on house wiring similar to that carried by salesmen working any other specialty. It is a good plan for your salesman to carry photographs of representative houses wired, reproductions of testimonial letters, lists of names and addresses of houses secured, also individual cuts of special campaign fixtures. This is a very essential point, eliminating the time required to go through a bulk catalog, also an assistance in keeping the customer's mind from being attracted to a lot of fixtures which he might admire, but not be able to purchase. Men doing this work should of course be prepared to

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quote average lighting bills of customers, kilowatt-hour consumption, etc., keeping in mind that his recommendations should be governed to a large extent, on what in his judgment, the customer can best afford. A talking knowledge of his company's affairs, such as connected load, number of 50-watt equivalents, number of customers and a policy of his company will prove of much assistance. This ammunition of the salesman brings out a very important feature in securing house-wiring contracts. To begin with we know that the subject of house wiring is a rather intangible one to deal with, more or less incomprehensible to the layman. This handicap is largely overcome by the use of data such as mentioned.

Advertisement Used with Marked Success by the Public Service Company of Northern Illinois.

A prospect's attention is very often more readily secured by clever mention of a neighbor whose house is wired than it is by the house-wiring proposition itself. People are, as a whole, more interested in people than abstract facts. Various cuts and prices of fixtures assist your prospect in visualizing their own house wired and allows for mental comparisons. Some salesmen have successfully carried the latest newspaper ad, the idea being to have something for the prospect to look at all the time. Something to liven what is now an impalpable subject. Successful campaign advertising disregards more or less the mention of our desirable service and talks facts, figures and results.

General advertising on the subject of electric service should educate the home owner to a point of familiarity. Campaign advertising consisting of plain facts should lead to a desire for possession. The psychology of advertising for results is that nothing succeeds like success. Everyone likes to buy that which he sees others are buying. No one is interested in that which everyone is refusing. It is undoubtedly true that the majority of your prospects today are aware of the advantages of electric service. Their interest, however, is only passive. It takes a positive impulse to create a desire. It may possibly be the advantages of electric light, it may be the burglar protection that the porch lamp affords or it may be the convenience that a cellar or garage light offers and, last, but not least, it may be the use of some modern electrical appliance.

To make this one of momentary interest, much can be done by offering your American public a bargain or in other words, establishing a campaign. Too much cannot be said about the talking points of various electrical appliances in the securing of residence wiring. Each house wired affords one more opportunity to sell appliances and build up the central-station day load and every electrical appliance furnishes one more talking point on the subject of wiring. There are many appliances sold to existing customers, such as electric washing machines, that do a great deal towards popularizing the use of electric service and are important features in wiring existing buildings. A customer using an electric washing machine and moving to an unwired house will make arrangements to be able to again use his machine. People living in rented houses, will often go to some expense to wire another man's property, just to enjoy the comfort that electric service previously provided; in other words, their standard of living has been educated to the use of electric service. There are on the market a great many mechanical, medical, therapeutic and photographic contrivances, which are operated by electricity. The installation of electric service to operate such devices forms the entering wedge to the further electrification of the home.

Advantages of Premium Offers.

Some companies offer an electric flat iron as a premium on their house wiring propositions. Aside from the fact that an electric iron makes a particularly attractive premium, central stations are placing a large number of irons without any special sales effort. In some of its towns, the Public Service Company of Northern Illinois, has had sensational success by approaching the house-wiring prospects on the sale of electric irons, giving the housewife a long talk on the advantages of this everyday modern household device. The woman immediately

Form C. D. 49 5M 2-26-15-H

No._____ St. Ave. Town_____ Date_____ 191__.

Occupant _____ Owner_____

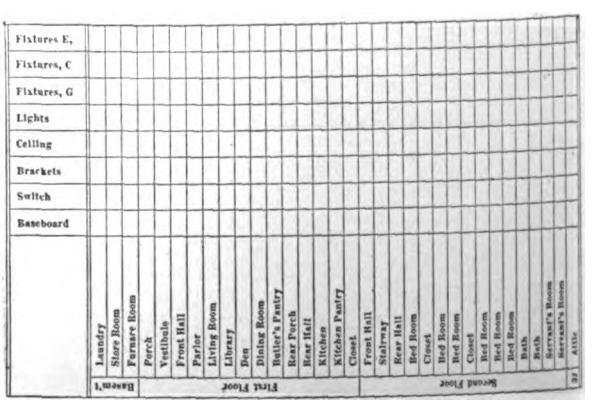
Salesman _____ Lease Expires _____

____Story Frame. Brick. Stone. Barn, wired. Yes. No. Flat_____ No. of rooms_____ How lighted _____ Hardwood, Soft floors Halls. 2nd Floor ____ Single, Double Floors_____ Attic Floored, Opened ____ Basement Sealed. Opened_____ Cutouts. Floors Wired Basement, First, Second, Third, Attic. Fixtures—Gas____ Electric____ Combination____

Information obtained from _____

Remarks_____

Card Used to Tabulate Data on Customers' Installation.



Wiring Record for Tabulating Number of Outlets.

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expresses that she would be interested if she had electricity in her home. This plan takes the woman, who previously displayed no interest in electric light, from her defensive attitude and allows for a discussion on the subject of house wiring. The salesman makes a special proposition to install an outlet for the iron service and also offers her the iron that she has already expressed a desire for, provided she wires her house. This was practiced on jobs amounting to $24 or over.

Other companies have successfully used a scheme giving an appliance for each live prospect furnished by their present customers. This plan of using present customers as "Prospect Diggers" has been worked out extensively by the Minneapolis General Electric Company. Not long ago this idea resulted in the cleaning up of a large stock of left over toasters and the addition of 1,000 new names to the company's wiring prospect list.

The Brooklyn Edison Company has practiced a similar plan allowing a credit of $4 on the purchase of appliances.

The Louisville Gas & Electric Company used a scheme allowing a credit on gas and electric bills.

HERE ARE POINTS TO REMEMBER

To secure house wiring the following fundamental factors must be met:

(1) The central station must have at hand an analysis of its field, preferably obtained by a canvass by salesmen.

(2) The homeowner's interest must be stimulated to one of momentary desire by adopting successful campaign methods.

(3) The cost factor must be met by arranging terms of payment as this seems necessary.

(4) Central stations should have a satisfactory working scheme with contractors engaged in wiring, and their co-operation should be secured.

Co-Operation of Employees Can Be Obtained.

Nearly every utility has a great many employes such as meter readers, linemen, fitters, etc., who are, in their everyday duties meeting the public. These self same people have a circle of friends and acquaintances. These facts have been capitalized by some companies by putting in the hands of their employees a prospect card which is turned over to the sales department. Prizes are given each month to the three most active in this work. This affords every employee of the company an opportunity to be on record as a live one and to take a part in the sales work of his company. Milk dealers, coffee and tea merchants and various other people have built up big business by just such methods.

Public utility companies are missing a big chance when they do not capitalize the educational value that their large number of employes offer. This co-operative plan has been the means of securing a great many house-wiring contracts in the territory served by the Public Service Company of Northern Illinois.

Co-Operation of Contractors.

Much has been said and done on the subject of the contractors wiring existing buildings. The relation of the contractor to the central station is of vital importance when we discuss the subject of wiring a home. Several steps forward have been made in the last year toward a closer co-operation with the contractor. We can no longer in this relation, follow the trail of those who have gone before, simply because they were successful for what spells success yesterday may spell failure tomorrow. In the past most of the attempts to enlist the contractor on a co-operative plan have been made entirely by the central station. So it is with considerable importance that we notice that at a recent meeting of the Electrical Contractors' Association of Illinois, that a committee was appointed to take up and investigate the relations of its members to central station, to study what has been done in other places and report what has been done in Illinois. There is a great need for such a committee and a great good can be accomplished.

Because of the ever increasing popularity of the present uses of our service, and in view of the multiplied electrical developments now in process, your prospects are limited to the number of houses in a given community.

This nation's present possibilities for development of foreign trade, the rehabilitation of European countries after the war, our own preparation to maintain peace, the universal supply of electrical energy, the wireless telephone, the electric furnace and electrical cooking are a few factors in the era of prosperity we are now entering.

It appears that those central stations who adopt successful merchandising methods in their house-wiring efforts should, within the next few years, secure a large number of unwired houses.

Electrolysis Damage at Trenton, N. J.

The Water Department, Trenton, N. J., has recently tendered a statement to the City Commission showing that it is costing the municipality on an average of $2,000 annually to replace the water service lines on North Clifton Avenue. It is held that electrolysis caused by the system of the Trenton & Mercer County Traction Company on this thoroughfare is responsible for the damage, and that in some instances the large water mains also show signs of deterioration through this cause. Expert examinations a few months ago went to show that the electric energy escaping from the trolley lines was responsible.

PUBLIC SERVICE COMPANY OF NORTHERN ILLINOIS — PROSPECT FOR NEW BUSINESS

NAME _____ TOWN _____

ADDRESS _____ PHONE _____

CALL ON ABOVE PARTY IN REFERENCE TO APPLIANCE OR WORK NOTED BELOW

	House Wiring		Iron, Electric		House Piping		Lamps
	Additional Wiring		Toaster		Service		Heater
	Store Lighting		Percolator		Meter (Gas)		Hotel Ranges
	Window Lighting		Vacuum Cleaner		Stove Connection		Broilers
	Signs		Washing Machines		Fixtures, Gas		Soldering Furnace
	Street Post		Portables		Gas Iron		Urns
	Power		Heating Pad		Range		Cake Griddles
	Motors		Grill		Water Heater		Steam Boilers
	Fixtures, Elec.		Cooking Utensils		Laundry Stove		Steam Tables
	Meter (Electric)						

PUT (X) IN SQUARE BEFORE ARTICLE CUSTOMER DESIRES

DATE _____ 191__ NAME _____ DEPT. _____

Card Used by Public Service Company Salesmen in Making Canvass of Territory to Determine Field for Sale of Appliances or Service.

SALESMAN REPORT

DATE	SALESMAN	REMARKS	DATE TO CALL AGAIN

Reverse Side of Record Card Where Salesmen's Entries Are Made for Follow-up Purposes.

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Securing Industrial Lighting Business

A Presentation of Facts and Figures for the Central-Station Representative to Enable Him to Interest the Factory Manager in Efficient Lighting and to Lay Out the Installation

By Oliver R. Hogue

THE importance of industrial lighting is making marked gain in its effect upon many different classes of people and in as many different pursuits. One of the chief industries effected is that of the central station, with its varied and sundry connections. The central station has a peak or maximum load, which lasts only a short time each day. After this period of maximum demand the load of the station drops off to the average daily output.

As the central station must be able to meet all demands at the peak period, this means that it necessarily must invest a large amount of capital in machinery, which is used only at the peak period, or a short interval each day, thus tying up a great amount of capital that does not work at very high efficiency. As the industrial lighting in most cases is a long-hour load it is particularly desirable to the central station, on account of its ability to raise the average load more nearly to that of the peak load, increasing the efficiency of the plant as a whole; it is also a means of direct revenue that is very profitable when handled properly.

Mr. Hogue is Head Lighting Agent for the Commonwealth Edison Company, Chicago, Ill., and Chairman of the Sub-Committee on Industrial Lighting of the Lighting Sales Bureau, Commercial Section, N. E. L. A.

Industrial lighting is of great importance to the manufacturer and to the laborer. In the case of the manufacturer it has been definitely proved that by proper illumination he can increase his output five per cent. The value of the total output of the manufacturing industries in the United States for the period of one year is between twenty-five and thirty billion dollars. A five per cent increase will mean that in the course of a year, with proper illumination, the manufacturers would increase their output over one billion dollars. In addition to the increased output there is a marked improvement in the quality of the output, which is also a matter of great value to the manufacturer; another advantage is that with proper illumination inspection is much easier, it tends to produce cleanliness about the plant and give it a more cheerful aspect.

To the laborer industrial lighting is of importance, because it is one of the best means of reducing the chances of accident. The reduction in the number of accidents has been shown to be about 25 per cent. Illumination increases the efficiency of the laborer, because he can work continuously without interruption when there is any necessity for adjustments or fine measurements. Industrial lighting reduces the objectionable feature of eye strain, making the employee uesful over a longer period of time; the surroundings are more cheerful, which in turn reflects upon the condition of the workman, making him more satisfied, more efficient, and more healthy. Taking into consideration that of the total number of wage earners in the United States, 38,167,366, over one-fifth are employed in the manufacturing field, and that the total value added to the product in the course of manufacture is about one-third of the total output value, or between eight and ten billion dollars, the size of the field and the number of people affected can readily be appreciated, and some idea gained of the importance of this phase of the illuminating profession.

Industrial lighting is of interest to the engineers, because of the diversified problems it presents for solution. Each installation has conditions that are particular to itself. There are many varying quantities to be met and factors to be considered before any recommendation for illumination can be made. There have been developed and collected many tables, curves and other data which pertain to general lighting installation.

Industrial lighting is of interest to all those who are concerned in bettering the welfare of the working class, as it is through this means that the working conditions may be improved to a greater degree than by almost any other. Improved ventilation and illumination are the best means to obtain hygiene and sanitation.

The various interests, realizing the importance of industrial lighting, are becoming more active along this line; they are all working together towards the same end, and by their concerted efforts great results will be obtained. These interests, with their demands, have brought forward a new profession, that of the illuminating engineer, and have made him a necessity for modern development and advancement. Some of the rules and plans used by the illuminating engineer in connection with industrial lighting are offered herewith, although we do not hope to cover the subject exhaustively on account of its magnitude and diversity. We hope, however, to give you some idea of what industrial lighting should be and the means and methods used to obtain the best results.

Natural Light.

When we consider the lighting of an industrial plant we have to consider both the natural and artificial light, as in many cases they are dependent one upon the other. In most industrial plants a large part of the operations involve the close and continuous use of the eye, necessitating adequate and correct illumination on the various working planes, whether natural or artificial light, or both, is used. Considering natural light, or daylight, we find that we have three sources of illumination to consider:

First, the direct rays of the sun.

Second, the light reflected from the sky.

Third, the light reflected from the surrounding objects or buildings.

Although the direct rays of the sun constitute the main source of all natural light, we are more dependent upon the light reflected from the sky. For interior illumination we are dependent upon the sky's intrinsic brilliancy, which varies greatly under different meteorological conditions. From tests made to determine this variation, it has been found

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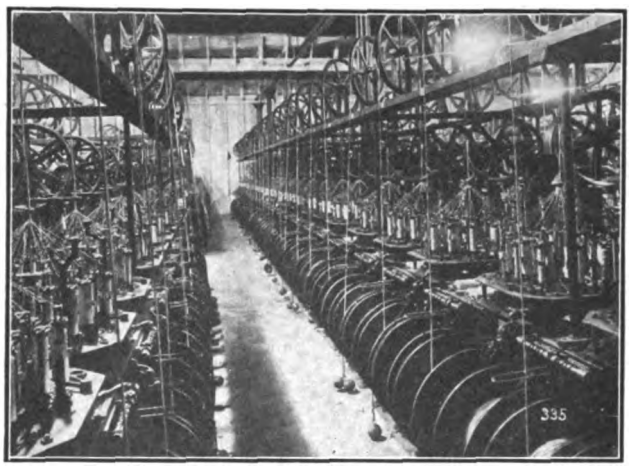
Mercury-Vapor Lamps in a Motor Plant—150 Used.



Excellent Lighting in Braiding Department of Wire Plant.

that these values vary from about 200 candles per square foot when there are storm clouds present, to about 700 candles per square foot when the sky is overcast, no blue being visible. One of the peculiar features of the tests was that the greatest intensity was found when there was no blue sky visible. The amount of natural light that reaches the interior is dependent upon many variable quantities, and also upon the fact that for the same amount of illumination these factors vary for the different floors of the building.

As the sky is our source of natural illumination, the window areas must furnish adequate natural light under all the varying conditions to meet the requirements of work to be done in the room. For rough calculations use the ratio of the window area to the floor area, which in the case of factories is about one to four; in the case of other types of buildings the ratio varies. This method of determining window area is limited in its use by several factors:

First, the depth of the room.

Second, the location of the windows.

Third, whether you are illuminating an upper or a lower floor, as the illumination will vary, especially if there are tall buildings adjacent.

Fourth, character of the glass in the window.

Fifth, the shape of the window.

Sixth, reflection co-efficient of the surrouding objects.

Seventh, sky brightness.

Eighth, the sky angle.

By sky angle of a room we mean the angle formed between the vertical wall of the building and a line drawn from the top of the nearest building to the top of the window. The sky angle is dependent upon the vertical dimensions of the window, the distance of the window to the opposite building, the height of the neighboring building, and the story in which the room is located.

Another condition to be considered in natural illumination is that in many cases only a small per cent of the flux that reaches the window will be transmitted, depending upon the blinds, curtains, decorations, quality and kind of glass, cleanliness of the glass, and the angle at which the ray strikes the glass, as well as the absorption of the walls and the ceiling.

With these variable quantities in view the requirements for natural lighting are as follows:

First.—The amount of light admitted to the interior should be as large as possible and adequate for the employees.

Second.—The distribution of light upon the working planes should be as uniform as possible.

Third.—The light should fall upon the working plane from a proper direction.

Fourth. —The light should reach the center of the room.

Fifth.—The equipment should be so placed as to avoid casting shadows.

Sixth.—The walls and ceiling should be of such color as to absorb the minimum amount of incident light.

Seventh.—The daylight admitted into the room should be of such a nature as to avoid the glare of the direct sun rays, or the direct rays of the sky striking the eye.

To obtain these requirements several means of building constructions are used. The three most important are:

First.—The saw-tooth construction. This class is by far the most common, and excellent results are obtained as to

Day and Night Views of Shops, Showing Use of an Approved Metal Reflector With Type C Lamps.

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the quantity and quality of light that is directed upon the working plane during the larger portion of the day. The glass in this type of lighting is generally turned towards the north instead of the south, where the direct rays of the sun would hit it. The north light is the best for many purposes, especially in engraving and other work where minute details must be examined.

Second.—The skylight in which the windows are located in a horizontal plane, is the second most common form of construction.

Third.—The construction where the rays of light are redirected to the working plane by the use of prismatic glass.

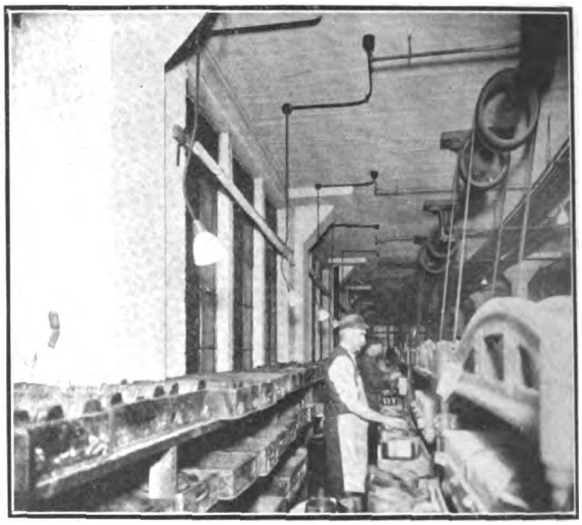
By the use of any one of these three methods light can be distributed in the interior of the building in such a manner that much of the space which was of no value before on account of its location is available for working purposes, increasing the efficiency of the plant.

Especial attention should be called to the requirements that specified that the light should be without glare and the direct sun rays avoided. This can be accomplished by the proper selection of shades or awnings that will reduce the effect of the direct rays. In case the glass in the window is prismatic the effect will be more marked than with the plain glass. In such cases some type of diffusing screen should be used. When the prismatic glass is used, if the diffusing screens or blinds are placed over the upper half of the window the results are unsatisfactory. This screen should be raised from the bottom instead of lowered from the top, thus reducing the intensity near the window without affecting the illumination further in the room.

The kind and quality of glass used in the windows is of importance. With clear glass about 90 per cent of the incident light will be tranmitted, when the angle of incidence is less than 30 degrees. As this angle becomes larger the percentage of transmitted rays rapidly falls off because of their increased reflection. When the factory is upon the lower floor and surrounded by tall adjacent buildings, the light which reaches the glass from the sky comes from such direction that the angle of incidence of the light is the critical angle, so that the rays are practically all reflected from the surface of the window glass instead of being transmitted by it. Under such conditions the use of prism or factory-ribbed glass, with the corrugations on the exterior surface, is of great benefit by reason of the change this glass produces in the angle of incidence, thus permitting a large portion of the light to be refracted into the interior. Prismatic glass, to give the best results, should be recommended intelligently, and for the specific installations for which it is to be used, as any cut prism cannot be used for all installations.

In addition to the clear and prismatic glass, wire glass is used. Wire glass is often required by insurance companies, on account of its reduction of fire risks. For commercial purposes the translucent form is used in preference to the clear type. Where an open-mesh wire is used the reduction in light may be considered negligible. Wire glass on account of its construction, which prevents it from falling, if by any means the glass should become broken, should always be used in overhead construction.

Cleanliness of the window surface exercises a marked influence upon the amount of light transmitted. Dirty windows may reduce, by as much as 50 per cent, the amount

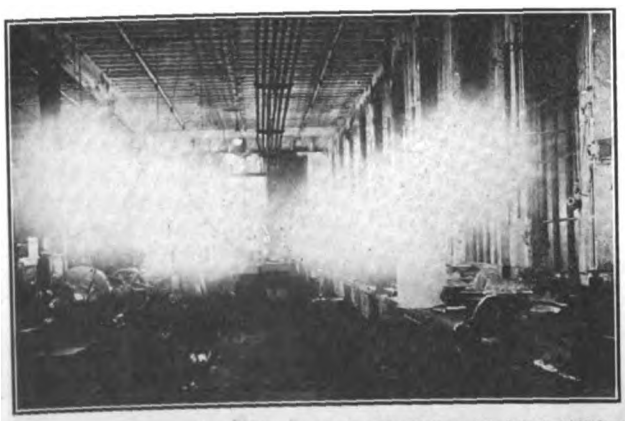


An Unusual Installation—Directing Light Where It Is Needed.

of light which is capable of being transmitted through the window. In the case of wire glass care should be taken to obtain a glass with a smooth surface, to facilitate cleaning.

The intensity at any point in a room can readily be checked by a simple calculation. The average brightness of the sky during business hours is approximately 250 candles per square foot. Allowing for the various losses and existing conditions, with the exception of exceedingly stormy days, the intensity of the sky, as seen through the windows, will be about 100 candles per square foot. To find the intensity at any point in the room we multiply the height and breadth of the window in feet by the fractional part of the window through which the sky is visible and by the intensity in candles per square foot. This quantity is divided by the square of the distance of the point we are examining from the window, which gives us the foot-candle intensity at that point.

Using the same average intensity of 100 candles per square foot as before, then assuming the intensity desired upon the working plane for the particular type of work that is to be done under this skylight, we can, knowing the distance from the working plane to the skylight, find the square-foot area necessary in the skylight to give us this



Two Views of Same Room Lighted Without Use of Reflectors and With Proper Reflectors.

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intensity. For instance, the foot-candle intensity desired upon the working plane, times the square of the distance from the working plane to the skylight, divided by the intensity of the sky in candles per square foot, gives the number of square feet necessary in the skylight. In the case of windows, this gives the window area through which the sky is visible.

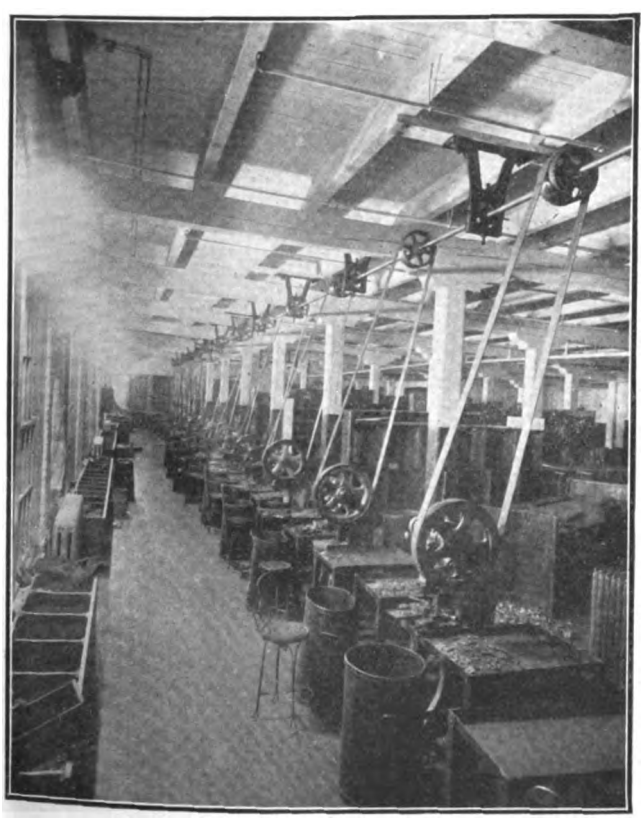
When we check over the intensities at various stations in a room and find that the intensity given by the window exposures will not give an intensity at these stations as great as will be required by the class of work that is being done, we will have to reinforce the daylight conditions by artificial illumination, the requirements for which have been developed by the illuminating engineer.

Artificial Light.

In artificial lighting, as in natural lighting, there are many laws and rules that must be followed if correct results are to be obtained. These are as follows:

First.—The illumination must be adequate for the work to be done. By adequate we mean that the intensity on the working plane shall be of such a value that the eyes will be able to see well for a long time with visual comfort.

Second.—There must be uniformity of distribution and the direction of light must be correct. Uniformity of distribution is necessary in order to do away with the high and low lights that would otherwise result; the spotted effect would be very detrimental, not only to the appearance of the factory in general, but also to good vision, as the eye would become fatigued trying to accommodate itself to the different intensities of the various portions of the room. Uniform distribution will facilitate the moving from one place to another. It will eliminate objectionable shadows, and will prevent accidents due to misjudging obstacles that are in the room, or inability to see some of the objects in



Lighting of Punch Presses by Mercury-Vapor Lamps—Direction of Light Same as From Windows.

the dark spots. With diffusion we approach, in a certain respect, even distribution, but the more marked advantage is that it reduces the apparent intrinsic brilliancy of the light source, protecting the eye as it eliminates glare according to the amount of diffusion. With diffusion we sacrifice the control of the light rays to a certain degree. It is essential that the light should come to the working plane from a certain direction. This is necessary in many classes of work, to avoid shadows as far as possible, and at the same time have the light where it is most needed, facilitating the efforts of the workman.

General Lighting in Modern Concrete Building.

Third.—The color of the light should be adapted to the nature of the work performed. In many classes of work, such as dye houses, paint shops, textile plants, cigar factories, lithographing plants, printing shops, laundries, shoe manufacturies, etc., where it is necessary that one be able to match various colors, the artificial lighting must be of the type that will enable this process to be carried on with the greatest efficiency. For this purpose science has developed units that will give a light whereby colors can be matched very nearly as perfectly as under natural light. In other places where exact color discrimination is not necessary, much better results can be obtained by using a different type of unit, obtaining the advantage of the efficiency which necessarily is lost when the light has been strained to such a value that it has the properties of white light.

Fourth.—The prevention of glare effect in artificial illumination is important, as it interferes seriously with the eye in its usual course of operation. It further has a harmful effect upon the eye itself, caused by fatigue.

Fifth.—Shadows should be avoided. This rule is more or less dependent upon the principles already discussed. In industrial plants, especially where fine work is being done, shadows should be eliminated for many reasons; chief among these is that unless this is done the product is liable to be spoiled from some misjudgment of the conditions, due to the deceptiveness of the shadow. Shadows are very detrimental to the welfare of the workman, as they are often of such a nature as to cause many serious accidents. Many cases can be cited where, through the deceptive shadows cast by objects, the workman has received permanent injury, which has led to heavy damage suits that could readily have been avoided if the proper illumination had been provided.

Sixth.—The system must be efficient. Efficiency in this case may be defined as the useful percentage of the total quantity of light produced by the lamps. Efficiency is necessary in industrial lighting in order that we may produce good lighting results at the minimum cost to the manufacturer. It is the cost that determines in many cases whether the system is installed, and for this reason an efficient system must be chosen to lower, as far as possible, the original cost. Besides the efficiency we must consider in a certain respect the appearance of the installation; although this latter item is not of vital importance, it nevertheless must be

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given attention, as it will determine somewhat whether the results obtained will be liked or not.

If all the foregoing items are combined in their proper proportion, a good system will be obtained.

There are four general classes of lighting that can be used to obtain these results. They are localized, general, combined general and localized, and modified lighting.

Localized lighting consists, in a general sense, of individual lamps placed upon drop cords and used in connection with each operation. In industrial lighting purely localized illumination should, as far as possible, be avoided, because the work itself should not be the only surface to receive light. Unless the surroundings as well as the working space receive a considerable amount of light, too great a contrast and excessive eye strain will be produced. There are doubtless exceptional cases where it may be necessary to use this system.

General lighting signifies uniform illumination, and is preferable for the lighting of such areas as machine shops and assembly rooms, where the work is all of a similar nature. This lighting consists of a uniform spacing and hanging of a uniform size of light. Wherever practicable a system of general lighting is to be preferred, as it is easier for the workman and makes the arrangement of the work in the room more flexible.

Where, however, the intensity required in places for particularly fine work is so high that it would be impossible to provide a general illumination of the necessary intensity over the entire space, it is advisable to supplement the general lighting by a system of localized lighting, which should provide the needed high intensity at the points where required, and keep the general lighting at a lower intensity. Just where to draw the line between general lighting and combined general and localized lighting will depend upon the class of work, the accuracy required of the workman, the relative amount of area requiring high intensities, and other local conditions.

Modified lighting is, to all appearances, a general system, and should be used under conditions described for general and localized lighting. Reflectors in this system are the same distance from the floor, but some of the outlets may carry larger lamps and reflectors than the others, and they are located with reference to the places that require the most illumination. It is used chiefly where there is no objection to a low intensity in certain parts of the shops.

Regardless of which one of these four systems is chosen, some form of calculation must be used to obtain the proper relations, requirements that are essential to a good lighting system. We will give two methods which may be used according to the degree of precision that is desired.

The first method is known as the point-by-point method of calculation, and is dependent upon the old law of light, that is: The intensity varies inversely as the square of the distance.

$$I=CP/D^2$$

where I=intensity of illumination,
CP=candlepower of the lighting unit,
D=distance from the unit.

By way of explanation of this formula we might give the following example: For instance, one foot away from a light source of 16 candlepower we obtain an intensity of 16 foot-candles, while four feet away from the source of 16 candlepower the result will be 1 foot-candle. This formula holds true only when the light rays strike the plane of illumination at right angles. If the rays strike at any other angle, then by mathematics, we develop the formula

$$I=CP\cos^3\theta/H^2$$

where I=intensity of illumination,
CP=candlepower of the lighting unit,
H=height of unit above the plane of illumination,
θ=angle between the light ray and a perpendicular dropped from the lamp.

The candlepower is obtained from the distribution curve of the lamp be used. The angle θ is found by a simple application of the rules of geometry, while $\cos^3\theta$ will be found in almost any table of trigonometrical functions. For convenience we give herewith such a table.

TABLE I.

θ	$\cos^3\theta$	θ	$\cos^3\theta$	θ	$\cos^3\theta$
0	1.000	31	0.630	61	0.114
1	1.000	32	.610	62	.103
2	.998	33	.590	63	.0936
3	.996	34	.570	64	.0842
4	.993	35	.550	65	.0755
5	.989	36	.530	66	.0673
6	.984	37	.509	67	.0597
7	.978	38	.489	68	.0526
8	.971	39	.469	69	.0460
9	.964	40	.450	70	.0400
10	.955	41	.430	71	.0345
11	.946	42	.410	72	.0295
12	.936	43	.391	73	.0250
13	.925	44	.372	74	.0209
14	.913	45	.354	75	.0173
15	.901	46	.035	76	.0142
16	.888	47	.317	77	.0114
17	.875	48	.300	78	.0090
18	.860	49	.282	79	.0070
19	.845	50	.266	80	.0052
20	.830	51	.249	81	.0038
21	.814	52	.233	82	.0027
22	.797	53	.218	83	.0018
23	.780	54	.203	84	.0011
24	.762	55	.189	85	.0007
25	.744	56	.175	86	.0003
26	.726	57	.162	87	.0001
27	.707	58	.149	88	.0000
28	.688	59	.137	89	.0000
29	.669	60	.125	90	.0000
30	.650				

In the solution of this latter formula we obtain the candlepower by finding the value of the angle θ, then, referring to the distribution curve, take the candlepower shown for this angle and substitute the values directly in the formula. In both of these formulas, if the illumination intensity is desired in foot-candles, the distances D and H must be given in feet.

The point-by-point method of calculation is the most accurate, as well as the longest and most tedious, and is more for office work and engineers rather than for the lighting salesman. In many cases it is impracticable or impossible to obtain the distribution curve of the unit to be used. In such a case this form of calculation cannot be used and other methods of calculation are necessary. Whatever method is chosen, certain known constant quantities are necessary. These constants have been determined by experiments, and have been found to hold true if chosen to fit the conditions that apply to the particular installation which is being figured. The following tables are needed in the second method of calculation:

TABLE II.—ILLUMINATION INTENSITIES USED IN SHOP LIGHTING.

Kind of Shop or Work.	Foot-Candles.	Kind of Shop or Work.	Foot-Candles.
Bakery	2 to 3	Meat packing, cleaning	2 to 3
Bench work (fine)	5 to 10	Packing	2 to 4
(Rough)	3 to 5	Packing and shipping—	
Box factory	2 to 4	Fine work	2 to 5
Candy factory	2 to 4	Ordinary work	2 to 3
Clothing factory—		Paint shop, automobile	4 to 8
Sewing machine	10 to 15	Machine	2 to 5
Hand	4 to 8	Pottery, grinding	1 to 2
Cutting	5 to 6	Pressing	2 to 4
Cotton mill, weaving	2 to 4	Preserving plant,	
Dairy or milk depot	2 to 4	cleaning	2 to 4
Electrotyping	3 to 6	Cooking	2 to 3
Forge shop, ordinary		Printing, typesetters	6 to 8
anvil work	1 to 3	Presses	3 to 5
Tool forging	2 to 4	Sheet-metal shop,	
Foundry, bench molding	1 to 3	punching	3 to 6
Floor molding	1 to 2	Assembling	2 to 4
Glove factory, cutting	5 to 6	Shoe shops, cutting	5 to 7
Sorting	6 to 10	Bench work	2 to 5
Hat factory, forming	3 to 5	Silk mill—	
Stiffening	2 to 4	Winding forms	2 to 4
Blocking	4 to 6	Weaving	4 to 6
Jewelry making—		Finishing	3 to 5
Bench work	4 to 8	Stock rooms—	
Machine work	3 to 6	Rough material	1 to 3
Knitting mill	3 to 6	Fine material	2 to 4
Laundry	3 to 5	Wire drawing—	
Leather working, cutting	4 to 6	Coarse	2 to 4
Grading	6 to 8	Fine	4 to 8
Machine shop—		Fence machines	2 to 5
Lathes	4 to 7	Wood working, fine	3 to 5
Millers	3 to 6	Rough	2 to 4
Planer	3 to 5	Woolen mill—	
Drills	2 to 4	Picking table	2 to 4
Assembling	4 to 7	Twisting	2 to 3
		Weaving	4 to 6
		Warping	3 to 5

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The foregoing intensity table gives the value in foot-candles that have been tried and found by many experiments and applications to give very good results. It should be remembered, however, that on account of various conditions these values are only approximate, but they can be used advantageously for rapid calculations.

TABLE III.—LUMENS PER WATT.

Lighting Unit	Light Ceilings		Medium Ceilings		Dark Ceiling
	Light Walls	Med'm Walls	Light Walls	Med'm Walls	Light Walls
Prismatic bowl reflector	6.0	5.3	5.2	4.8	4.6
Steel bowl reflector	4.8	4.6	4.7	4.5	4.7
Dense opal glass reflector	5.0	4.5	4.4	4.2	4.0
Light opal glass reflector	4.8	4.3	4.2	3.8	3.5
Steel dome reflector	5.6	5.4	5.5	5.2	5.1
Totally indirect	3.3	3.0	2.3	2.0	1.2
Semi-indirect	3.8	3.4	2.8	2.4	1.6

The values of lumens per watt or the foot-candles per watt per square foot given in Table III are based upon the use of 10 lumens per watt, or approximately one watt per candlepower. Where a different efficiency is used, the value in this table should be divided by the efficiency at which the lamp recommended is burnt.

In order that we may thoroughly understand the application of these two tables to calculations we will assume a proposition and work it through.

Assume an assembly room in a machine shop, 100 by 160 feet, having a 20-foot dark ceiling. Referring to Table II, the intensity I is equal to 4 to 7 foot-candles. Assume an intensity of 6 foot-candles, as fine work is being assembled. First, find the area of the room.

$$160 \times 100 = 16{,}000 \text{ square feet.}$$

As we assumed 6 foot-candles were needed for each square foot we have $16{,}000 \times 6 = 96{,}000$ effective lumens required. As it is a machine shop, we will use the steel porcelain-enameled dome reflectors.

Referring to Table III for values used with dark ceilings, we find the value of 5.1 effective lumens per watt. This value is given when the lamp is burnt at an efficiency of one watt per candle. We will use a type C Mazda lamp, which operates at an efficiency of 0.7 watt per candle. Taking the value 5.1 and dividing by 0.7, we obtain a value of 7.3 effective lumens per watt when the Mazda C lamps are used. Dividing the total 96,000 effective lumens required by 7.3, we get 13,150 watts required to give us an intensity of 6 foot-candles. Then by laying off the floor in bays 20 by 18 feet, we will have 5 lamps in one way by 9 in the other, making a total of 45 lamps; dividing the 13,150 watts required by the number of lamps, 45, we get 293 watts required per lamp. The nearest size to this is the 300-watt, which we will use. In our original assumption we placed the lamps on 18-foot and 20-foot centers, and used a porcelain dome reflector, which has a distributive characteristic. From experience we have found that the ratio of the hanging height to the spacing for even distribution for the different types of curves is as follows:

TABLE IV.—RATIO OF HEIGHT TO SPACING.

Ratio of Height to Spacing.	Type of Curve.
1 : 2	Extensive
5 : 8	Distributive
4 : 5	Intensive
4 : 3	Focusing
2 : 1	Concentrating

From this table of ratios we find that the height suspended should be five-eighths the spacing; as the spacing is 20 feet, the hanging height should be 12 feet 6 inches above the plane of illumination. The plane of illumination is ordinarily assumed to be 30 inches above the floor. This will place the lamps 15 feet above the floor in this case.

In addition to these two methods of calculation there are many other means that can be employed, but all are closely related. Other methods of calculation can be found in any book dealing with calculations of light. The various methods can be found properly explained in the "Salesman's Handbook," published by the National Electric Light Association.

In the solving of any given set of conditions there are generally one or more conditions that must be assumed to start with. If these conditions do not give the results desired, then the solution can be altered and the correct results obtained. In working up an installation there are a few general rules which should be kept constantly in view. These are:

1. Light sources should be kept out of the line of vision. The eye protects itself against excessively bright rays and adjusts itself to the brightness prevailing by shutting out some of the light rays, thus reducing the ability of the operator to see clearly.

2. Flickering light sources produce eye strain and should be avoided. Eye strain reduces the workman's efficiency, besides being likely to cause permanent injury to the workman's eye.

3. Areas should be divided as nearly as practicable into squares with one unit in the center of each square. The size of the square or bay depends upon the architectural construction and the size of the illuminant to be used.

4. Units should be located around posts in such a manner as to avoid shadows.

5. The spacing ratio given is the spacing distance divided by the mounting height, and must be followed for uniform illumination. The mounting height is the distance above the plane of illumination.

6. It is better to use one large reflector and lamp instead of several small ones, as better results are obtained and the system is more efficient.

7. Flat reflectors should not be installed where shallow or bowl types may be utilized.

8. The fixtures should be in keeping with the general design of the room and the purpose for which it is to be used.

In addition to thoroughly understanding the method of calculation, it is well for one who contemplates laying out a lighting system to be familiar with the different reflecting devices, their efficiencies, their characteristics, and their good or bad points, as it is through their application that we are able to redirect the rays of light, which is essential to obtain good illumination. He should also be familiar with lamps and other light-giving sources that are used in the industrial field.

Reflectors for industrial illumination are varied in shape, finish and manufacture, and are both good and bad. They are made of different materials, metal and glass. The steel reflector is particularly adaptable to this type of work because it is durable, low in price, easily washed and will take almost any finish. The two common finishes are the aluminum mat surface and the porcelain enameled. These finishes give a spread and diffused character of reflection.

Spread reflection is obtained with aluminum, while the porcelain enamel and paint enamel give a diffuse reflection. With spread reflection, the measured portion of the reflected light deviates only slightly from the law that the angle of reflection equals the angle of incidence. For this reason, this type of reflector is especially useful, inasmuch as with the proper design and shape almost any desired distribution of light can be obtained. The diffusing reflecting surfaces, however, such as porcelain enamel, scatter the rays widely, on account of which it is impossible to obtain as widely varying a set of characteristics as with the aluminum surface.

These various finishes are made into different types, namely: the shallow bowl, deep bowl and angle. These types are again classified according to their general distribution, which gives five classes: 1, distributive; 2, extensive; 3, intensive; 4, focusing; 5, angle. There is a further type known as concentrating, but it is only found with the aluminum finish, deep bowl, as well as with types of the prismatic and the mirrored glass reflectors.

The correct type of reflector should be chosen for the character of work to be done. As a general rule the distributive reflectors should be used for warehouses, platforms, railway yards, freight houses, etc., where large sized lamps are best with fairly high mounting height, also where the hanging height is low. Extensive reflectors are used where the ceilings are low and to give general illumination. Extensive reflectors are designed for the general lighting of machine shops, factories, laundries and assembly rooms. Where the reflectors are to be hung high, or a greater intensity is desired than can

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be obtained with the distributive or extensive, the intensive type of reflector should be used. Intensive reflectors are suitable for narrow aisles, benches, and localized lighting of machines. Where the hanging height is still higher, or simply a very bright beam of light over a limited area is desired, either the focusing or the concentrating type reflector should be specified. Focusing reflectors lend themselves to the lighting of high narrow spaces where the outlets are close together and high above the plane of illumination.

For conditions which necessitate lighting from the side, the angle type reflectors should be installed. Angle reflectors are made in sizes ranging from 25 to 1,000 watts; the smallest sizes are adaptable to individual machine lighting while the larger sizes serve satisfactorily for illumination of tennis courts, playgrounds, bulletin signs and billboards, traveling cranes, subways, etc. In the use of any one of the types of reflectors care should be used that the spacing and hanging height are in the correct relation; otherwise the illumination will be faulty. It is better to have reflectors spaced a little too close together than too far apart.

In addition to the metal reflectors, there are the various types of glass reflectors that are applicable to different uses in the industrial field. Chief among the glass reflectors are the prismatic type and the mirrored reflectors. The prismatic reflectors are based upon the principle of refraction while the mirrored glass is based upon the principle of direct reflection. In each case the control of light is so well adjusted that a reflector for any particular distribution can be designed. These two types of reflectors are made in all sizes, for use with the smallest to the largest size of lamps. The chief objection is the breakage, which is a serious matter where the lighting unit is exposed to collision or other rough handling.

After reflectors, comes the selection of the illuminants to be used with them. Of incandescent lamps there are the carbon, the gem, and the tungsten lamps. The tungstens are divided into two classes, namely, the vacuum type, such as the Mazda type B, and the gas-filled type, such as the Mazda type C.

The carbon lamp was the first type of incandescent lamp. It consists of a continuous filament mounted in a vacuum and heated to incandescence. Under its best conditions it operates at an efficiency of 3.1 watts per candle.

The carbon lamp has been superseded by the gem lamp, which is essentially the carbon lamp with a re-treated carbon filament that gives it the character of a metal filament. The gem lamp operates at an efficiency of 2.5 watts per candle. Gem lamps should be used in all places where there is very heavy vibration or where the cost of the energy is very low. The carbon lamps are adopted where the lamps are seldom used, and the first cost is of prime importance. The refilled carbon lamps are very inefficient and erratic as to their wattage and candlepower values as well as their life. They should never be used unless the cost of the lamp is absolutely the only point to be considered.

In its first stages the tungsten lamp was made from a pressed filament that was very fragile; however, the present form is made from a drawn-wire filament and is rugged, withstanding most of the shocks to which lamps are subjected in the ordinary industrial plant. The Mazda type B lamp is a tungsten lamp having a filament mounted in an exhausted bulb. It operates at an average efficiency of one watt per horizontal candlepower. This lamp operates at a much higher temperature than the carbon or gem; for this reason care must be taken to protect the eye from the direct glow of the bare filament. The Mazda B lamps are now being made in all sizes up to 100 watts; above that size they have been superseded by the Mazda type C lamp.

The Mazda C lamp consists of a drawn-wire tungsten filament mounted in a bulb which is filled with an inert gas at about atmospheric pressure. This lamp operates at a much higher efficiency than that of the Mazda B. For this reason the intensity of the light from the filament is much greater; it is, therefore, more imperative that this lamp be used in connection with some type of reflectors, or inclosed in glassware, or frosted, or placed in a concealed position. There is another feature in connection with the Mazda C lamp which must be given attention, and that is that ample provision should be made for ventilation; also the fixture material used should be of such a quality as to withstand heat. The wiring should be of the slow-burning type or asbestos-covered. In addition to being well ventilated, for exterior use, the fixture should be weatherproof, in order to prevent moisture from striking and cracking the lamp while it is hot.

In addition to the reflectors and the incandescent lamps the engineer has at his disposal the arc lamp and the vapor lamp.

In the arc lamp we have two very efficient types, the magnetite, and the flaming arc. The magnetite arc lamp has metallic instead of carbon electrodes. The positive electrode is of solid copper, the negative electrode is a composition of magnetite inclosed in a thin sheet of iron. The magnetite arc is not suitable for alternating current.

The flaming arc is an improved type of arc using impregnated carbon electrodes, the color and efficiency of the arc depending upon the nature of the impregnation. The arc lamp is used where a high-candlepower source is desired and the hanging height is high, generally above 30 feet.

Of vapor lamps, the Cooper Hewitt is the principal one; it consists of a tube that contains mercury. This mercury is vaporized and becomes luminous when current is passed through the tube. Its light is lacking in red rays, having a bluish-green color which will result in the distortion of other colors. It cannot be used where it is necessary to match colors. However, in places such as machine shops, foundries, etc., where color value is of no advantage, it is very good. It is particularly adaptable to all classes of photographic work.

We have not attempted to go into details concerning any of these devices. Descriptions, curves, measurements, etc., of reflectors and lamps can readily be obtained from any manufacturer of standing.

An excellent source of reference for practical subjects upon illumination is the "Salesman's Handbook," published by the National Electric Light Association. This book has recently been revised, much new data added and all the existing data brought up to date. This work has been carried on by the best engineers in the illuminating field, and is of value to all who are interested in this line of work.

In conclusion, it seems well to discuss the reasons why proper illumination should be installed in all industrial plants and the advantages that can be gained if our recommendations are followed. The best reason for good industrial lighting is that by its means the number of accidents occurring each year can be materially reduced. Tests and experiments show that the total number of accidents can be reduced at least 25 per cent by the installation of the proper lighting system.

The next item of importance is the increase of output that can be obtained by good illumination. By experiments it has been shown that the increase in output in a manufacturing establishment where good illumination is installed was 5 per cent. The estimated value of the output of the manufacturers is in the neighborhood of $25,000,000,000; 5 per cent of this quantity will mean an increase of $1,250,000,000; adding to this the $100,000,000 saved in compensation, will mean to the manufacturers a total of $1,350,000,000 that they can add to their resources in the course of a year.

Increased output naturally covers the item of the increased efficiency of the workman in the plant, as well as the improved quality of the output, and with the increased quality of the output the spoilage and seconds are naturally decreased. It is figured that the annual spoilage, due to poor manufacture in the course of a year amounts to $150,000,000, of which 20 per cent is directly due to poor lighting. There, again, is another gain of $30,000,000.

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Electric Commercial Vehicles in Cincinnati

Successful Operation of Electrics in a Typical Hilly Community Gives Conclusive Evidence of Their Ability to Give Satisfaction Regardless of Road and Topographical Conditions

By C. E. Ogden

AN argument often used by our esteemed gasoline competitors against the electric vehicle, is that "they are no good on hills." While all those connected with the electric-vehicle industry know how absurd this statement is, nevertheless the uninitiated purchaser is often discouraged in the consideration of the electric by having this argument advanced by competing salesmen.

While this statement might apply to electrics made 8, 10 or 12 years ago, it must also be remembered that the single-cylinder gas cars as then built, were dreadfully short of hill-climbing ability. It was really surprising how these old electrics, designed for use in level cities, adapted themselves to conditions, and in most cases made a remarkable showing even in hilly communities. While gas cars made in those early days have been on the junk pile for many years, the greater proportion of these old electrics are still in service, and evidently good for many more years of hard work.

This durability of the electric, instead of being appreciated by many of their users, has acted as a sort of a boomerang, and we find in many mixed-fleet installations of motor trucks, competitive tests being made between electrics 8 and 10 years old, and new, modern gasoline trucks. And in the majority of these cases the electric operates more cheaply than the gas trucks, but where they fail, unjust comparisons such as this are taken as conclusive evidence that the gasoline truck is superior to the electric.

For real hill-climbing ability, it is essential that every part of an electric be brought to its maximum efficiency; that a motor large enough to secure a reasonable efficiency at maximum overload be used; that a battery of sufficient size be used to furnish the necessary amount of power, and last but not least, a driving mechanism whose efficiency varies but little between level and hilly service conditions.

These conditions are easily fulfilled, by taking advantage of the improvements made in motor and battery construction within the past few years. It is a simple engineering problem to design an electric truck with a powerful high-speed electric motor, and large battery, both of these units weighing much less than similar units used in the past with only half the power and capacity.

Modern ball and roller bearings, and improved driving mechanism brings the modern electric vehicle to a point where it is beyond comparison with any other type of motor vehicle, both as to efficiency and low cost of operation.

Instead of hills being a detriment to the successful use of electric vehicles, these abnormal conditions affect the economical use of both horse-drawn and gasoline vehicles much more than they do the electric.

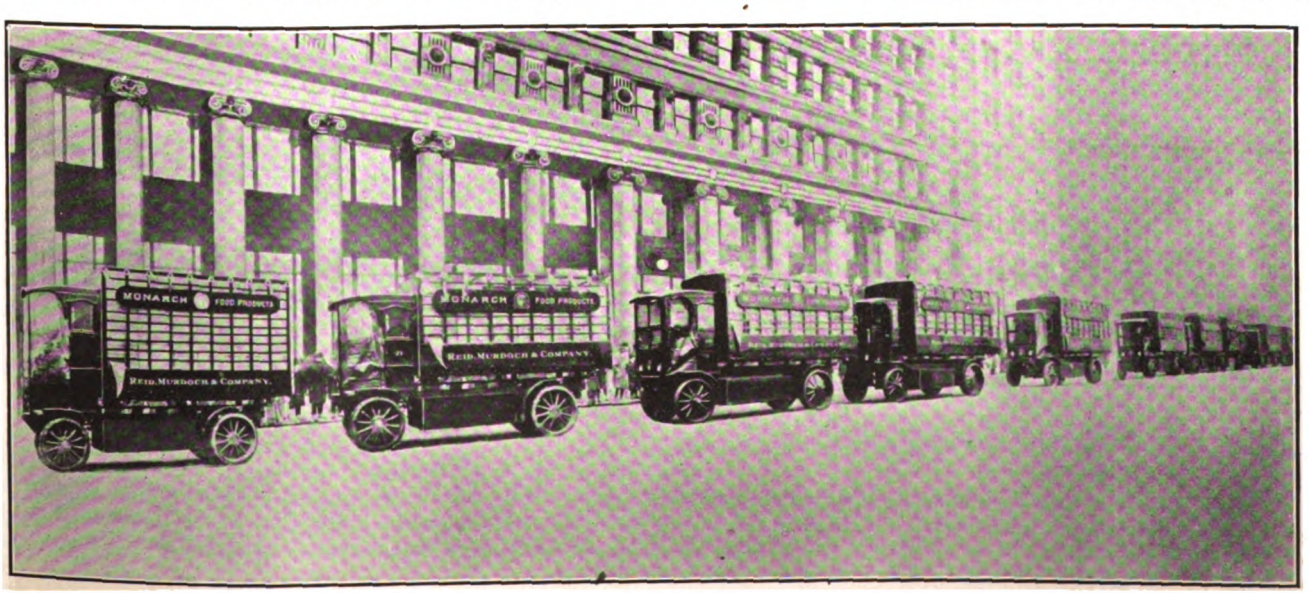
To pull a load up a grade, requires more power than to haul the same load over a level street, be it horse power, gasoline power, or electric power. And it is a fixed law of mechanics that the slower this load is moved, the less the power required.

A team of horses, upon coming to a grade, slows down. The steeper the grade and the heavier the load, the slower they move. If the grade get too steep, or the load too heavy, more horses must be added. All this tends to greatly shorten the lives of the horses, and many concerns employ different teams each day, permitting a team to work one day and rest the next.

Watch a gasoline truck come to a grade. If the coast is clear, the driver usually makes a "run" for it, and tries to get up on high gear. If the load is heavy, he must shift to intermediate gear, and if the hill is very steep, go into low.

The engine is speeded up, it becomes hot, tremendous strains are imposed upon the driving mechanism, all of which seriously shortens the life of the truck, and greatly increases its operating costs. Any driver knows what it means to start on a hill with a heavy load, and if he succeeds in starting without stalling the engine, he knows how hard it is to shift gears under such conditions.

But watch an electric up the same grade, fully loaded.



Fleet of Electric Vehicles Participating in Parade.

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As it comes to the grade, it automatically slows down. As the grade becomes steeper, it slows down still more. But its power is irresistible. It does not stop. It moves silently, gracefully, but surely up the hill with its load.

Fleet of Electrics Operated by Cincinnati Merchant.

Instead of running faster, its motor runs slower. If it becomes necessary to stop, the operator pulls his controller handle back. When he is ready to start, he moves it forward. He has no engine to stall, no gears to strip, no clutch to slip. Instead the electric picks its load up easily, but firmly, and resumes its journey up the hill.

The efficiency and usefulness of a properly designed electric is not seriously affected by hilly conditions, despite the feeling existing to the contrary.

Cincinnati, the queen city of the West, has long been noted among the automobile fraternity for its rough streets and steep hills. While the first named condition has been greatly remedied during recent years, the topographical conditions will always remain the same, and a brief statement as to the operation of electric commercial vehicles in that city might prove of interest.

The first electric truck sold in Cincinnati was placed in actual service in July, 1905. It is still running, and its owners have since added two more electrics to their delivery system.

The next electric sold was a six-ton, double-motor gear-driven machine, which is still giving a satisfactory account of itself.

So satisfactorily did these two trucks operate, that some 12 to 14 electric trucks were sold within the next two years. While most of these machines are still in use, in those early days expert attention was hard to secure and the trucks suffered as a result. Many were laid up, due to battery and other trouble, some junked, and the rest kept in operation regardless of cost.

Several owners tried to manufacture their own batteries, and after investing several thousand dollars in parts and equipment, junked the entire outfit.

These were indeed dark days for the electric, and it lost many friends. But improved batteries began to make their appearance, and the users gradually became educated in their care, which tended to revive interest in the electric vehicle.

In the latter part of 1910, the first modern chainless electric truck, a Walker 3,000-pound capacity, was put in service in Cincinnati. The records set by this truck completely upset all previous standards of electric truck operation in Cincinnati, and within the next year, six more trucks of the same make, but of various load capacities were put in the service of prominent Cincinnati concerns.

Every one of these trucks is in operation, and it would be hard indeed to sell their users a gasoline truck of any description. On a few of these installations, operating costs and other information is available, which is given below.

The A. Nielen Company, which operates a large household supply and furniture house, has a fleet of five electric trucks, three being of 3,000-pound capacity, and two of 1,000-pound capacity, all being equipped with the nickel-steel battery.

Both trucks and batteries are over four years old, and thanks to their mechanic in charge, who does all the repair work, besides being engineer and all-around repair man in the establishment, these trucks run better and look better than at any time since they were installed.

This concern has a branch at Hamilton, O., and practically every week sends one of its large trucks to Hamilton with a load of goods, which it delivers, and generally returns with a load of furniture to be repaired or exchanged in Cincinnati. This trip is a little over 50 miles, yet they have never experienced any difficulty in making it upon a single charge. Several times have made the trip, loaded both ways, upon two-thirds of a battery charge, meaning that under similar road and load conditions with a fresh battery they could have traveled 25 miles further.

Daily service, delivering furniture and household supplies, averages between 35 and 50 miles, which has made no trouble in negotiating under any road or load conditions.

In deep snows, both driving wheels are equipped with non-skid chains, which cut down the mileage a little, but not enough to seriously interfere with the operation of the vehicles.

They have never found a hill too steep to go up, and both users and operators are well pleased after four years of hard service.

Outside of spring bolts, and grease cups, repairs on these machines have been practically nothing, and the trucks are apparently good for 10 years more of hard service.

In 1913 G. A. Wiltsee, the leading undertaker of Cincinnati, purchased a 1,000-pound Walker electric truck for a service wagon, with Edison batteries, and during the entire time this truck has been in service, repairs have cost less than $35. Solution renewal in the batteries has cost about $65, making a total of approximately $100 for 2.5 years' service.

Mr. Wiltsee also has a Detroit electric pleasure car, and charging current for both pleasure car and truck seldom costs more than $15 per month. His truck is equipped with solid-

Type of Vehicle That is Popular in Cincinnati.

rubber tires, which average only about 10,000 miles due to the rough conditions of the Cincinnati streets. This car is fitted with a special undertaker's body, and is accounted one of the best looking commercial vehicles in the city. Needless to say, its owner is proud of its performance, as well as of its low operating costs, and is a great booster for electric vehicles.

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The Work of the Underwriters' Laboratories

A Review of the Activities of This Organization, Its Equipment, Methods of Testing and Procedure, Factory Inspection and Field Work, Label Service, and Relations With Other Factors of the Industry

NO general review of electrical development in any section would be complete that did not contain some account of the work of the Underwriters' Laboratories. Reference to the Laboratories' activities in the electrical field is especially appropriate when electrical development in Chicago is to be considered. This institution began its work in Chicago; its main office and principal testing station have always been located there.

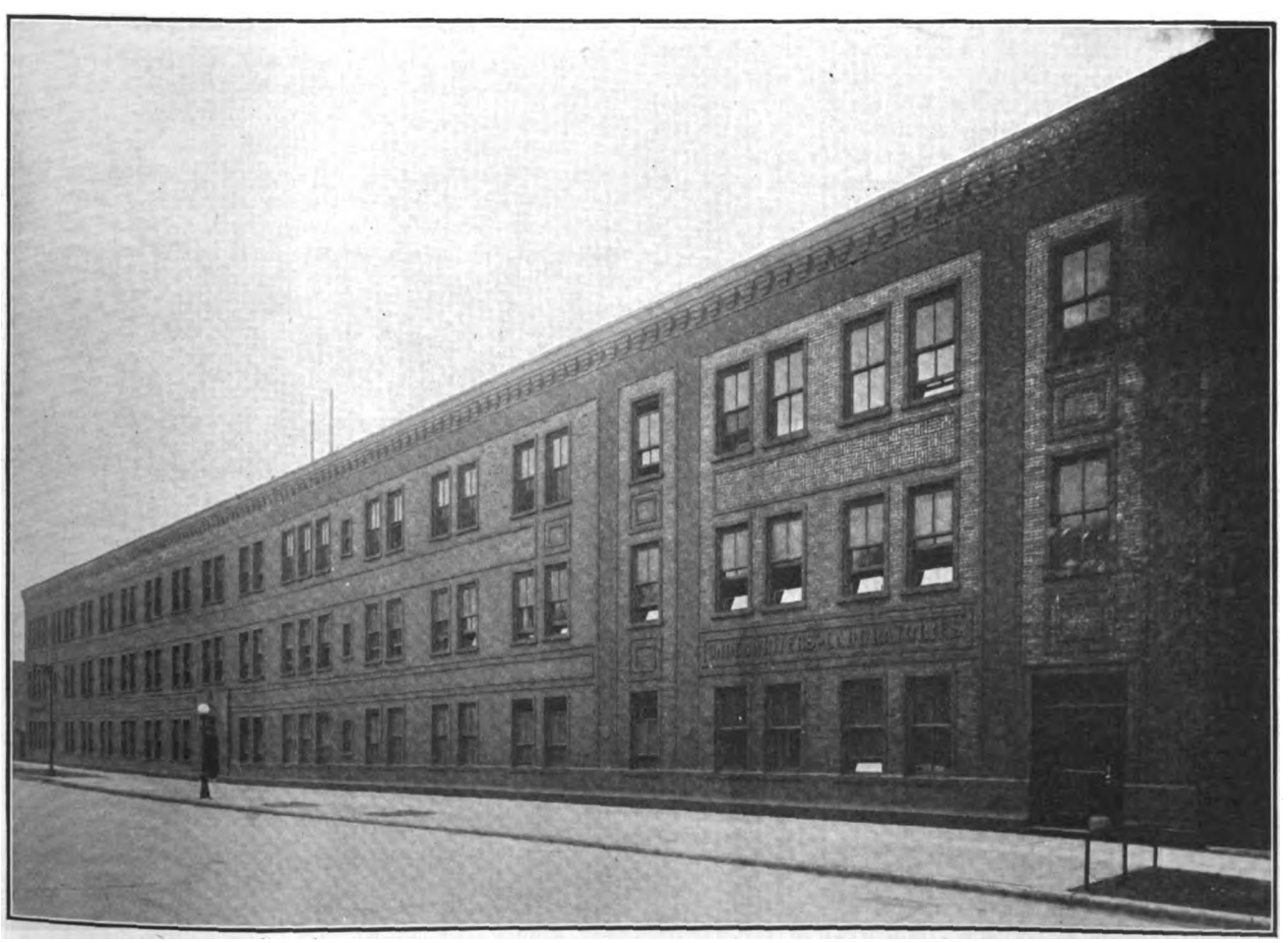
Although the Laboratories now undertake to make the services of the institution available in every industry where they may be properly and effectively employed in fire protection and accident prevention, electrical testing was for a time the only work done. It has continued to be a very important part of the service. The work in the electrical field has unquestionably been a most substantial contribution to the growth of all branches of the industry. Also, the growth of the industry has been reflected in the steady increase in the volume and scope of the Laboratories' activities along electrical lines, for the institution has continuously added to its facilities as fast as it was necessary in order to meet with promptness and dispatch the constantly increasing demands upon its resources.

Starting about 20 years ago as a small shop, where tests were conducted on samples submitted from the comparatively few lines of electrical fittings and appliances then manufactured, the electrical department of the Underwriters' Laboratories has reached the stage of development where laboratory and suitable follow-up service is provided in scores of different lines of electrical goods, and where the number of devices and appliances and unit quantities of materials certified as standard runs well into the millions each year.

Test Equipment and Procedure.

The procedure in all electrical testing follows methods prescribed in the National Electrical Code. But Class D rules of the code, which relate to the design and construction of appliances and materials, are necessarily but a partial outline of specifications. It is therefore one of the functions of the Laboratories to develop complete standards and work out the details of comprehensive test and inspection procedures in such a way that the Code requirements shall be properly interpreted. A Code rule covering but a pargraph or two may call for specifications scores of pages long in order that the rules may be correctly applied in practice. At the Laboratories there are always on file complete standards for electrical fittings, which include the provisions of the Code and, in addition, specifications for performance under test and in service, and further details of design and construction.

A second important task has been that of providing the laboratory test equipment needed. The greater part of this has to be designed especially for the service required. The working out of the details of test methods and test



Principal Offices and Testing Station at 207 East Ohio Street, Chicago.

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apparatus is often an undertaking of very considerable proportions. A small amount of the apparatus referred to is shown in the illustration used in this article. But nothing in the way of a description of apparatus or the technique of tests will be undertaken here, further than a brief reference to the switch-and-socket machine shown, this being a rather typical part of the older portions of the electrical equipment.

A common use of this machine is for making the tests called for in Rules 65*s* and 72*n* of the National Electrical Code. The machine is entirely automatic in its action and will turn on and off any type of snap switch or socket on the market. Tests may be run on a number of different types at the same time. Incandescent lamps supply the load on the switches under test, and the number of cycles to which a given switch is subjected is registered by an automatic counter.

Factory Inspection and Field Follow-up.

It should be borne in mind that Underwriters' Laboratories is much more than a testing station equipped to conduct investigations on sample wares. If the work began with the development of test methods and ended when suitable apparatus for making tests had been constructed and the tests on the device or material submitted completed, the work would be of limited practical value. The task of the Laboratories has included that of providing machinery for the proper digestion of data obtained in tests, and of insuring its utilization in a proper, thorough, intelligent, honest and uniform manner, and afterwards that of making the conclusions reached readily available to those who may profit by them. The Laboratories has always proceeded on the theory, now well justified by years of trial, that those who have had extended experience in the field where a given product is to be used are properly qualified to form correct conclusions from data obtained in experimental investigation. Hence, products listed as standard are restricted to those that have received the endorsement of the councils of Underwriters' Laboratories, following a review by the council members of reports on tests of samples submitted.

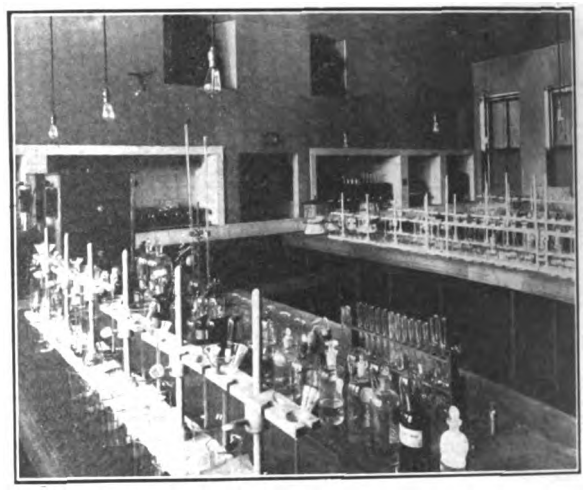
When a product has been listed as standard a practicable, efficient system of follow-up is essential for providing comprehensive information concerning the quality of the factory output and its behavior under conditions of actual service. A laboratory test of a sample ware is, of itself, insufficient. At least 60 per cent of the Underwriters' Laboratories' work is now done through engineers and inspectors stationed at branch offices, and through other

The Underwriters' Laboratories 20 Years Ago.

representatives in the field. There are approximately 100 of these branch offices, and a number of special agents and service engineers are constantly on the road.

Labeling.

Factory inspection and labeling of goods found to be standard is employed in more than 25 electrical industries. Inspectors at the factories examine and test the output, and goods thus found to correspond with the samples originally tested are provided with manifests in the form of labels or stamps bearing the Laboratories' name.

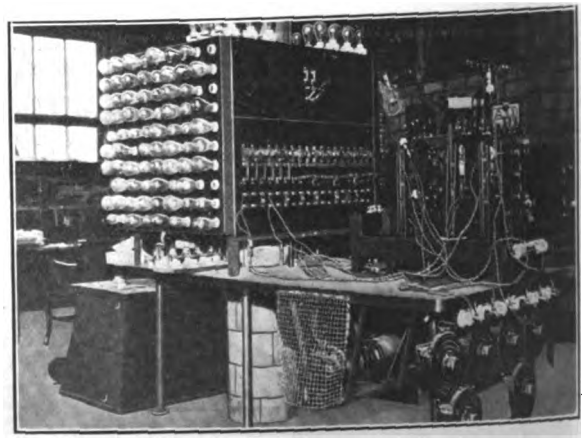


Room Where Certain Chemical Tests Are Made on Rubber Compounds.

For a number of electrical products this service is further extended to include a field follow-up of the labeled articles. Samples from goods that have been in practical use for considerable periods are obtained and re-tested, and schedule estimates are prepared each month showing comparative demerits noted on products for periods ranging from three months to several years.

Maximum Economy Maintained.

Those who have had to deal with the larger problems of maintaining a reasonable measure of safety in electric service have well understood the importance of providing the safeguards necessary without imposing burdensome costs on the electrical industry. Underwriters' Laboratories has found it possible to operate its system of inspection service and follow-up in such a way that the cost of it need not usually appear at all in the selling price of the certified product. Close observation and long experience justify the conclusion that the results obtained represent an efficiency of more than 95 per cent. Such results are made possible largely through the very hearty co-operation of electrical manufacturers and the strong



Switch and Socket-Testing Machines.

support of inspection organizations everywhere throughout the country. Underwriters' Laboratories undertakes to maintain with the two classes of interests mentioned the

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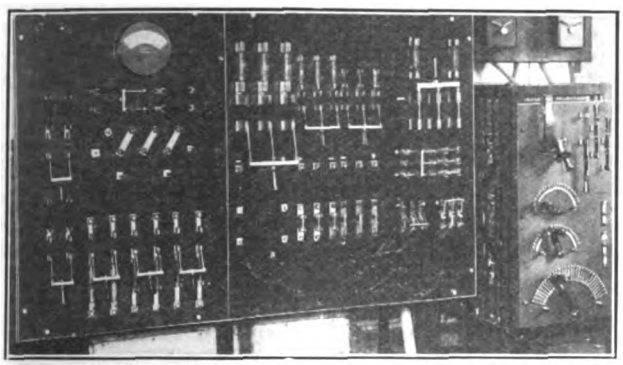
best relations possible for economy and efficient service without lost motion or duplication of effort. Heads of inspection organizations in sufficient numbers and from sections sufficiently various to make these officials fairly representative of the entire country are secured as members of advisory boards and directorates. Thus they bring



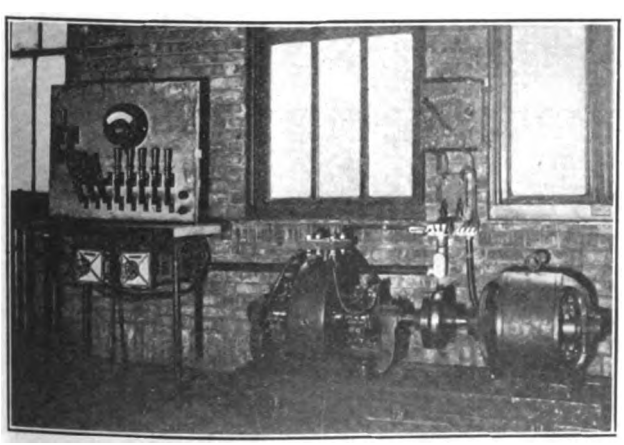
A Test-Control Board.

to the institution a measure of wise council and expert knowledge which through this means becomes a public service of a very high order. Industry conferences and committees of the Associated Manufacturers of Electrical Supplies provide ready means for the adjustment of problems that need to be considered jointly and immediately by the Laboratories and the manufacturers.

The policy of serving the industries without any avoidable delay or expense was responsible for the establishment of the branch testing station of the Underwriters' Laboratories in New York City. Here electrical testing of the same character and scope as the work in Chicago is being done. The branch was established primarily for the convenience of manufacturers in the eastern section of the country. The wisdom of this move has been fully justified.

Co-operation with Contractor, Dealer and Central Station.

While, from the nature of its work, Underwriters' Laboratories' relations with manufacturers and inspection organizations have been more direct than with other branches of the industry, there has been no lack of a disposition to co-operate with contractors, dealers and central-station interests in all available ways. By hearty, active participa-



Low-Tension Testing Set.

tion in the maintenance of suitable standards of safety the three interests mentioned may co-operate in a sense that is very real for the promotion of the electrical industry. For the good of the electrical industry it should be "all together all the time" in the matter of encouraging a reasonable measure of safety in electrical work. Underwriters' Laboratories is in the business of maintaining suitable standards with an equipment in plant and men extensive and highly specialized. The institution is endowed with the rich knowledge acquired through 20 years of experience. It has been able to enlist and retain the active support of inspection authorities and leaders in the electrical field in every quarter of the country. The aim is to maintain the standards essential in an economical and uniform way.

Illuminating Engineering Lectures.

The series of twenty lectures on the principles and practice of lighting to be given at the University of Pennsylvania, September 21 to 28, under the joint auspices of the university and the Illuminating Engineering Society, will immediately follow the annual convention of the Society in Philadelphia. The fee has been fixed at $25.

Reprint of the 1910 lectures on illuminating engineering presented at Baltimore under the auspices of the Illuminating Engineering Society and the Johns Hopkins University will be supplied to those taking the new course, together with a reprint of the new lectures. Whereas the 1910 course emphasized the science of illumination, the new course will emphasize the art of illumination.

Associated with the lectures will be an exhibition at the University of the latest developments in illuminating appliances, including lamps, accessories, photometers, etc., together with novel applications of light. This exhibition is expected to be of great educational value. In connection with the course there will be organized an inspection tour which is expected to be of particular interest and value for those who come from a distance. This will be laid out in such a manner as to afford the maximum of educational value with a minimum of time and expense. It will include visits to manufacturing establishments, laboratories, lighting companies and notable lighting installations.

The I. E. S. Committee on Lectures, having charge of the preparation of syllabus and the selection of lecturers, is as follows: E. P. Hyde, chairman; Louis Bell, L. B. Marks, W. H. Gartley, W. D. Weaver, C. W. Sharp, secretary. The Administrative Committee on Lectures is as follows: P. S. Millar, chairman; C. E. Clewell, J. D. Israel, A. S. McAllister, H. K. Mohr, C. O. Bond, F. H. Gale, C. L. Law, W. J. Serrill, G. H. Stickney. The members of the University faculty committee having charge of the course are as follows: C. E. Clewell, electrical engineering; G. E. de Schweinitz, ophthalmology; R. H. Fernald, mechanical engineering; A. W. Goodspeed, physics; W. P. Laird, architecture; Harold Pender, electrical engineering; W. T. Taggart, organic chemistry.

Water-Storage Basin Proposed to Increase Capacity of Sanitary District Hydroelectric Plant.

In a report to the Sanitary District of Chicago, submitted by its consulting engineer, Prof. Gardner Williams, it is recommended that a large water-storage basin be constructed adjacent to the District's hydroelectric plant between Lockport and Joliet, Ill. The cost of this plant was about $3,800,000. By the expenditure of about $1,000,000 it is estimated that enough water could be impounded daily from the Chicago Drainage Canal and the Desplaines River to provide for a greatly increased flow during the hours of peak load. The electrical output of the plant could thereby be increased about 43 per cent and its income nearly doubled. In 1915 the connected load on the Sanitary District's transmission and distribution system was 55,640 horsepower and its total earnings $932,566.48. By means of the proposed basin, it is said, that the cost of generating the additional power desired for street lighting in Chicago and other loads would be much less than by the addition of an auxiliary steam power plant of equal capacity.

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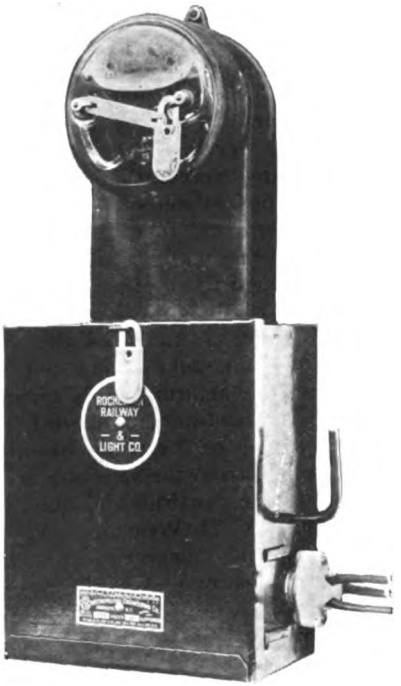
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Metropolitan Standard Service and Meter Protective System.

It is coming to be recognized by progressive central-station companies that the ordinary unprotected service switch, main cutout and meter form an undesirable combination for numerous reasons, among which the important



Metropolitan Service and Meter Protective Device.

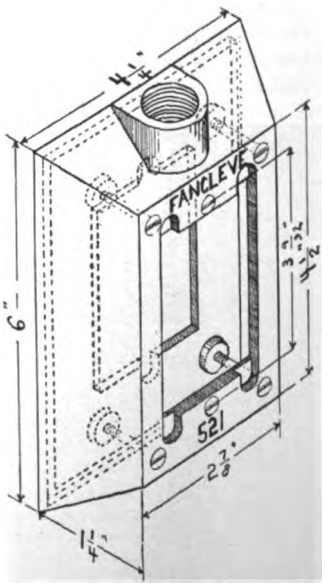
ones are the liability for tampering with the circuit in the effort to divert current from the meter, also the possibility of unintentional interference with the circuit due to ignorance, also the danger from exposed current-carrying parts. It has been felt for some time that to overcome these and other objections, the entire service connection, main switch and cutout and the wiring of the meter should be sealed.

This matter has been given much thought and development by the Metropolitan Engineering Company, 30 East 42nd Street, New York City. As a result of these developments there has now been perfected a complete standard protective system which is adaptable to any of the standard meters used for a customer's circuit. The outfit consists of a metal box inclosing the service switch and cutout and connected to it is a metal cover that fits close to the meter. If a number of services are to be connected near each other, there is also provided a wire conduit connector or metal-covered trough between the service boxes. From this brief outline it is evident that the entire wiring is inclosed in metal casing which is sealed. The service cutout is arranged to permit ready testing of the meter. The service-switch handle extends from the right side and the switch may therefore be operated without opening the cabinet or disturbing the seal. This switch may also be locked in the open position by means of an inside latch if desired. The cabinet is equipped with openings for different sizes of conduit and also for attachments by means of which open wiring can be carried from the cabinet throughout the house if so desired. What is known as the meter adapter connecting the main cabinet with the bottom of the meter is made in several forms so as to suit the various standard meters used. The cutout in the cabinet can be equipped with terminals for either Edison plug fuses, standard cartridge fuses or link fuses.

Among the advantages of this very flexible system are its eliminating the possibility of injury or fire, provision of uniformity in installation, economy in wiring and facilitating in testing or locating trouble, elimination of efforts at theft of current or tampering with service or meter. Where the use of energy has been temporarily discontinued and the meter is to be removed, this may be done and the service disconnected in the cabinet ready for immediate reconnection when desired. The entire protective service device, together with the meter, may be assembled and wired in advance at the shop, thus making its installation on the premises of the customer very simple.

Fancleve Switch-Box Adapter.

In making alterations in the wiring of a building it is often desirable to move a wall outlet to a more convenient position. A fitting designed to permit doing this readily has been placed on the market by the Fancleve Specialty Company, Jamaica Plain Station, Boston, Mass. The idea of this adapter is to apply the base of the device to a concealed switch box with the same screws that are used to



Switch-Box Adapter.

fasten the switch or receptacle to the box, then to remount the switch or receptacle on the face of the adapter fitting and run an exposed tap or outlet to some new or more convenient location. This fitting is adaptable to standard switch and receptacle boxes and is made according to the customary Fancleve standards of workmanship.

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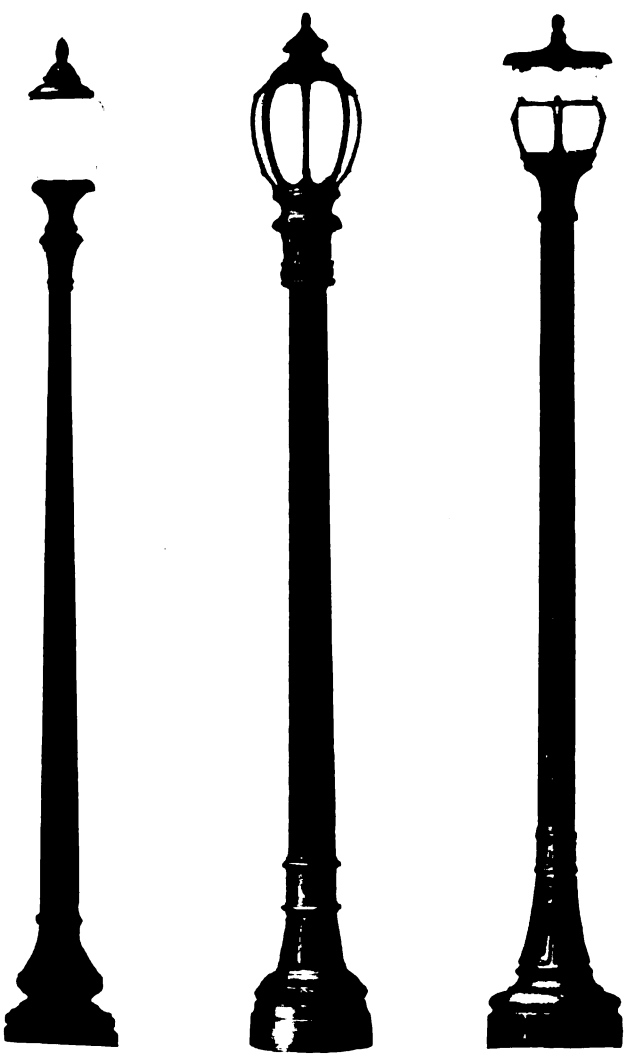
New Designs of Ornamental Street-Lighting Posts.

The movement for street lighting by means of ornamental posts now frequently finds expression in units of the single-lamp type, since these are in many cases not only simpler and less expensive but also more efficient than cluster units. A desirable feature of such installations is distinctiveness and for this reason a considerable number of new designs of the single-unit type have recently been developed by the King Foundry Company, St. Joseph, Mo. Only a few typical designs of this series are shown in the accompanying illustrations.

In the post shown in Fig. 1 the equipment includes a Novalux unit of General Electric make known as the form 8. This is intended for use with 100, 200, 300, 400 or 500-watt type C multiple Mazda lamps, or with 100, 250 or 400-candlepower type C series lamps. The unit is arranged to have a height of 11 feet to the center of the globe. The column tapers from 3 inches near the top to 5.5 inches where it joins the base, and the diameter of the base is 17 inches. A modified form of this unit with a height of 12 feet 6 inches to the center of the globe and with a base 19 inches in diameter is also made.

The design shown in Fig. 2 shows not only a different form of column but also one of the new General Electric ornamental lanterns which gives an exceptionally pleasing appearance to the complete unit. Another form of lantern, including a refractor unit inside, is shown in Fig. 3. All of these designs are arranged for ventilation to allow use of gas-filled tungsten lamps. Considerable flexibility of selection is possible by using these and similar globe and lantern fixtures with the numerous designs of column available.

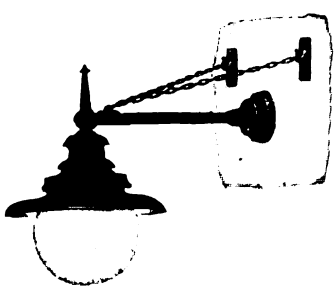


Figs. 1, 2 and 3.—New Designs of King Ornamental Posts.

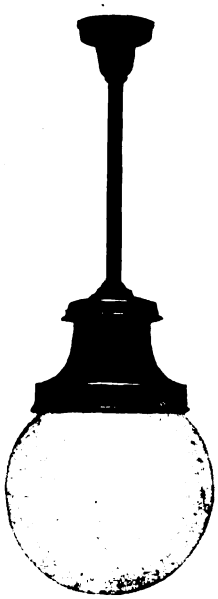
Herwig Ventililite Fixtures for Gas-Filled Lamps.

The accompanying illustrations show a few of the more popular new forms of fixtures for type C Mazda lamps, built especially for outdoor service by the Herwig Art Shade & Lamp Company, 2140 North Halsted Street, Chicago, Ill. The bracket and suspension types have the Ventilite holders which are triple-ventilated, supplying the liberal cooling so essential to long life of the lamp. These holders are made of cast metal and are finished in heavy, baked, black enamel which prevents rusting. These reflectors are of spun steel, porcelain-enameled. These units can be supplied in all sizes from 6 to 10 inches and are for lamps of from 300 to 1,000 watts.

The pendent type is a two-piece holder made of cast metal and finished the same way as the Ventilite. This type has been brought out to supply the demand for a holder without the reflector. Both types of holders are very easy to wire. The top of the holder is held in place by lugs and three screws, easily detachable. A mogul-base socket without the brass cap may be used. The under side of top of holder is tapped for screws and will take any standard make of lamp socket.



Herwig Ventilite Bracket Fixture for Gas-Filled Lamps.



Herwig Pendent Fixture.

The company reports a large demand for these units. They are especially adapted for use in yards, docks, factories, store and theater fronts, train sheds, etc. A recent order was for the complete lighting equipment for a shipbuilding yard in New York, and there have been many smaller orders for similar installations. The bracket type is being used extensively by central stations in store-front lighting campaigns with very successful results.

Spencer Motor-Driven Vacuum Cleaner.

To meet the demand for a vacuum cleaner for use in the home that will suck all dirt, dust, germs and foul air out through a tube to a receiver in the basement, with no machinery or germ-laden exhaust air in the rooms, the Spencer Turbine Cleaner Company, Hartford, Conn., has developed a steel turbine central home cleaner.

This system has the same characteristics as the large central cleaning plants used in colleges, large office buildings, churches, hotels, department stores, and large residences. It is designed to give the same satisfaction in its field as the larger plant.

The plant is located in the basement and a system of installing the tubing and wiring has been devised which will not cut up the house nor cause inconvenience. There is nothing to handle in the rooms except the cleaning

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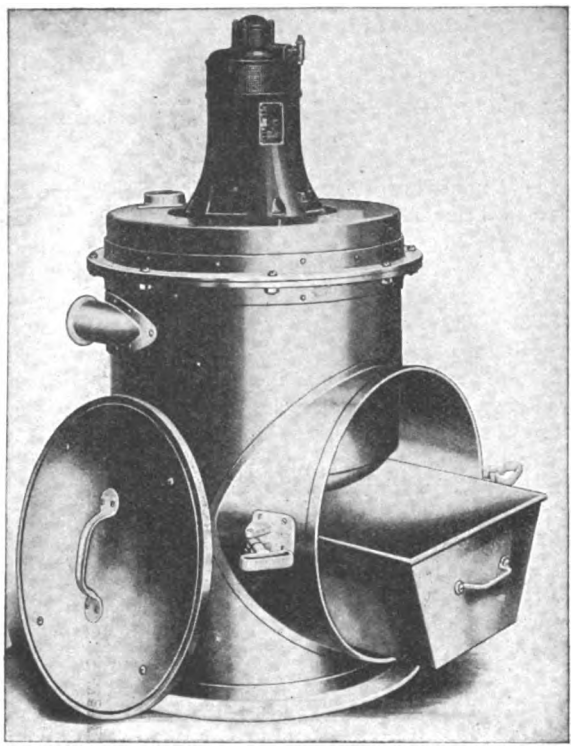


Spencer Stationary Vacuum Cleaner.

tool and the hose, which is attached to an inlet valve, installed in the baseboard of the room. This apparatus is light and easy to handle.

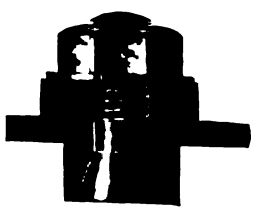
It is stated that the advantages of this system are that all the dirt is sucked out through a tube, that no foul or exhaust air or any part of the dust is discharged back into the rooms and that all the machinery is located in the basement, where it is not moved, handled nor skimped in size, weight, or efficiency. It supplies a strong, even vacuum so well controlled as to avoid all possibility of injury to rugs or fabrics and removes all dust and grit from cracks or pores in the floor.

The machine consists of a low-velocity, wide-clearance Spencer turbine fan which produces the vacuum, a separator of the centrifugal type, and a receiver of extra large size. The construction of the whole outfit is of steel, welded and riveted. Bearings of large size are used.

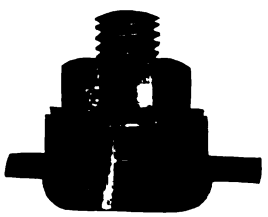
The illustration herewith shows the outfit equipped with a one-half-horsepower universal vertical motor manufactured by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The motor will operate successfully within its capacity and without the use of any external resistance on circuits of 110 volts direct current or alternating current of any frequency up to and including 60 cycles.

The Hightower Leak-Repair Plug.

The accompanying illustrations show a simple and novel device which will appeal to every operating engineer and plant manager. Frequently exasperating annoyances occur by reason of leaks through small holes in steam, ammonia, oil and water pipes, pipe fittings, condenser tubes, hot-water boilers, tanks, etc. With this little device the trouble may be quickly remedied. It consists of a conical headed bolt, nut and washer, and a plug made of soft metal alloy. The alloy will resist action of steam, ammonia, oil, etc. To apply the plug, ream the hole to the size of any standard size plug, so as to secure sound metal surrounding the hole; insert the plug, holding its head with a thin wrench to prevent turning; then screw up on the expansion-bolt nut until tight, when the leak will be permanently stopped. The alloy mushrooms around the end of the plug, against which the pressure is always exerted, thus making a perfect seal.



Plug Inserted in Hole But Not Tightened.



Plug Tightened, Sealing Hole Securely.

These plugs are being placed on the market by the Russell-DeWolfe Company, 537 South Dearborn Street, Chicago, Ill. They are known as Hightower's leak-repair plugs and have been tested to 2,000 pounds hydraulic pressure without leaking.

Automatic Twin-Tub Electric Washer.

In families where considerable washing must be done, it is often advisable to provide a washer of the twin-tub type which permits operation of the two tubs interchangeably or both together at the same time, thus greatly facilitating the work. Such a machine, designated as model No. 8 twin-tub machine, has been placed on the market by the Automatic Electric Washer Company, Newton, Iowa. It consists of two complete washing-machine units mounted upon a firm steel frame, which is equipped with a folding side bench for two extra tubs. A swinging reversible wringer with 12-inch rolls is provided; this is of the standard type furnished by this company and covered by a five-year guarantee.

New Twin-Tub Electric Washer.

The manufacturer makes strong claims for the simplicity of construction and operation of the entire outfit. The frame is particularly substantial, being built out of angle iron with gas-pipe legs fitting into malleable-iron corner sockets. The tubs have large outlets for draining, which are threaded both inside and outside for hose connection and thereby permit emptying the tubs without tilting. Owing to the double work that the machine can do, it is equipped with an extra large ventilated driving motor. The weight of the complete machine is about 300 pounds. It is mounted on ball-bearing casters that permit moving it about very easily.

Largest Circuit-Breakers Made Give Excellent Service.

What are said to be the largest circuit-breakers ever built have been in continuous service for over two years in the Sherman Street substation of the Commonwealth Edison Company, Chicago. These breakers are connected directly

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into the heavy copper direct-current leads carrying 20,000 amperes from the larger of the two rotary converters in this substation. This machine is a 5,000-kilowatt unit, converting three-phase, 25-cycle current into 250-volt direct current. The two breakers, front and rear views of which are shown herewith, are mounted on adjoining panels, each 54 inches high by 30 inches wide.

These circuit-breakers are of the overload and reverse-current type. They are remote-controlled from an operating board, shown at the right in Fig. 2, which is mounted on a gallery overlooking the rotary converters. The operation is by means of two solenoids, of which the one shown in the tubular portion in the front and at the bottom is the coil which opens the breaker by tripping the release mechanism. For closing the breaker the large coil mounted in the cylindrical casing shown directly behind the opening coil is used. In closing the breaker the contact brushes must first be lifted rapidly to the closing position, and then pressed against the contact blocks with a pressure of several tons. This requires an exceptionally strong magnetic pull, which accounts for the size of the coil used. The closing action is very positive and powerful. If the circuit-breaker is to be opened or closed by the operator at the control board, he needs merely to throw a small control switch either up or down. This energizes the opening or closing magnets, and produces almost instantaneous operation of the breaker. It is also possible to trip the breaker by hand by pushing a release button under the opening coil. As it may be necessary to close the breaker by hand, an exceptionally long closing handle is provided. This operates through a set of levers, in order that sufficient pressure may be exerted to completely close the contacts.

Normally the breakers are not used to open and close the circuit under load, because, if the rotary is to be either put into or out of commission, the load is gradually transferred. Under excess load, however, the breaker opens automatically, the release coil being energized from a relay on the control board. Likewise on reverse current, that is, if the alternating-current supply to the rotary converter should go down or fail, the circuit-breakers will open, and thereby prevent running of the rotary as an inverted machine fed from the direct-current side.

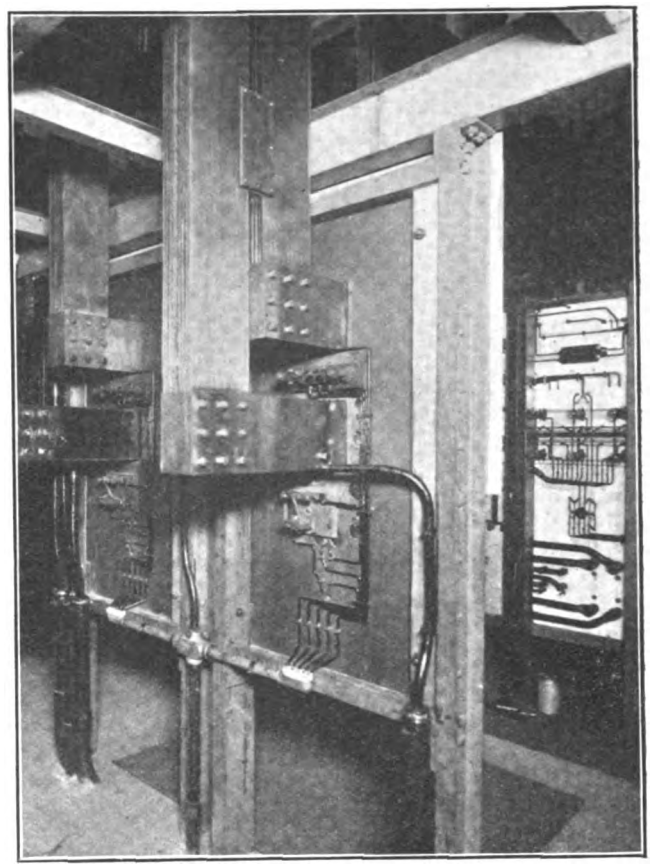

Fig. 2.—Rear View of 20,000-Ampere Breakers.

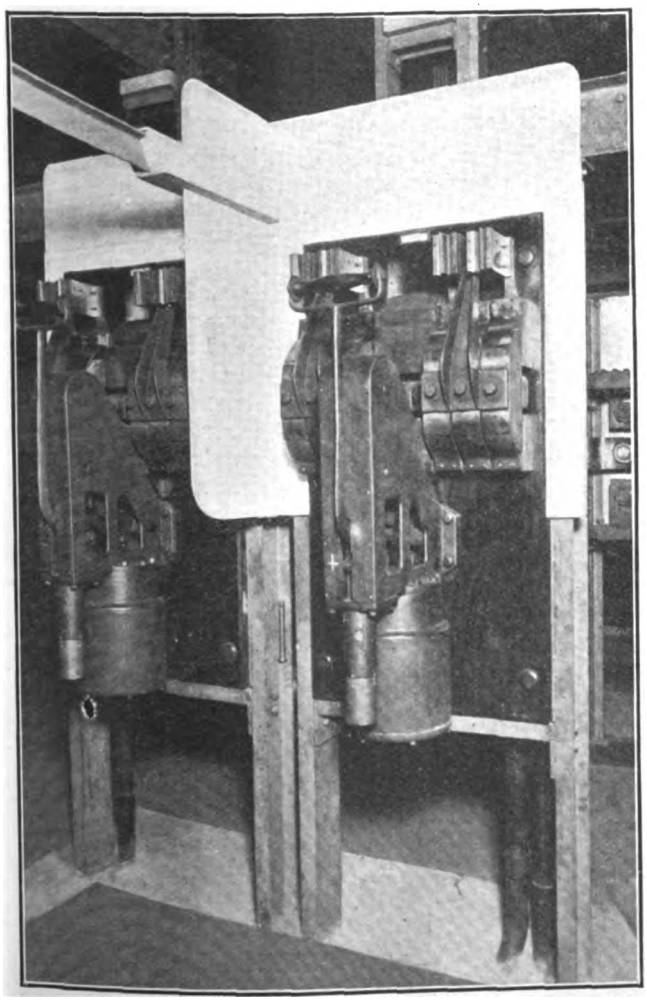

Fig. 1.—Pair of Anderson 20,000-Ampere Circuit-Breakers.

The contact brushes on each of these breakers are two in number, symmetrically arranged, and each composed of three sections. Each section has a multitude of laminations abutting directly upon the heavy copper cross bars or terminals. The outside or front lamination is made of heavy phosphor bronze, which provides powerful spring action; at the upper edge of this bronze member is a separate hard-drawn copper contact, and above the whole is a double set of carbon arcing contacts, there being four for each breaker. In opening, the massive copper brushes are separated first, then the copper contacts at the top of the bronze springs, and finally the carbon contacts at the top of the breaker. When the breaker opens under heavy load it has been found that no appreciable arcing occurs and the carbon contacts have been in service a long time without needing renewal. The operating mechanism consists of a series of compound levers to close the brushes, and a positive locking arm, held in place by a toggle, to hold the brushes closed. The breaker cannot be opened without first breaking the toggle, which can only be done by raising the plunger of the tripping solenoid, either by hand or by sending current through the coil. The mechanical operating mechanism is thoroughly insulated from all current-carrying parts. All of this mechanism is inclosed, except near the lower portion at the sides, where opportunity is provided for oiling the bearings.

When the circuit-breaker is open the upper carbon contacts are separated about 12 inches. The breaker can be locked in the open position, so as to prevent any possibility

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of closing while work is being done upon it or any of the main circuits in which it is connected. A set of indicating switches is mounted between the two terminals of the breaker, and arranged so that it controls pilot lamps on the operating board. As long as the breaker is closed a red lamp remains lighted; while the breaker is open a green lamp is lighted. About the upper portions of these breakers and between them is installed a Transite-asbestos-wood barrier. This is for the purpose of removing any remote possibility of arcing from the positive to the negative breaker.

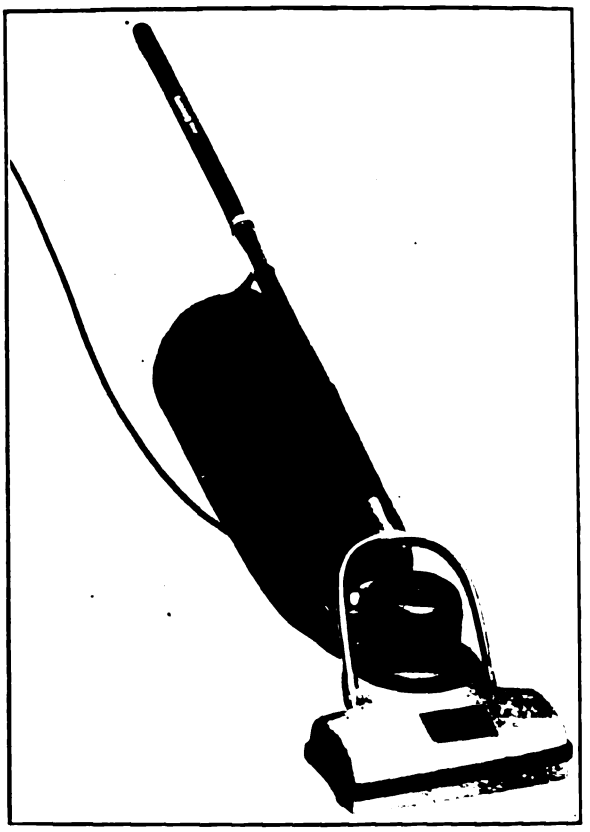
These breakers are of the type C, manufactured by Albert & J. M. Anderson Manufacturing Company, Boston, Mass. A similar but smaller set of these breakers, rated at 14,000 amperes, is also installed in this substation. A large number of breakers of this type are being used in power plants and substations with very excellent results. The Anderson company is prepared to build breakers of this type carrying currents of 25,000 amperes and over.

Early Model of Hoover Suction Sweeper Compared with Present Type.

The comparative youth of the vacuum-cleaning industry is forcibly brought to mind by an examination of the first of the accompanying illustrations showing one of the first models of the Hoover electric suction sweeper put out just nine years ago. The vacuum-cleaning business seems like an old one, perhaps because its early history was fraught with so much exploiting and over capitalization, but this picture of the pioneer reminds us that after all it really is a business in its youth.

One very interesting point in connection with the machine pictured is that while one would possibly not recognize in it the trim, handsome, compact Hoover machines of today, the principle is exactly the same. The same electrically driven brush, which distinguished the Hoover from the cleaners of those early days, is the big talking point and selling advantage of the present-day Hoover machines. The same combination of sweeping and shaking—added to the powerful suction of the fan—was found in the earliest model of the Hoover, as it is found today. To be sure, there has been a lot of refining.

Early Type of Hoover Electric Suction Sweeper.



A Recent Type of Hoover Suction Sweeper.

However, the Hoover Suction Sweeper Company, New Berlin, O., states that the Hoover principle of the electrically driven auxiliary brush has reigned supreme and today is a bigger selling advantage than ever, and of more value to its owners.

New Electric Searchlight for Automobiles.

A new automobile searchlight, known as the Pittsburgh Five A, has been placed on the market by the Pittsburgh Electric Specialties Company, Pittsburgh, Pa. The shell of this searchlight consists of a single spinning and it is consequently very light in weight, the total weght including bracket being only 1.5 pounds. The construction of the outfit permits the use of any automobile lamp made, regardless of style, size or voltage. Consequently it can be made to give a very powerful light or a light of less brilliancy, according to the owner's wishes. The searchlight is easily opened for changing bulbs and the focusing is accomplished by loosening an exterior set screw. The diameter of the lamp is five inches.

This lamp is made to sell at a popular price and completes the Pittsburgh line of searchlights, which comprises searchlights for all types of cars.

New Pittsburgh Electric Searchlight.

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Electric Power Unit for Use in the Kitchen.

Since the use of electrical devices is meeting with rapidly increasing popularity in the home, as well as in offices and shops, there has arisen a demand for an electric power drive which can be used with labor-saving kitchen appliances of various kinds. In the accompanying illustration is shown a device of this kind, known as the Reco electric kitchen power unit, which is so arranged that it can operate any of the well known hand-driven kitchen utensils, such as bread mixer, meat grinder, coffee or spice mill, ice-cream freezer, raisin seeder, cherry pitter, potato slicer, cake mixer, egg whip and other devices. It has in addition a buffing and grinding-wheel attachment.

The Reco unit is so constructed that it will drive any of the above mentioned appilances without reconstruction whatsoever. The driving arm may be raised or lowered to suit any height of appliance. There is a horizontal as well as a vertical drive. The drive shafts are equipped with a chuck and crank. The chuck is used where the handle of the appliance can be easily taken off, while the crank is used where the handle of the appliance cannot be removed. The shelf is for supporting appliances which have table clamps. There are holding hooks provided to hold appliances in position while being driven. The motor is one-sixth horsepower and is furnished in both direct current and alternating current in all voltages and cycles.

The device is finished in dark maroon, while the shafts are either nickel-plated or polished steel. This power unit is indorsed by culinary experts, and will do the work of two or three people in the kitchen. It is a boon to all housekeepers as it saves labor, time and unnecessary steps. The Reco unit is manufactured by the Reynolds Electric Company, Chicago and New York, and is on sale in many of the prominent central-station appliance rooms, as well as electric shops, hardware stores, etc.

Reco Electric Power Unit.

Novel Display Window Device for Demonstrating Hotpoint Vacuum Cleaners.

A novel and attractive window display is being furnished distributors of Hotpoint products, by the Hotpoint Electric Heating Company, Ontario, Cal., to facilitate the sale of Hotpoint vacuum cleaners during Hotpoint Week, July 3 to 8. The display consists of the figure of a woman, "The Hotpoint Maid," neatly dressed. The maid is apparently very much alive and has special value, as it demonstrates the suction power of the Hotpoint vacuum cleaner and conveys to the onlooker a good idea of the emancipation of woman from the house-cleaning drudgery.

By a unique make-and-break device in the automatic mechanism, the figure is continually moving, being first seen deflated, in a crumpled-up posture—"all fagged out from using the broom." By means of air forced through the rubber hose attached to the dust bag of the cleaner, the figure is inflated and brought to an erect, buoyant position, one hand pointing to the vacuum-cleaner card.

This window display will be featured in special national advertising The Hotpoint Electric Heating Company in furnishing its distributors with this very attractive and expensive window display, has considered carefully the fact that, as a rule, it is a difficutl matter for the dealer to convey his message to the passing throng without going to a great deal of work and expense. Hotpoint Week, July 3-8, will be the sixth anniversary of this special sale.

Hotpoint Vacuum Cleaner Window Display.

American Ironing Machine Company's Newest Plan to Help Simplex Dealers Increase Sales.

Going on the assumption that many dealers lose sales because their clerks are not sufficiently well posted on the articles they are offering to the public, the American Ironing Machine Company, of Chicago, has recently conceived of a plan which should eliminate most of this waste and make every salesman worth more to the house. The campaign is directed particularly to dealers of the Simplex ironer and is somewhat unique.

Consider a case where a woman customer comes into the store and tells one of the clerks that she would like to have a demonstration of the Simplex ironer. The woman is not so much interested in the kind of steel, iron or bronze put into the construction. She wants to know how and what it irons, and when she can see a dainty piece of fine linen (which she knows is difficult to iron by hand) ironed in a jiffy right before her very eyes with no labor whatever a strikingly favorable impression is created.

The salesman who can take her in hand, show how the device operates, explain all the finer points to her and make her realize that she needs one of these labor-saving machines is pretty certain to make a sale. The salesman who is handicapped with only scant knowledge starts off on the wrong foot, so to speak, and is fortunate if he makes much of an impression.

To counteract this condition the American Ironing Machine Company has prepared a very elaborate portfolio, which is really the whole story of the Simplex ironer in a nutshell. In this every dealer help put out by the Simplex organization is reproduced and explained in full.

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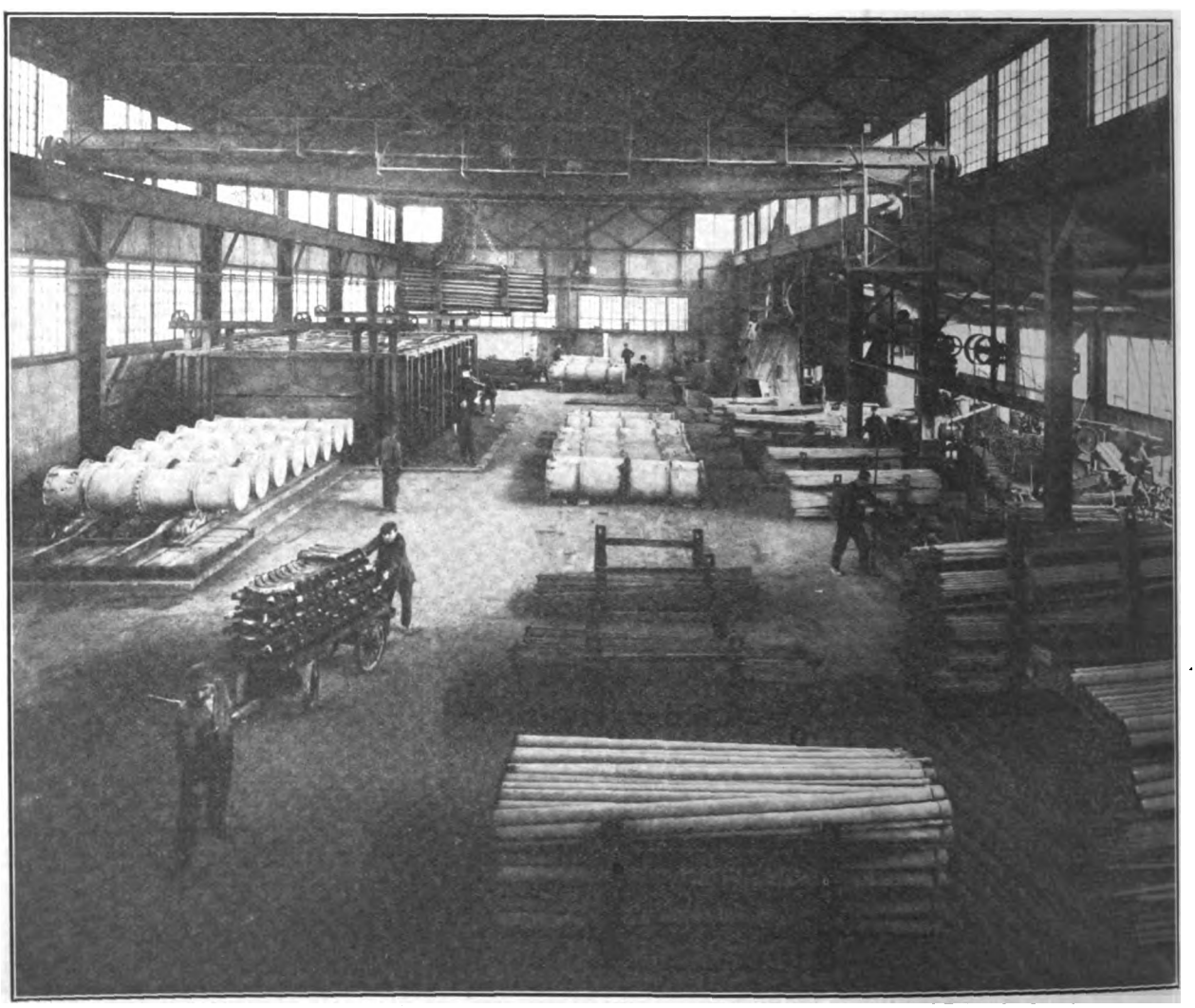
Booklets, circulars, street-car cards, electrotypes of newspaper advertisements to be run in the dealer's local newspapers, complete follow-up campaigns to be mailed out to the prospects, motion-picture slides—all these and more are included. Simply by turning to this portfolio the dealer can pick out any or all of these sales stimulants. These are valuable dealer helps, but perhaps not so new to the dealer as the educational work also included as a part of the Simplex ironer portfolio.

This is directed more particularly at the clerks, the idea being that if only one man in each dealer's store really studies up on the many sales points of this Simplex device the result in the aggregate will well pay for the time and effort expended in teaching these men to be more successful. "Not only do we supply our dealers with a most comprehensive array of printed matter, but we show them how to take care of their customers after they come in to see and learn about the Simplex," said H. G. Grosse, president of the American Ironing Machine Company, in discussing the subject. "We try at all times to keep in close touch with our dealers and their salesmen. Of course, we are especially interested in the men who actually sell Simplex ironers. Some time ago we got up a very complete correspondence course of lessons in salesmanship, and it is surprising and gratifying to learn how many of our boys are anxious to get these so they can make themselves worth more to their firms. To stimulate interest in this correspondence course of Simplex salesmanship, we have recently offered prizes to the clerks who turned in the best sets of answers to the questions. While we have not had time to check up the amount of added interest that this plan creates, we know for a certainty that our correspondence course, in general, is a great success, both to us and to our dealers."

The Simplex ironer portfolio, of which the lessons in salesmanship and other means of getting more business are a part, is put out in such compact form that it is getting a warm welcome everywhere. Many dealers who hitherto have not taken much stock in such ideas are beginning to realize that the day has come when they must be fully fortified to answer any questions which may arise.

Simplex ironers distinguish themselves for their neat design and their extreme simplicity and durability. These features insure long and satisfactory wear and service. An important feature which has been found to appeal to the user of the Simplex is the absolute safety with which this machine may be operated, even by inexperienced help. Simplex ironers may be heated by gas, gasoline or electricity. They are furnished with belt for power connections, or complete with their motors attached.



Interior View of Sherarduct Plant of the National Metal Molding Company, Pittsburgh, Pa.

The above view of the interior of the Sherardizing Department of the large plant of the National Metal Molding Company, at Economy, Pa., shows one of the large sherardizing furnaces in which Sherarduct sherardized rigid steel conduit is treated. This conduit is distinctive in that both its interior and exterior surfaces are given double protection, first by being sherardized, a treatment from which noncorrosive surfaces of a zinc-steel alloy result, then further protected by coatings of a transparent acid and alkaliproof enamel baked on, thus resulting in a finished product which is both rustproof and acidproof. Sherarduct has been installed exclusively in a large number of the most notable buildings in the country. More than fifty car loads were used in the new Equitable Building, New York City. In this plant, which covers 14 acres, the company also manufactures Flextube nonmetallic flexible conduit, Flexsteel flexible metallic conduit and armored cable, and a complete line of fittings, National outlet boxes, switch boxes, metal molding and fittings, fixture studs, locknuts and bushings, and also a complete line of both metallic and nonmetallic automobile conduits and fittings. The company reports a capacity demand for all these materials.

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INDUSTRY ACTIVITIES

Harvey Hubbell, Inc., Bridgeport, Conn., has issued catalog sheets, bulletin No. 15-18, on Hubbell locking lamps.

Crouse-Hinds Company, Syracuse, N. Y., is sending out a folder describing its 112-page booklet on "One Hundred Condulet Suggestions."

Adjustable Electric Socket Company, Dallas, Ore., manufacturers of electric appliances, has just installed a large amount of new factory equipment.

Ward Leonard Electric Company, Bronxville, N. Y., has issued for addition to its loose-leaf catalog a new section, G-13, on its Adaptor (plug and socket) resistance units.

Westinghouse Church Kerr & Company, 37 Wall Street, New York City, has issued a folder on the erection of a locomotive repair shop for the Canadian Pacific Railroad at Calgary, Alberta, Can.

Pass & Seymour, Solvay, N. J., have issued a 24-page booklet on "The Gateway of Electric Service," which as the title page says, "is a brief exposition of the importance of various factors that produce satisfaction in the use of electricity."

Western Agencies Company, recently organized in San Francisco, Cal., with offices and stockrooms at 249 Minna Street, is representing the Niagara Searchlight Company, Bright Star Battery Company, U. S. Incandescent Lamp Company and several other lines in that territory. Nicholas Abrams, formerly with the Interstate Electric Novelty Company, of New York City, is president of the new company.

Defrees, Buckingham & Eaton, 1720 Borland Building, announce the admission of Paul B. Fischer, Don Kenneth Jones and Richard Yates Hoffman to membership in the firm. This firm of lawyers is well known to the electrical industry and the senior members, Joseph Defrees, George T. Buckingham, Marquis Eaton and Donald Defrees, are among the most prominent figures in the city of Chicago in connection with many welfare movements and civic undertakings.

Woodrow Manufacturing Company, Newton, Iowa, is preparing to place on the market a complete line of power and electric washing machines which the company will manufacture exclusively. It is the intention to manufacture machines of high quality to sell at a slightly higher price than the average, the machines to be marketed through electrical, hardware and implement dealers. Each member of the firm has had a wide experience in the manufacture of washing machines, O. B. Woodrow, president of the company, being the inventor of the first dolly-type electric washing machine.

W. R. Ostrander & Company, located for the past 20 years at 22 Dey Street, New York City, will move to 371 Broadway on or about June 14. The increasing business of this company demanded larger quarters, and it also desired to obtain a more central location to better handle its large volume of shipping. The company is one of the oldest houses in the electrical trade, having been in existence since 1852. It was incorporated in 1904 and transacts a manufacturing and general supply business, devoting special attention to bells, annunciators, fire-alarm equipment, metal shades, speaking tubes, and other manufactured products. It also manufactures electric-lamp sockets. The building to which the company will remove is a five-story modern edifice, double the size of its present building, and is fully equipped to be the headquarters of this progressive company.

New York Gas & Appliance Company, 569 Broadway, New York City, has issued a booklet showing a few illustrations of its extensive line of electrical fixtures, which are of very pleasing designs. Prices are given, with a liberal discount to the trade.

Westinghouse Lamp Company, 1261 Broadway, New York City, has issued the sixth of its series of salesmen's lamp handbooks, and which is entitled "How to Design Effective Lighting." This particular issue deals with a subject that is rather new in some of its aspects, and it is expected that the information contained therein will be of great value to everybody interested in the selling of lamps. Copies of the booklet may be obtained without charge upon request to the company.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has issued bulletin No. 875 entitled "The Potentiometer System of Pyrometry." The bulletin contains 28 pages with many illustrations and explains the principles of this system of pyrometry in detail. The indicating and recording types of pyrometer sets are described. On the last few pages of the bulletin is given a discussion of the adaptability of this method of pyrometry to location of the transformation points in the heat treatment of special steels.

Royal Electric Manufacturing Company, 606 East Fortieth Street, Chicago, Ill., has issued its general catalog No. 2. The company does electrical engineering work and designs and manufactures high-tension switching apparatus and accessories for central-station and outdoor use for potentials up to 140,000 volts, and also designs apparatus to meet special conditions. Its cataloged lines include pole-top and disconnecting switches, horn-gap lighting arresters, choke coils, horn-gap fuses, steel towers and bus supports. Some valuable tables on current-carrying capacities of copper tubing, wire and cables, and flat busbar copper, on currents in three-phase circuits, on spacing of conductors, and other data are given in the catalog.

The Electric Controller & Manufacturing Company, Cleveland, O., has issued several unique instruction booklets dealing with some of its automatic control equipment. In getting up the booklets it has been the policy of the company to include much more than mere instructions for maintenance, adjustment, etc., which the operator may or may not be able to follow because of probable inability to understand properly. To overcome this and other objections to the ordinary instruction book, the company has decided to include in each booklet a simple explanation of the principle of operation of the device considered so that the reader can readily understand the function of each part and the effect any change or adjustment will produce. To make the matter more understandable, simple drawings and numerous half-tone illustrations are used. Three of these booklets are already published; these deal with the type A series switch, type C overload relay, and type SC acceleration relay. The booklets are of hand size (3.5 by 6 inches) and are well printed and illustrated. Similar booklets dealing with other apparatus made by the company are in preparation and it is hoped to cover the entire line of its products in this manner. Through their publication operating men will be enabled to obtain a much better understanding of automatic control equipment and therefore a more rapid growth of motor applications should result.

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The Terry Steam Turbine Company, Hartford, Conn., announces the appointment of O. E. Thomas, 626 Washington Building, Los Angeles, Cal., as district sales manager, for a territory covering Arizona and the southern portions of California and Nevada.

Market for Electrical Supplies in China.—The Chicago district office of the United States Bureau of Foreign and Domestic Commerce has been requested by a firm of import and export agents in Shanghai, China, to put it in touch with manufacturers of sockets, switches, wire, motors and all other kinds of electrical supplies. Communications are also requested from manufacturers of machines for making silk and cotton tape of various widths. Catalogs and full details are desired. Name and address, with other particulars as to other articles handled by this company, may be obtained by addressing Stanley H. Rose, Commercial Agent in Charge, Bureau of Foreign and Domestic Commerce, 504 Federal Building, Chicago, Ill.

Sangamo Exhibit at N. E. L. A. Convention.—The principal features of the exhibit of the Sangamo Electric Company, Springfield, Ill., this year, particularly from the standpoint of novelty, will be the switchboard and portable graphic wattmeters of the mercury-motor type, and an entirely new and unusual type of ampere-hour meter intended especially for use on submarine boats. The exhibit will include a part of the prize exhibit of the Sangamo company at the Panama-Pacific Exposition. Numerous standard switchboard types of watt-hour and ampere-hour meters will be shown. Particular attention will be given to the new Sangamo switchboard graphic wattmeter which operates on the mercury-motor principle and has a number of novel features not used heretofore. The submarine type of ampere-hour meter will not be connected for operation, but will be arranged so that its construction can be studied as an improved development of the electric meter art. This instrument consists really of two meters combined on one base and connected through differential gearing so as to give the sum or difference of the quantities measured by the two separate elements. The operating dial shows at all times the true condition of a storage battery with respect to charge and discharge. Several of the single or ordinary type of Sangamo ampere-hour meter are already in use on many submarines and the new combination instrument will doubtless supersede all previous types.

Sherwin-Williams Company, Chicago, Ill., is one of the largest consumers in the United States of certain dyes used in color making. These dyes are known as paranitraniline and beta napthol and are used in making reds of various kinds. Soon after the war broke out, the company foreseeing the difficulties of importing dyes from abroad, laid plans for the manufacture of these and other dye stuffs. It had previously erected a tar distillation plant which produced some of the important basic materials used in the manufacture of dyes. This plant was quickly enlarged and expert chemists were engaged to install and operate a complete and efficient works for the production of finished dyes. These works are now in operation and are producing daily a satisfactory output of paranitraniline and beta napthol of quality equal to the best that has been imported. Additional equipment will shortly be installed which will double the ouput and orders are now being accepted for the surplus not required in the company's own color works. It is also booking orders for para reds and invites inquiries from consumers of these products. The company is also actively engaged with plans for the production of many other important dyes and hopes soon to make definite announcement with regard to the supplies it expects to offer the trade. In manufacturing dye stuffs, the Sherwin-Williams Company is carrying out its policy of controlling all of its own important raw materials, the production of which has much to do with the quality of their products.

Century Electric Company.—The Century Engineering Club, an organization of the employees of the Century Electric Company, St. Louis, Mo., holds it second annual banquet and smoker, May 2, at the Mercantile Club with an attendance of over 175. D. S. Kramer, special representative of the company, the principal speaker of the evening, gave an illustrated talk on his experiences in the various foreign countries which he recently visited. Several entertaining features by members of the organization completed the program. The present officers are J. L. Woodress, president; E. A. Ross, vice-president; A. L. Cutter, secretary, and R. H. Hickey, treasurer.

Northern Electric Company.—The Electrical Engineering Company, Minneapolis, Minn., after a successful career of 23 years, has absorbed the Northern Electrical Company, Duluth, Minn., and will now be known as the Northern Electric Company. The company has increased its authorized capital to $300,000 and is contemplating the enlargement of its building at 19 North Sixth Street, to take care of increased business and to afford better facilities for the handling of the large demand for materials sold. The company does a jobbing, wholesaling and retailing business, manufacturers fixtures, and has a large corps of salesmen covering the Northwest. The personnel of the company will remain the same, with James Richardson president and W. E. Stephenson secretary, both pioneers in the electrical industry in the Northwest and identified with this company for eight years. The company recently added a new motor and power apparatus department to satisfy the demands of its customers for large apparatus. The company maintains an engineering force to give suggestions regarding problems encountered by central-station men.

H. W. Johns-Manville Company.—One of the interesting and instructive exhibits at the coming convention of the National Electric Light Association, at Chicago, Ill., will be the very comprehensive display of products of the H. W. Johns-Manville Company, New York City, occupying booths Nos. 9 and 11. In this space will be shown the entire line of "Noark" protective devices—fuses, service and subway boxes. Special attention will be given to the "Noark" Universal system, by means of which numerous service appliances can be built up of practically the same unit parts. The application of this system, which should appeal particularly to central-station men, will be demonstrated at the exhibition of various built-up devices. The Johns-Manville line of molded insulations will be adequately represented by specimens showing each of the types and grades manufactured. The various compounds are based on rubber, shellac, asbestos, or synthetic products, depending on service for which required. In this group also is included an exhibit of J-M ebony asbestos wood, used for switchboards, barriers, switch bases, etc. In the distribution division the company is represented by the J-M fiber conduit, to be shown in several types. J-M friction and rubber tapes and other miscellaneous textiles for the electrical industry will also be displayed. The new "Polaralite" sign, made by the I. P. Frink Company, together with other displays of Frink lighting systems, for which the Johns-Manville Company is the sole selling agent, should prove of great interest. Unique mounting of exhibits by means of "shadow-box" display will be a feature. These "shadow boxes" are cases of mahogany, piano finished, so built as to be non-reflecting. The following representatives of the H. W. Johns-Manville Company will be in attendance throughout the convention: J. W. Perry, general manager, electrical department; R. R. Braggins, manager, Cleveland branch electrical department; G. A. Saylor, manager, Chicago branch electrical department; H. M. Frantz, Chicago branch electrical department; R. C. Cole, electrical engineer, the Johns-Pratt Company, Hartford, Conn., and Joseph Sachs, the Johns-Pratt Company, Hartford, Conn.

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PERSONAL AND BIOGRAPHICAL

MR. EUGENE J. DEUTH, president of Deuth & Company, Inc., is rapidly advancing the plans of the company to increase its output of incandescent lamps and has recently re-organized the business, taking over the control of the output of several of the largest independent incandescent lamp concerns in the country. Mr. Deuth has been connected with the tungsten incandescent lamp industry for a considerable time, coming to this country six years ago as the American representative of Alois Schweiger & Company, whose principal offices are in Vienna, and one of the first concerns to export tungsten lamps to the United States on a large scale. Later on, Mr. Deuth controlled the output of the largest factory in Europe, importing millions of lamps to this country. Since the outbreak of the war, he has reorganized the business and the new company has changed to handling United States products and all the lamps it now buys and sells are made in the United States. The company occupies an entire floor of offices in the Fifth National Bank Building, New York, and through Mr. Deuth's personal connections has secured the patronage of a large number of public libraries, public schools and other departments of the city of New York, the buildings of a number of large estates, many of the largest office buildings in New York and other principal cities, and the incandescent lamp requirements of several leading building contractors. Mr. Deuth has surrounded himself with a strong executive organization. The treasurer of the Equitable Building, New York, Mr. W. D. McElhinny, is a director of the company, also Mr. Thomas Morch, of the Equitable Building, and Mr. W. Dunbar McElhinny, formerly connected with the Equitable Building, is now secretary and treasurer of Deuth & Company, Inc. Another member of the board is Mr. Charles LeBarbier, formerly Assistant District Attorney of New York City.

E. J. Deuth.

MR. S. L. BLACKBURN, representative of the Westinghouse Electric & Manufacturing Company, at Cleveland, O., was recently elected secretary of the Cleveland Section of the Society of Automobile Engineers

MR. JOHN B. SEBRING, Pittsburgh representative of the Ward Leonard Electric Company, has moved his offices to 901 Park Building. MR. G. H. ARMSTRONG has recently joined the Sebring organization.

MR. C. L. BURGER and MR. W. H. C. CLARKE, formerly associated with the firm of Moore & Clarke, have formed the firm of Burger & Clarke, and will continue in the offices of Mr. Burger, 2 Rector Street, New York City, the practice of the law of patents, trademarks and copyrights.

MR. STEPHEN L. SELDEN has resigned as vice-president of J. G. White & Company, Inc., and has resumed the practice of the law. He has associated himself with the firm of Walmsley & Kohlman and the new firm will practice under the name of Selden, Walmsley & Kohlman, with offices at 61 Broadway, New York City.

MR. ANDREW N. FOX, advertising manager of the Benjamin Electric Manufacturing Company, Chicago, Ill., is one of the prominent members of the Advertising Association of Chicago and a member of the executive committee of the Associated Advertising Clubs of the World. Mr. Fox is a brilliant speaker, and has been appointed lecturer by the Advertising Association to deliver a series of addresses connected with the "Big Brother" movement inaugurated by that association. In connection with this work Mr. Fox has recently completed a speaking tour which included addresses before the Chambers of Commerce and the advertising clubs of Aurora, Ill., Decatur, Ill., South Bend, Ind., Evansville, Ind., and Jeffersonville, Ind.

MR. T. COMMERFORD MARTIN and MR. STEPHEN LEIDY COLES have announced their purpose of collaborating in the writing of "The Story of Electricity." This will be a popular and accurate historical account of the establishment and wonderful development of the electrical industry. Mr. Martin, now secretary of the National Electric Light Association, was for many years editor of the *Electrical World*. In this connection his name and fame have traveled wherever there has come any knowledge of the electrical industry. The author of "Edison, His Life and Inventions," "Inventions and Researches of Nicola Tesla," "The Electric Motor," and other classical contributions to the literature of electricity, Mr. Martin might well be chosen as the editor of this work. Mr. Coles was formerly managing editor of the ELECTRICAL REVIEW and is editor of the American edition of "Electric Heating, Cooking and Cleaning." For many years he has devoted himself to a continually increasing practice as a public utilities engineer. In the combining of forces of these two great journalistic comrades, the industry and the public in general are assured of a contribution that will leave little to be desired. These men have had the most intimate contact with practically all there is of the scientific and commercial development of the electrical industry. Their collection of information is rich in its possibilities. Their personal acquaintance with the men who have created and developed the art and application of the generation and utilization of electrical energy and the manufacturing of electrical apparatus give them an extraordinary opportunity for making a close range study and revealing to the world what we expect will be the most acceptable and valuable work on the subject that has ever been produced.

MR. DON KENNETH JONES has been admitted to membership in the firm of Defrees, Buckingham & Eaton, one of the foremost firms of attorneys in the city of Chicago. Mr. Jones, who has had a brilliant career and attracted a great deal of conspicuous attention, was born on February 21, 1888, at Quincy, Mich., graduating from the University of Michigan and the Chicago-Kent College of Law. He became connected with the firm in April, 1910, and was admitted to practice in July, 1910. He is well known in the electrical industry, having represented a large number of electrical interests in litigation in various parts of the country. He is interested in many civic enterprises and in community development and is a prominent member of the Theta Delta Phi law fraternity.

D. K. Jones.

PROF. C. L. CORY, professor of electrical engineering and dean of the College of Mechanics, University of California, has been elected president of the California Chapter of Sigma Xi, the honorary scientific fraternity.

MR. D. T. CAMPBELL, general manager of the Scranton Electric Company, has taken charge of the plant of the Citizens' Electric Illuminating Company, recently purchased by the American Gas & Electric Company, which also controls the Scranton company. Mr. Campbell will draw up the plans for the rehabilitation of the Pittston plant.

MR. J. A. PERKINS, formerly manager of the Union Gas & Electric Company, Bloomington, Ill., has become general manager of the Lockport (N. Y.) Light, Heat & Power Company, succeeding MR. EDGAR WALLOWER, who has gone to Oklahoma City, Okla., to engage in the oil and gas industry.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

CONCORD, N. H.—The Concord Electric Company, one of the properties under the engineering management of Charles H. Tenney & Company, Boston, has purchased the Penacook (N. H.) Electric Light Company, and will use its plant as an auxiliary. The Penacook Company has been a close corporation, and has been conducted profitably for some years. By means of the larger generating facilities of the Concord plant, the energy supply will be more economical than by the operation of the small local plant.

BOSTON, MASS.—The Edison Electric Illuminating Company will build a distribution station to cost about $45,000 on its land at 12 Central Avenue, Dorchester. The building will be of concrete and brick, 49 by 109 feet. Whidden, Beekman Company are the contractors, and Bigelow & Wadsworth the architects.

HAVERHILL, MASS.—The City Council has passed an order to extend the whiteway system.

LUDLOW, MASS.—The local electric light company is making a number of plant extensions.

SHELBURNE FALLS, MASS.—The New England Power Company, of this city, has issued $1,000,000 in bonds, the proceeds of which will be used for acquiring a hydroelectric plant on Deerfield River. Plans are being made to combine the properties of this company with those of the Connecticut River Transmission Company.

GLOVERSVILLE, N. Y.—Mayor Baird and the lighting committee of the City Council are making plans for an ornamental lighting system in the business district.

HERKIMER, N. Y.—The Municipal Commission has purchased a 500-kilowatt Kerr turbogenerator for installation in the electric-lighting plant.

LYONS, N. Y.—The Public Service Commission has authorized the Salmon River Power Company, of Orwell, N. Y., to issue $1,097,275 in bonds for the purchase of the Lyons power plant of the Niagara, Lockport & Ontario Power Company, of Buffalo. It is reported that the former company will expend $500,000 in enlarging the building and adding equipment.

NEWARK, N. Y.—Sealed proposals for electric work will be received until May 25 at the New York State Custodial Asylum at Newark, N. Y., by A. W. Beaven, president of the board of managers.

NEW YORK, N. Y.—The Interborough Rapid Transit Company has prepared plans for a $40,000 power house to be erected on Jerome Avenue near Kingsbridge Road. G. H. Pegram is the architect.

NEW YORK, N. Y.—An issue of $8,000,000 in bonds by the New York Connecting Railroad was authorized by the Public Service Commission. The bonds are to be issued at 4.5 per cent and will mature in 1953. The money will be spent for general construction purposes.

PINE BUSH, N. Y.—Fred Fowler, of the Wallhill (N. Y.) Electric Light Company, is planning to extend the company's lines to this community to furnish energy for street lighting.

ROCHESTER, N. Y.—Residents on Bonivard Street are circulating a petition for additional street lighting.

WATERVLIET, N. Y.—The Board of Aldermen has decided against rebuilding the municipal electric-lighting plant, and has entered into a contract with the Adirondack Electric Power Corporation, of Glens Falls, to furnish energy for street lighting and private consumption.

BERRYSBURG, PA.—Application for a charter for the Berrysburg Electric Company to furnish electric service here has been made by B. W. Fees, John Pfeiffer and others, who also have made a similar application for the Gratz Electric Company, at Gratz, Pa.

GREENVILLE, PA.—A syndicate of eastern capitalists has purchased the holdings of the Mercer County Light, Heat & Power Company, of this city.

MAUCH CHUNK, PA.—O. O. Jarrard, superintendent of the Mauch Chunk Heat, Power & Electric Light Company, has closed a contract for lighting the Lehigh Valley Railroad yards. The company also expects to furnish power to the Lehighton Light Company, and a transmission line will be erected between the two plants.

PITTSTON, PA.—The Citizens Illuminating Company has disposed of its holdings to the American Gas & Eelectric Company of New York City, for $875,000. Extensive plant improvements will be made.

FREDERICK, MD.—The Board of Aldermen is preparing to construct a municipal electric-lighting plant, and will reconstruct the street-lighting system according to plans prepared by C. L. Reeder, Park Avenue and Saratoga Street, Baltimore.

NORFOLK, VA.—The installation of cluster lamps on Church Street is being advocated by the Church Street Improvement League.

WARWOOD, W. VA.—The City Council is considering plans for a new electric-lighting system.

CLIFFSIDE, N. C.—R. R. Haynes, Caesar Cone and others have incorporated the Broad River Electric Power Company, of Cliffside, with a capital stock of $500,000.

FREEMONT, N. C.—An election will be held May 23 to vote on the question of issuing $60,000 in bonds for improvements to the electric-lighting plant.

CORDELE, GA.—A resolution calling for a bond election for $75,000 to construct a municipal electric-lighting and power plant and a white way in the business section of the city was passed by the City Council.

HAHIRA, GA.—An election will be held May 24 to vote on the question of issuing $8,500 in bonds for the establishment of a municipal electric-lighting plant.

CLEARWATER, FLA.—The Clearwater Lighting Company will improve its power plant and build an electrically operated ice plant.

COCOANUT GROVE, FLA.—The Cocoanut Grove Public Utilities Company plans to erect an electric-lighting plant here.

TALLAHASSEE, FLA.—An electric line from Tallahassee to Thomasville and other towns in that section is projected by a number of business men. The proposition is being submitted to the business organizations in the towns involved. A. S. Metzner is promoting the project.

TAMPA, FLA.—The Tampa & Eastern Traction Company, F. W. Cole, president, has been incorporated with a capital of $750,000, for the purpose of building an electric railway from Tampa to Lakeland, Fla., via Gary, Mango, Seffner, Dover, Plant City, Youmans and Winston, and also to furnish electrical energy for heat, light and power where desired.

TAMPA, FLA.—The City Council has granted a franchise to the Export Phosphate Railway & Terminal Company for building and operating a traction line. H. L. Pierce, who is in charge, stated that the line will be in operation by January 1, 1917. A provision in the franchise provides for the electrical operation of the line not later than two years from the date of starting operations, and it is hoped to have the entire route electrified soon after that. The American Agricultural Chemical Company, of New York, is financing the deal.

NORTH CENTRAL STATES.

CLEVELAND, O.—The Cleveland Illuminating Company is planning to erect a substation in East Fifty-fifth Street, costing about $35,000.

LOWELLVILLE, O.—The new 20,000-horsepower addition to the Lowellville generating station of the Mahoning & Shenango Railway & Light Company, the operating subsidiary of Republic Railway & Light Company, has been placed in operation. The station now has 40,000 horsepower capacity and the addition was made in record time, work being started in October, 1915.

BRISTOL, IND.—The Bristol Electric Company has been incorporated by H. L. Harkenstein, J. C. Upton and L. H. Upton to furnish electric service here.

GOSHEN, IND.—The Hawks Electric Company, of this city, has purchased the holdings of the Bristol (Ind.) Light & Power Company, and will erect a transmission line connecting the two plants.

MUNCIE, IND.—If the city officials and the Muncie Electric Light Company agree to a contract for city lighting, the company probably will make installation of an extensive system of boulevard lighting. The company is now planning to build a new office building, which will cost approximately $45,000.

JOLIET, ILL.—At a meeting of the Illinois and Michigan Canal Commission and the Illinois Waterway Commission with Governor Dunne at Springfield, arrangements were made to advertise for bids for the lease of the power site at the Joliet dam. The lease now held by the Economy Light & Power Company expires July 17. The specifications call for the development of the power to its fullest extent.

NORMAL, ILL.—Plans are being discussed for the establishment of a municipal electric-lighting plant here.

ADRIAN, MICH.—The Lawrence Gas & Electric Company has announced that it will increase the capacity of its plant nearly 75 per cent by the erection of a new power plant and additions to the gas plant.

DETROIT, MICH.—The Ireland & Matthews Manufacturing Company is planning to build a new factory. A power house will be erected.

JACKSON, MICH.—Following a visit of New York officials of the Commonwealth Power, Railway & Light Company, of this city, it is reported that construction of a dam for a hydroelectric development will be commenced at the junction of the Pine and Manistee Rivers, near Wexford, Mich.

ROCHESTER, MICH.—The City Council is planning the installation of an ornamental lighting system.

SAULT STE. MARIE, MICH.—The Great Lakes Power Company, with a capital of $2,600,000, has been incorporated at Toronto, Ontario, and will take over the electric power plant of the Algoma Steel Corporation here. The company plans to spend $3,000,000 in improvements and extensions to the plant.

DENMARK, WIS.—Following the organization of the Denmark Light & Power Company recently, a contract has been signed with the Wisconsin Public Service Company, of Green Bay, to furnish electrical energy to this city. A 33,000-volt transmission line will be erected from Green Bay to this city and extended to Two Rivers to supply energy for street lighting there.

ST. PAUL, MINN.—Final negotiations will be closed this week whereby the St. Paul & Southern Electric Railway, which proposes to operate between St. Paul and Rochester, will lease the branch line of the Chicago and Northwestern Railway from Zumbrota to Rochester, according to a Rochester report. This stretch of 26 miles will be electrified.

ELDORA, IOWA.—The Iowa Railway & Light Company, of Cedar Rapids, which recently purchased the electric-lighting plants at Manchester, Guthrie Center and other towns, is seeking a franchise in this city. Application has been filed with the City Council.

HUTCHINSON, KANS.—The United Water, Gas & Electric Company is planning a number of plant extensions. A. C. Malloy is vice-president of the company.

MINNEOLA, KANS.—The City Council is planning ways and means for the establishment of a $25,000 electric-lighting plant and waterworks system.

NORTON, KANS.—Black & Veatch, engineers, 507 Interstate Building, Kansas City, Mo., have prepared estimates for a municipal electric-lighting plant and waterworks system.

SALINA, KANS.—City Engineer Paul Wakenhut is preparing preliminary plans

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for improvements to be made during the summer to the municipal electric-lighting plant.

STELLA, NEB.—Superintendent John Brenner, of the local electric-lighting plant, is planning to make extensions and improvements to the plant.

SUTHERLAND, NEB.—A special election has been called for June 6, at which time the taxpayers will decide as to whether or not they desire to bond the village in the sum of $9,000 for the construction of an electric-lighting plant.

WILSONVILLE, NEB.—Bonds in the sum of $6,500 have been issued for the construction of a municipal lighting plant.

SOUTH CENTRAL STATES.

BOWLING GREEN, KY.—The Kentucky Public Service Company has spent $75,000 for new buildings and machinery, having among other improvements installed a refrigerating plant.

COVINGTON, KY.—Extension of its transmission system for a distance of five miles is proposed by the Fort Covington Light, Heat & Power Company, to furnish service in the town of Bombay.

FRANKFORT, KY.—Construction and equipment of two power houses are projected by the Shelbyville & Frankfort Realty Company, E. H. Taylor, Jr., president, in connection with a proposed electric railway.

LEXINGTON, KY.—The Bluegrass Lumber Company, which will construct a new plant, will equip to operate electrically and will use central-station power.

LEXINGTON, KY.—The Kentucky Traction & Terminal Company is planning to add a new 500-horsepower boiler to its power plant and make other improvements estimated to cost $40,000.

LEXINGTON, KY.—The Lexington Roller Mills is considering replacing the steam power plant at the mills with electric drive, to operate on central-station power. Joseph LeCompt is president.

MIDDLESBORO, KY.—The Puckett Creek Coal Company will rebuild its $10,000 electric power plant which recently burned.

MIDDLESBORO, KY.—The Climax Coal Company and the Crystal Coal Company, two of the largest coal-mining concerns in Bell County, have announced that they will immediately wire their employees' homes for electric light and that they will supply the current for this service as well as for street lighting.

PEMBROKE, KY.—Franchises to supply electricity to Adairville, Elkton, Auburn, Lewisburg and Frankline, Ky., and to Cedar Hill, Portland and Adams, Tenn., have been obtained by the Southern Kentucky Power Company.

FRIENDSHIP, TENN.—W. H. Fisher, manager of the local electric-lighting plant, has announced that he will install larger generators and furnish energy for street lighting and private use.

MANCHESTER, TENN.—The City Council has appointed a committee to invest gate the cost of purchasing a power site at Little Falls and making a hydroelectric development for furnishing electric light and power to the city.

MEMPHIS, TENN.—An isolated electric power plant will be constructed by the Kelly Handle Company, of Charleston, W. Va., which will erect a new $100,000 handle factory here, replacing the present plant.

MURFREESBORO, TENN.—The Murfreesboro Light & Power Company, B. B. Beasley, manager, will enlarge its plant and furnish the city with energy for street lighting.

NEW TAZEWELL, TENN.—W. B. Carr has been elected president and Joe Cameron manager of a company organized with $15,000 capital to construct an electric lighting and power plant in connection with a flour mill and water works.

SHELBYVILLE, TENN.—The Public Light & Power Company, S. E. Stern, chief engineer, will build its projected dam across the Duck River for a hydroelectric power development.

TCHULA, MISS.—The City Council will receive bids until June 6 for the construction of an electric-lighting system estimated to cost $4,600.

MANDEVILLE, LA.—It is reported that a trolley line will be built from this city to Madisonville and Hammond, about 25 miles.

WINNSBORO, LA.—The Carl Shipp Electric Light & Power Company is planning to install 50-horsepower and 25-horsepower engine-driven generators.

BALD KNOB, ARK.—The Town Council has granted a 50-year franchise to T. J. Campbell and J. L. Richardson of this place for the erection and operation of an electric-lighting plant.

FORT SMITH, ARK.—The city has employed the Phillips Engineering Company, of St. Louis, to prepare plans for an electric-lighting plant and to supervise the awarding of contracts.

LITTLE ROCK, ARK.—The lighting committee of the City Council is considering the installation of a flood-lighting system for the exterior of the city hall similar to that at the state capitol.

LITTLE ROCK, ARK.—The Little Rock Railway & Electric Company has submitted to the Board of Aldermen a proposition to relinquish its lighting contract in the ninth ward, provided the city releases the company from the payment of the $500 annual franchise tax of the Merchants Lighting Company, which the Little Rock company has taken over. The franchise of the former company called for this payment for a term of 27 years. If the proposition is accepted the city will install new street lamps in the ninth ward, which it will light from its own plant.

MALVERN, ARK.—The Arkansas Light & Power Company is planning to rebuild its transmission system here.

WARREN, ARK.—The City Council granted a franchise to L. J. Burbridge to establish an electric light and power plant. It is provided that light shall be furnished to all municipal property at a price not to exceed 7.5 cents per kilowatt-hour and to residents at a rate not greater than 10 cents. A company will be organized and a plant erected.

ALLEN, OKLA.—Bonds have been voted for the establishment of a municipal electric-lighting plant.

MOORELAND, OKLA.—A bond issue amounting to $10,000 has been voted for the purpose of installing an electric-lighting system. Energy will be secured from the power plant of the Woodward Cotton Company and this city will pay for the erection of a transmission line to Woodward.

CUERO, TEX.—The Texas Southern Electric Company plans to install new equipment in its electric power station here at a cost of about $10,000.

DALLAS, TEX.—The City Commission has granted an extension of six months' time allowed the Dallas Northwestern and the Dallas Southwestern Traction companies to begin work on their interurban lines which are to enter Dallas.

DALLAS, TEX.—The Stone & Webster Engineering Corporation, of Boston, Mass., has filed notice with Mayor Henry D. Lindsley that it will contest the validity of the $500,000 bonds that were recently voted for the purpose of constructing a municipal electric-lighting plant.

FRANKLIN, TEX.—The City Council will soon begin the construction of a municipal electric-lighting plant.

FREEPORT, TEX.—At a meeting of directors of the Freeport Sulphur Company in New York City it was decided to install a fourth unit in the power plant at the mines here. This plant will be a duplicate of plant No. 3, now nearing completion, and will furnish 13,000-horsepower, bringing the total horsepower of the plants here up to 36,000, one of the largest steam power-plant developments in Texas. Westinghouse Church Kerr & Company will supervise the construction of the new plant.

HUMBLE, TEX.—The Humble Power & Ice Company has been incorporated with a capital stock of $30,000 by F. A. Peters, C. L. Gossett and W. J. Peters. A new power plant and ice factory will be erected.

TAYLOR, TEX.—The Texas Power & Light Company, of Dallas, will extend the electric-lighting system here.

WESTERN STATES.

GLASGOW, MONT.—The installation of new Deisel engines in the city generating plant to replace steam power has been completed by the lighting department. The new equipment comprises a four-engine combination, with 280 horsepower capacity. The steam equipment had a capacity of 205 horsepower. A cheaper rate for energy has been provided by the city as a result of the recent improvement.

GREAT FALLS, MONT.—According to recent reports, the Park Board has under contemplation the installation of ornamental lights in both Margaret and Gibson Parks. A committee has been appointed to investigate the cost of the installation.

HELENA, MONT.—According to reports, the Council is favorably considering the petitions of residents in both the second and fourth wards for the creation of lighting districts.

STERLING, COLO.—The Sterling Consolidated Electric Company has disposed of its holdings to the Colorado Power Company, of Denver. The power plant will be operated as a separate unit from the present system of the Colorado Power Comany, but plans probably will be made to make it the nucleus of a large generating system.

MIAMI, ARIZ.—The I. A. Van Dyke Light & Power Company is preparing to install a new and larger unit.

WILLIAMS, ARIZ.—The Williams Water & Electric Company has been granted until June 15 in which to install the new lighting system as per its contract of February 21.

LAS CRUCES, N. M.—The council of the Elephant Butte Water Users' Association has approved a contract with the government which will give the association the right to construct the proposed Leasburg hydroelectric plant.

SPRINGVILLE, UTAH.—The Utah Power & Light Company has commenced the construction of 130 miles of transmission line from this city to the coal mining districts in Carbon County, at an estimated expense of $250,000. This line will supply the United States Fuel properties with energy for power and lighting.

COEUR D'ALENE, IDAHO.—The Taxpayers' League has appointed a committee to confer with the City Council regarding the proposed bond issue for municipal light and water plants.

NORTH YAKIMA, WASH.—The Pacific Power & Light Company will expend about $260,000 in eastern Washington this summer in improvements to its plants and lines in this section. Approximately $75,000 will be spent in the construction of a concrete substation in this city.

OROVILLE, WASH.—The Okanogan Power Company has acquired the holdings of the Similakameen Power Company, and plans are under way for the extension of the system. A line is being built to the town of Mansfield and a movement is on foot at Withrew to have the lines extended to that district.

REPUBLIC, WASH.—The Laurier Mining Company has applied for a franchise to construct light and power lines on the public roads of Ferry County.

SEATTLE, WASH.—Officials of the Superior-Portland Cement Company, which maintains offices in the Northern Bank Building, Seattle, report an additional unit is to be added to its power plant at Concrete, Wash. Plans for the electrical installation are being prepared by Robert Howes, electrical engineer, American Bank Building, Seattle. The installation will be made this summer. Later, the company

DATES AHEAD.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 15-16. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Rochester*, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

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plans dismantling the present steam plant, and substituting electrical equipment. Approximately $30,000 will be spent in installing the additional unit.

OREGON CITY, ORE.—The contract for furnishing electrical equipment to be installed in the proposed addition to the Hawley Pulp & Paper Company's manufacturing establishment in Oregon City has been awarded by Rasmussen-Grace Company, engineers, Eates Building, Portland, to the General Electric Company. The balance of the equipment to be installed, including racks, gates, turbines, etc., will be furnished by Edward G. Gordon, hydraulic engineer, of Portland. The Rasmussen-Grace Company is the designer and constructor of the proposed power plant, which will cost when completed approximately $200,000.

SEASIDE, ORE.—J. E. Davidson, general manager of the Pacific Power & Light Company, of Portland, which recently acquired the plant of the Seaside Electric Company, reports his company will expend $30,000 in improving and establishing better service connections.

SILVERTON, ORE.—The proposition to issue bonds for the construction of an electric-lighting plant was defeated at a recent election.

FULLERTON, CAL.—Plans are under way for the installation of an ornamental lighting system on Sadpra and Commonwealth Avenues.

LOS ANGELES, CAL.—The Board of Public Service Commission will receive bids up to May 23 for incandescent lamps.

LOS ANGELES, CAL.—A petition has been presented to the City Council asking for ornamental lights on Washington Street, between Main and Vermont Avenues.

LOS ANGELES, CAL.—The City Council has decided by unanimous vote to reject the power companies' offer to buy all of the city's aqueduct power for $750,000 per annum. Chief Electric Engineer Scattergood said if the city accepted the companies offer it would stand to lose $8,000,000 in five years.

NOVATO, CAL.—Application has been made to the supervisors of Sonoma County by the Pacific Utilities Company for a 25-year franchise, to serve the township of Novato with electric light, power, water and telephones.

OAKDALE, CAL.—The Oakdale Irrigation District is now considering the establishment of a large power plant in the mountains in connection with its storage system. The South San Joaquin District has withdrawn from the joint agreement with the Oakdale District on mountain reservoirs.

REDONDO, CAL.—Proceedings have been started for the installation of ornamental lamp posts in the business district.

RIVERSIDE, CAL.—The Tungsten Mines Company has entered into a contract with the Southern Sierra Power Company to supply power for the operation of its mines and mills near Bishop.

SAN FRANCISCO, CAL.—A two-story brick substation is to be erected on North Bush Street for the City Electric Company at a cost of $90,000.

SAN FRANCISCO, CAL.—Negotiations are under way for an extension of the municipal railway line north in Baker Street, from Greenwich to the bay shore. The new extension would cover the route of the old Harbor View line, which was removed before the exposition. The cost is estimated at $50,000.

VALDEZ, ALASKA.—According to reports, the Inter Mountain Traction & Power Company submitted the low bid to the authorities at Fort Liscum for supplying electrical energy, etc., for light and power for a period of ten years.

Proposals

ELECTRICAL SUPPLIES—Sealed bids will be received at the office of the Board of Trustees, Brooklyn, Ind., until June 2 for furnishing supplies for the construction of an electric-lighting and power system for the town of Brooklyn, according to plans and specifications on file in the office of the Board and in the office of A. Schlesinger, engineer, 212 Traction Terminal Building, Indianapolis, Ind.

CONDUIT, WIRING, AND LIGHTING FIXTURES.—Sealed proposals will be opened in the Supervising Architect's office, Washington, D. C., at 3 p. m., May 31, for extension of conduit and wiring and gas piping systems and lighting fixtures in the United States postoffice and courthouse at Peoria, Ill., in accordance with drawings and specification, copies of which may be had at that office or at the office of the custodian, Peoria, Ill., in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

HYDROELECTRIC PLANT.—Sealed proposals will be received until May 24 for constructing a hydroelectric plant in Fort Dodge, Iowa. Separate bids will be received for furnishing material, labor and equipment and constructing a dam, power house and appurtenances, to be accompanied by a certified check for $5,000. Seperate bids will be received for furnishing and installing a hydraulic turbine, generator and accessories, to be accompanied by certified check for $2,000. W. L. Tang, City Clerk.

ELECTRIC-LIGHTING PLANT IMPROVEMENTS.—Sealed bids will be received May 26 for the construction of additions and improvements to the electric light plant in Jackson, Minn. The work is divided into two parts, as follows: Part 1. Brick and tile building. Part 2. Electrical equipment, consisting of furnishing and erecting one fire-tube boiler, set in battery with an old boiler; one concrete chimney; one 150-kilovolt-ampere engine-generator unit; additions to switchboard; piping connections; constant-current transformers for street lighting; furnishing and erecting one 150-gallon motor-driven waterworks pump, including piping connections. Bids will be received only on complete parts. S. W. Bruce, Village Recorder.

New Incorporations

CLEVELAND, O.—Lakewood Electric Company. Capital, $10,000. Incorporators: E. A. Scherer, G. C. Davis and others.

HARTFORD, CONN.—W. E. House Electric Company. Capital, $7,100. Incorporators: W. E. House, E. M. Young and others.

ROCHESTER, N. Y.—Brown & Pierce Company. Capital, $10,000. Manufacture electrical household appliances, etc. Incorporators: V. S. Pierce, C. J. Oster and W. J. Eaton.

DOVER, DEL.—Pittsburgh District Electric Company. Capital, $1,000,000. Own and operate public utilities of all kinds. Incorporators: H. E. Latter, N. P. Coffin and C. M. Egner.

ERIE, PA.—Garner Magno-Electro Research Company. Capital, $5,000. Protect patents on machine designed to generate heat and power. Incorporators: W. R. Garner and others.

WILMINGTON, DEL.—Keystone Manufacturing & Electric Company. Capital, $100,000. Electricians, machinists and consulting engineers. Incorporators: A. J. Sherman, K. M. Dougherty and Ferris Giles.

MILWAUKEE, WIS.—Bureau of Sign Engineering. Capital, $10,000. Manufacture parts of and complete electric signs and electric advertising novelties. Incorporators: J. B. Lindl, Joseph Lindl and W. O. Meilahn.

BOSTON, MASS.—Buttner Electric Company. Capital, $5,000. Places of business in Worcester and Providence. Incorporators: A. A. Buttner and R. M. Buttner, Providence; A. F. Coghlin and A. W. Wilson, Worcester.

WILMINGTON, DEL.—Equitable Gas, Electric Light & Power Company. Capital, $5,000. Operate a plant for the production and distribution of electricity and gas. Incorporators: W. F. O'Keefe, G. G. Steigler and E. E. Wright.

Financial Notes

American Telephone & Telegraph Company has applied to the Utilities Commission of Ohio for permission to purchase $3,000,000 par value of stock of the Cleveland Telephone Company.

The Schenectady Illuminating Company has received authority from the Public Service Commission to issue $886,000 of common stock for the refunding of its notes and other indebtedness.

Cities Service Company has called for redemption at 102 and interest any time between June 12 and July 12, interest ceasing on the latter date, the $7,000,000 five-year seven-per-cent notes maturing May 15, 1918.

General Gas & Electric Company has asked for tenders until May 29 of sufficient [illegible]-per-cent 10-year bonds, due January 1, 1925, to exhaust $313,047 now available for retirement of these bonds to be paid for July 1.

Ohio State Telephone will offer rights to its stockholders to subscribe to a part of the $1,900,000 preferred and $1,150,000 common stock of Indianapolis Telephone Company, the latter being a consolidation of the independent telephone companies of Indiana, formerly under control of J. P. Morgan & Company.

Dayton Power & Light Company has sold to Charles D. Barney & Company and Drexel & Company, New York City, $1,250,000 first and refunding-mortgage five-per-cent bonds, due 1941. It is understood that all the bonds have been resold at 96.5. The proceeds will be used to increase the generating capacity of the company by 35,000 horsepower.

The directors of the Philadelphia Company have decided to give holders of the five-per-cent preferred stock further opportunity to exchange their stock for the six-per-cent cumulative preferred stock of the company. This exchange, share for share, may be made upon payment by the holders, of the sum of $3 per share, subject to the adjustment of the dividends as of date of deposit of the five-per-cent preferred stock. Deposits of stock will be received only at the office of C. J. Braun, Jr., treasurer of the company, 435 Sixth Avenue, Pittsburgh, from and after May 15 to and including July 15, 1916.

Dividends.

	Term	Rate	Payable
Cent. Miss. Val. Elec., pf.	Q	$1.50	June 1
Cities Service, pf.	M	0.5 %	June 1
Citizens Trac., Pittsb'gh.	S	3 %	May 15
Norfolk Ry. & Lt.	—	3 %	June 1
Pacific Ltg.	Q	2 %	May 15
Pacific Ltg., pf.	Q	1.25%	May 15
Phila. Elec.	Q	1.75%	June 15
Western Lt. & Pw., pf.	—	1 %	June 1

Reports of Earnings.

UTAH SECURITIES CORPORATION.

Combined earnings of subsidiaries.

	1916	1915
April gross	$ 442,056	$ 376,470
Net after taxes	244,695	205,113
Six months' gross	2,635,692	2,258,177
Net after taxes	1,471,082	1,143,896
12 months' gross	5,080,311	4,586,699
Net after taxes	2,754,631	2,258,221

CUMBERLAND COUNTY POWER & LIGHT.

	1916	1915
April gross	$ 211,944	$ 186,786
Net after taxes	77,150	74,965
Surplus after charges	10,863	4,562
Twelve months' gross	2,717,239	2,543,812
Net after taxes	1,125,575	1,106,327
Surplus after charges	327,320	343,367
Balance after dividends	189,320	205,367

CLOSING BID PRICES FOR ELECTRICAL SECURITIES IN THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 15	May 8
American Tel. & Tel. (New York)	128⅛	128
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	234	240
Electric Storage Battery, common (Philadelphia)	60	59
Electric Storage Battery, preferred (Philadelphia)	60	59
General Electric (New York)	167½	163½
Kings County Electric (New York)	129	129
Massachusetts Electric, common (Boston)	6	6¼
Massachusetts Electric, preferred stamped (Boston)	32¾	32¾
National Carbon, common (Chicago)	170	172
National Carbon, preferred (Chicago)	—	—
New England Telephone (Boston)	132½	132
Philadelphia Electric (Philadelphia)	27¾	27¼
Postal Telegraph and Cables, common (New York)	83¾	78¾
Postal Telegraph and Cables, preferred (New York)	67⅛	66
Western Union (New York)	95¼	90½
Westinghouse, common (New York)	62⅝	60¾
Westinghouse, preferred (New York)	73	70

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Increase in operating expenses for the month and for 12 months is due to the fact that the company is now charging into operating costs $6,250 a month for depreciation, and larger sums also are being set aside for maintenance.

UNITED LIGHT & RAILWAYS.

United Light & Railways Company reported for year ending March 31, 1916, as follows:

Combined earnings of subsidiary companies:

	1916	1915
Gross earnings	$6,502,664	$6,163,866
Net after taxes	2,589,222	2,386,247
Surplus after charges and preferred dividends	1,195,208	1,055,506

Earnings of United Light & Railways Company from subsidiary properties and other sources:

	1916	1915
Gross income	$1,742,512	$1,538,655
Net after expenses	1,608,588	1,420,660
Bond interest	364,700	350,679
Other interest and discounts	170,756	125,271
Preferred dividends	573,276	526,077
Surplus	*499,855	418,632

*Equivalent to 7.24 per cent on the common stock as compared with 6.06 per cent in the preceding year.

WISCONSIN-MINNESOTA LIGHT & POWER.

Wisconsin-Minnesota Light & Power Company, controlled by American Public Utilities Company, reported as follows for the year ended March 31, 1916:

	1916	1915
Gross earnings	$1,190,131	$1,049,808
Expenses and taxes	586,419	522,725
Net earnings	603,713	527,083
Bond interest	268,450	.....
Preferred dividends	166,950	.....
Surplus	168,313	.....

HAVANA ELECTRIC RAILWAY, LIGHT & POWER.

	1916	1915
March gross	$ 470,616	$ 472,185
Net after taxes	273,910	276,305
Total income	293,110	284,211
Surplus after charges	162,601	175,606
Three months' gross	1,452,233	1,390,314
Net after taxes	891,476	829,015
Total income	924,973	852,384
Surplus after charges	559,996	526,601

PORTLAND RAILWAY, LIGHT & POWER.

Portland Railway, Light & Power Company reports for fiscal year ended December 31, 1915:

	1915	1914
Gross earnings	$5,511,345	$6,273,171
Net earnings	2,969,067	3,577,815
Taxes	531,351	568,527
Bridge rentals	47,752	45,198
Interest charges	2,160,603	2,127,480
Surplus	229,361	836,610

MONONGAHELA VALLEY TRACTION.

	1916	1915
April gross	$124,203	$73,372
Net after taxes	73,178	42,643
Surplus after charges	40,561	16,895
Four months gross	495,831	284,333
Net after taxes	297,573	154,985
Surplus after charges	170,452	52,079

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20,948. ELECTRICAL SUPPLIES.—A firm in South Africa informs an American consular officer that it desires to purchase electrical supplies from the United States.

NO. 20,961. ELECTRICAL SUPPLIES.—An American consular officer in Russia writes that a man in his district desires to represent American manufacturers of electrical supplies. Correspondence may be in English.

NO. 21,008. ELECTRICAL APPLIANCES, ETC.—An American consular officer in France writes that a man in his district desires to represent, on a commission basis, American exporters of graphite crucibles and electrical appliances.

NO. 21,009. MICA.—The commercial attache of the Department of Commerce in Chile reports that a man in that country desires to communicate with American importers of sheet mica.

NO. 21,015. MAGNETOS.—An engineering firm in Norway informs an American consular officer that it desires to be placed in touch with American manufacturers of high-tension magnetos. It is stated that cash will be paid against documents in New York. Correspondence may be in English.

NO. 21,017. COPPER WIRE, METERS, ETC.—A firm of instrument makers in Spain informs the commercial attache of the Department of Commerce in France that it desires to import copper wire, electrical meters, thermometers, barometers, opera glasses, field glasses, etc., from the United States. A list of the requirements of this firm may be obtained on application to the bureau or its district offices.

NO. 21,029.—ELECTRICAL SUPPLIES.—An American consular officer in China reports that a municipality in his district has an unexpended balance of $800,000 appropriated for extensive improvements in its electrical department. A pamphlet relating to this opportunity may be examined at the Bureau or its district offices. (Refer to file No. 74980.)

NO. 21,161. ELECTRICAL SUPPLIES.—An American consular officer in Canada writes that a firm in his district desires to communicate with American manufacturers of electric irons and toasters, flexible looms, lamp sockets, and similar lighting specialties.

New Publications

INDUSTRIAL ARTS INDEX.—The H. W. Wilson Company, White Plains, N. Y., has issued the third volume of this publication, which is an index of the important articles pertaining to the industrial arts and appearing during 1915 in 80 of the leading engineering and trade periodicals and association proceedings. The index is printed in small type and in its 509 pages of bibliography there is much of an electrical nature.

ELECTRICAL DIRECTORY.—The 1916 edition of "The Universal Electrical Directory," published by H. Alabaster, Gatehouse & Company, London, has come to hand. This edition, the thirty-fifth, has been thoroughly revised, and contains a total of 35-640 names. The four geographical divisions are each sub-divided into alphabetical and classified sections, and the British division has also a geographical section. The price of the directory is $7.50, duty and carriage free.

Electrical Patents Issued May 9, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,181,985. Receiver for Printing-Telegraph Systems. C. G. Ashley and E. T. Byshe, assignors to General Engineering & Construction Co., Toronto, Ontario, Canada. Special structure of type faces.

1,181,988. Ship. E. N. Breitung, Marquette, Mich. Propeller operated by combination of wind wheel, engine, motor and storage battery.

1,181,993. Railway-Traffic-Controlling Apparatus. C. J. Coleman, assignor to Hall Switch & Signal Co., New York, N. Y. Train-operated signal system with electrically continuous track rails.

1,181,996. Magneto-Electric Generator. R. H. Cunningham, assignor to Splitdorf Electrical Co., Newark, N. Y. Armature core and field poles shaped to produce current impulses at longer and shorter intervals.

1,182,000. Thermostatic Controller. B. V. Edwards, assignor to Edwards Engineering & Mfg. Co., New York, N. Y. Details of thermally operated circuit-closer.

1,182,003. Signaling by Electromagnetic Waves. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Apparatus for generating high-frequency oscillations.

1,182,020. Electric Contact Device. G. L. Lang, assignor to Splitdorf Electrical Co., Newark, N. J. Details of interrupter.

1,182,029. Railway Telephone and Signal System. G. E. Neel, assignor of 26/100 to T. A. Russell and 26/100 to E. N. Kirby, Abilene, Tex., and 20/100 to O. Clapp, North Roby, Tex. Details of system having station telephone and train-carried telephone connected through ground and contact shoe.

1,182,062. Arrow-Light for Automobiles. W. Von Otto, Cincinnati, O. Details of mechanism of electromagnetically operated and electrically lighted direction-indicating arrow.

1,182,080. Electric Switching Mechanism. E. M. Fitz, Columbus, O. Details of device having solenoids, reciprocating plunger and actuating contact disks by rack and pinion.

1,182,087. Electric Switch. G. H. Hart, West Hartford, Conn. Push-button, tubular, cord-connecting switch.

1,182,088. Combined Lighting and Ignition Switch. G. W. Hart, assignor to Hart Mfg. Co., Hartford, Conn. Two sets of contacts and operating handles with lock.

1,182,090. Spark-Plug Tester. A. P. Jackson, assignor of one-half to L. A. Siegfried, Denver, Colo. Details of mounting of plugs in compressed-air cylinder.

1,182,091. Railway Signal Apparatus. J. E. Johnson, Anderson, Ind. Switch for signal circuits on car operated by track device or operator on car.

1,182,092. Lubricating Device. J. B. Kirby, Cleveland, O. For vertical or oblique motor shafts.

1,182,096. Electrolytic Battery. H. S. MacKay, assignor to MacKay Process Co., Norwich, Conn. Mounting of plates in precipitation battery.

1,182,097. Circuit-Interrupter. J. M. Mahoney and H. G. MacDonald, assignors to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Operating mechanism for double-throw oil-switch.

1,182,099. Electrical Measuring Instrument. W. G. Mylius, assignor to Westinghouse Electric & Mfg. Co. Continuously rotating armature shaft by adjustable cam releases spring mechanism under predetermined conditions.

1,182,100. Crossing Signal. C. P. Nachod, assignor to Nachod Signal Co., New York, N. Y. Signal set by vehicle-controlled switches on each side of crossing and restored by switch at crossing.

1,182,127. Automatic Fire-Extinguisher. F. A. Wolfe, Sioux Falls, S. D. Thermo-electrically controlled acid bottle in reservoir.

1,182,133. Time Controlling and Recording Mechanism. A. O. Benecke, assignor to Crosby Steam Gauge & Valve Co., Boston, Mass. Valve control by perforated record chart.

1,182,138. Telephone-Receiver Head-Piece. J. O. Bradley, New York, N. Y. Adapted to hang as ordinary receiver on hook.

1,182,152. Railway-Crossing Signal. R. E. Driscoll, Omaha, Neb., assignor of two-fifths to C. L. Ruffcorn, and one-fifth to A. Costanzo, Omaha, Neb. Magnet controlled pendulum.

1,182,157. Apparatus for Transmitting Synchronous Movements by Rotating Magnetic Fields. R. Federico and L. Segalin, Turin, Italy. Current transmitted from sectional battery through rotary distributer.

1,182,173. Silver Cleaner. J. B. Hoen, assignor to Frank A. Rolling Co., Philadelphia, Pa. Electrolytic cleaning of silverware.

1,182,176. Refillable Fuse. O. H. Jung, Milwaukee, Wis. Has removable side sections and removal of link.

1,182,179. Perforator for Forming Telegraphic Tape. C. L. Krum and H. L. Krum, assignors to Morkrum Co., Chicago, Ill. Electromagnetically and selectively operated, key-controled punches.

1,182,191. Support for Insulators. J. W. Malloy and J. Gilman, Sioux Falls, S. D. Spring-pressed insulator pin; movable longitudinally. (See cut, next page.)

1,182,202. Voltaic Cell and Battery. F. R. Parker, Chicago, Ill. Superposed cells mechanically and electrically connected by screw terminals on tops and bottoms.

1,182,205. Combined Alarm and Signal for Wet-Pipe Sprinkler Systems. C. E. Porter, St. Louis, Mo. Circuit-controlling clockwork controlled by fluid-pressure diaphragm.

1,182,206. Combined Alarm and Signal for Dry Pipe Sprinkler Systems. C. E. Potter. Modification of above.

1,182,216. Means for Converting Motion. R. A. Schoenberg, assignor to I. S. Rosenheim, New York, N. Y. Two-push-button snap-switch.

1,182,228. Multiple-Control System for Brakes. A. Sundh, assignor to Otis Elevator Co., Jersey City, N. J. Electromagnetic control for varying in synchronium

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power of applying or holding applied brakes on cars of a train.

1,182,230. Electric Regulator with Short-Circuiting Device. W. A. Turbayne, assignor to U. S. Light & Heat Corporation, Niagara Falls, N. Y. Main carbon-pile resistance shunted by auxiliary pile with air gap.

1,182,231. Automatic Electric Regulator. W. A. Turbayne, assignor to United States Light & Heat Corporation. Application of above to field of generator of car-lighting system.

1,182,234. Automatic Switch Mechanism. C. W. Wheeler, assignor to Otis Elevator Co., Jersey City, N. J. Rheostat magnet and reversing switches of elevator control interlocked.

1,182,241. Automatic Potential-Regulator. E. H. Bendel, Oakland, Cal. Connecting in of battery end cells responsive to voltage.

1,182,245. Master-Machine for Controlling Hydraulic Elevators. J. E. Boyce, assignor to Otis Elevator Co., Jersey City, N. J. Change valve for plunger elevator electromagnetically clutched to motor and electro-responsively operated independent of car movement.

1,182,257. Storage Battery. F. Engel, assignor to U. S. Light & Heat Corporation, Niagara Falls, N. Y. Support for plates.

1,182,265. Electric Switch and Switch-Operating Means. E. L. Gale, assignor to Otis Elevator Co., Jersey City, N. J. Motor-operated starting switch for induction motors.

1,182,271. Process of Making Radiators. H. E. Hersh, Allentown, Pa. Metal joining adjacent tubes is electrolytically deposited.

1,182,283. Elevator-Gate Contact Device. W. D. Lutz, assignor to Otis Eleavtor Co., Jersey City, N. J. Details of lever contact-device operated by door.

1,182,290 and 1,182,291. Rectifier and the Method of Operating the Same. G. S. Meikle, assignor to General Electric Co., Schenectady, N. Y. First patent: Mercury vapor device. Second patent: Structure and vapor pressure of mercury vapor device.

1,182,300. Transmission of Electrical Impulses. G. Musso, New York, N. Y. Transmits discharges of different characteristics and opposite polarities.

1,182,301. Telegraphy. G. Musso, New York, N. Y. Modification of above.

1,182,302. Transmission of Electrical Impulses Over Circuits of High Electrostatic Capacity. G. Musso, Vado, Italy. Telephone circuit.

1,182,312. Spark-Plug. E. Raber, Baltic, O. Has plurality of superposed sparking points on casing coacting with central electrode.

1,182,316. Sewage-Disposal Means. J. W. Roche, Hornell, N. Y., assignor of one-fourth to J. G. Kelley, and one-half to C. A. Hager, Perryburg, N. Y. Device has arrangement of metallic and carbon slats setting up electrolytic action.

1,182,329. Magnetically Operated Device. H. F. Stratton and H. R. Canfield, assignors to Electric Controller & Mfg. Co., Cleveland, O. Alternating-current electromagnet.

1,182,351. Electric-Light Fixture. W. B. Cochrane, Chicago, Ill. Details of fixture support and anchoring element.

1,182,363. Selector Switch. O. F. Forsberg, assignor to Western Electric Co., New York, N. Y. Automatic; for telephone systems.

1,182,380. Fire-Extinguisher. J. M. Johnson, assignor to United States Automatic Fire Alarm Co., Kansas City, Mo. Electromagnetically controlled acid bottle.

1,182,381. Electrical Signaling Device. P. Kaplan, New York, N. Y. Train signal lamps having circuits coupled through train.

1,182,399. Automatic Switch. M. Mintz, assignor to Gearless Automatic Pump Co., Rock Island, Ill. Structural details of mercury contact device.

1,182,419. Spark-Plug. C. M. Pearsall, Ridgewood, N. J. Device for securing conductor to plug.

1,182,434. Electric Heater and Toaster. C. Truitt, Pomona, Cal. Structure of deflector plate and grid.

1,182,438. Lock for Electric Switches. M. T. Whitesell, E. B. Hysell and F. Osborn, Broad Ripple, Ind. For switch for connecting separately energized terminals with each other or ground terminal.

1,182,512. Trolley Wheel. A. Tassi, San Francisco, Cal. Lubricating provisions.

1,182,513. Battery. H. G. C. Thofehrn, assignor to J. M. Flannery, Pittsburgh, Pa. Storage battery has active material including radio-active substance.

1,182,538. Line-Connecting Device. A. H. Dyson, assignor to Western Electric Co. For telephone systems; switch having plurality of rows of multiply connected contacts.

1,182,539. Alarm Device. T. N. Eatman, Hairston, Ala. Float-controlled switch.

1,182,542. Motorcycle. L. R. Evans, assignor to Cyclemotor Corporation, Rochester, N. Y. Mounting and drive for magneto.

1,182,546. Passenger-Car Construction. L. E. Fischer, St. Louis, Mo., and G. W. Burton, Peoria, Ill. Brakes cannot be released while door is open.

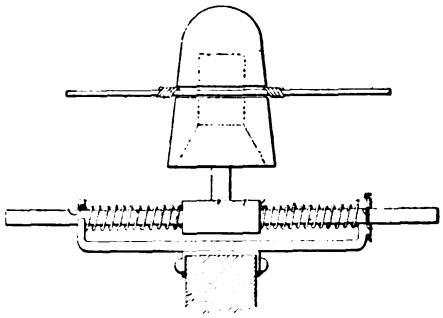
1,182,589. Clutch. C. F. Schnuck, assignor to Farrel Foundry & Machine Co., Ansonia, Conn. Has electromagnetically operated friction coil.

1,182,591. Machine for Covering Wire. W. F. Smith, assignor to Western Electric Co. Details of power-transmission system.

1,182,636. Educational Appliance. E. Ellisworth Burns, Berwyn, Ill. Special structure of coil and core of magnetic device.

1,182,656. Signal. H. C. Dolan, Detroit, Mich. Electromagnetic automobile traffic signal.

1,182,685. Current-Rectifier System. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Inductive device associated with mercury-vapor rectifier.



No. 1,182,191.—Support for Insulators.

1,182,688. Electric Radiator. J. B. Kirby, Cleveland, O. Has electrically heated vapor generator.

1,182,706. Support for Telephones or the Like. C. C. Priest, El Paso, Tex. Adjustable bracket.

1,182,709. Gas Regulator for X-Ray Tubes. C. G. Roch, Paris, France. Capable of working in any position.

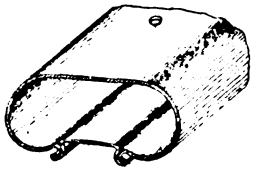
1,182,714. Carbureter. B. H. Schmidt, Minneapolis, Minn. Has an electric heater.

1,182,726. Telephone Call-Signal. J. J. Wetmore, Syracuse, N. Y. Structure of electric bell.

1,182,729. Electric Switch. C. E. Anderson, assignor to the Bryant Electric Co., Bridgeport, Conn. Details of rotary switch.

1,182,744. Telephone Attachment. C. E. Booker, Suffolk, Va., assignor of one-third to A. C. Volper, Suffolk, Va. Receiver hook, held elevated with receiver thereon and device restored when receiver is removed.

1,182,759. Battery and Generator. P. A. Emanuel, Aiken, S. C. Hydrogen and oxygen under pressure respectively supplied to hollow electrodes.



No. 1,182,783.—Electric-Conduit Molding.

1,182,783. Electric-Conduit Molding. O. K. Mitchell, Chicago, Ill. Details of metal structure. (See cut.)

1,182,798. Electromechanical Safety Device. A. P. Sanborn and Roy C. Wilson, Ossining, N. Y., assignors of one-third to H. R. Horton, Haymount, N. Y. Automatic block signaling system.

1,182,817. Outlet-Box Fitting. G. B. Thomas, assignor to the Bryant Electric Co., Bridgeport, Conn. Manner of securing insulating base in box.

1,182,818. Method of Calibrating Electric Current Meters. V. H. Todd, assignor of one-half to W. F. Mehring, Allentown, Pa. For meters having permanent magnet and a movable coil under its influence.

1,182,821. System for Autovehicles. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Power system composing engine, motor and generator.

1,182,833. Signal Box. W. H. Brockway, assignor to Gamewell Fire Alarm Telegraph Co., New York, N. Y. Has special structure of testing device; for fire alarm circuits.

1,182,843. Signaling. R. A. Fessenden, assignor to Submarine Signal Co., Waterville, Me. Method of determining course of a ship.

1,182,848. Device for Cooling Armatures of Dynamoelectrical Machines. E. C. Ketchum and D. H. Andrews, Newton Center, Mass. Structural details.

1,182,849. Automatic Telegraphy. J. W. Larish, assignor to R. H. Sellers Co., New York, N. Y. Structure of brush and rotatable contact member.

1,182,867. Igniter Mechanism. E. C. Wilcox, assignor to the Connecticut Telephone & Electric Co., Meriden, Conn. Interrupter structure.

1,182,868. Block-Signal Apparatus. F. C. Williams, Philadelphia, Pa., assignor to the Safety Block Signal Co. Signal and stopping system.

Reissue 14,131. Speed-Changing, Reversing and Braking Gearing. E. Halma, assignor to Menco Elma Syndicate, London, England. Electromagnetically operated mechanism.

PATENTS EXPIRED.

The following United States electrical patents expired on May 16, 1916:

624,904. Electrical Switch Apparatus. W. F. Bossert, Utica, N. Y.

624,914. Trolley. E. Duty, Jr., Cleveland, O.

624,971. Electric Motor-Starting Switch. E. H. Porter, Fort Wayne, Ind.

624,986. Continuous-Current Shunt Machine. A. Sengel, Darmstadt, Germany.

624,993. Electric Meter. H. O. Swoboda, New York, N. Y.

625,014. Apparatus for Electrically Igniting Miners' Safety Lamps. W. Best, Morley, England.

625,015. Battery Solution. H. Blumenberg, Jr., New York, N. Y.

625,049. Illuminating Advertising and Decorative Apparatus. T. P. Martin, Liverpool, England.

625,060. Apparatus for Controlling Movements of Electric Elevator Cars. G. Rennerfelt, New York, N. Y.

625,080. Apparatus for Cleaning Hulls of Vessels. J. S. Zerbe, New York, N. Y.

625,098. Electrical Distribution by Storage Batteries. J. B. Entz, Philadelphia, Pa.

625,099. Electrical Distribution by Storage Batteries. J. B. Entz, Philadelphia, Pa.

625,100. System of Electrical Distribution. J. B. Entz, Philadelphia, Pa.

625,133. Flashlight Apparatus. S. D. Alter and L. T. Young, Philadelphia, Pa.

625,142. Telephone Receiver. P. C. Burns, Chicago, Ill.

625,151. Controller for Electric Motors. H. P. Davis, Pittsburgh, and G. Wright, Wilkinsburg, Pa.

625,168. Electric Railway. R. M. Hunter, Philadelphia, Pa.

625,172. Apparatus for Manufacturing Material Having Insulating Properties. F. Lamplough, London, England.

625,183. Electric Arc Lamp. P. Mersch, Paris, France.

625,202. Commutator. J. Risbridger, North East, Pa.

625,204. Process of and Apparatus for Tanning Hides or Skins. P. G. Salom, Philadelphia, Pa.

625,219. Electric Switch. C. Truitt, St. Louis.

625,223. Electric-Railway System. L. E. Walkins, Springfield, Mass.

625,232. Non-Arcing Controller for Electric Motors. A. J. Wurtz, Pittsburgh, Pa.

625,246. Self-Starter for Electric Motors. H. H. Cutler, Chicago, Ill.

625,247. Telephone Repeater. W. M. Davis, Chicago, Ill.

625,252. Electrical Furnace. H. Eldridge, D. J. Clark and S. Blum, Galveston, Tex.

625,255. Process of Producing Watermarks in or on Manufactured Paper. T. A. Goodchild and A. C. T. Bond, London, England.

625,264. Electric Hand Fuse for Gas Burners. F. Hoffmann and W. Ohlsen, Kiel, Germany.

625,281 and 625,282. Electric-Railway System. L. E. Walkins, Springfield, Mass.

625,283. Inverted Third-Rail Electric-Railway System. L. E. Walkins, Springfield, Mass.

625,298. Galvanic Battery. G. W. Frazier, Allegheny, Pa.

625,300. Electric Track and Wheel Brake. G. B. Heath, San Francisco, Cal.

30,785. Motor Frame. H. H. Wait, Chicago, Ill.

30,787. Incandescent Electric-Lamp Shade. J. H. Wright, Columbus, O.

30,792. Guard-Rail for Street-Railway Curves. M. D. Pratt, Steelton, Pa.

30,794. Base and Casing for Portable Telephones, etc. B. Le Vino, New York, N. Y.

30,804 to 30,810. Manhole Cover. T. P. Greger, Philadelphia, Pa.

30,811 and 30,812. Manhole-Cover Plate. T. P. Greger, Philadelphia, Pa.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

FLOOD LIGHTING THE STATUE OF LIBERTY.

At the thirty-ninth convention of the National Electric Light Association, Mr. Henry L. Doherty, president of H. L. Doherty & Company, New York, made a suggestion full of generous and patriotic impulses, which aroused considerable enthusiasm. This suggestion was in the way of an endorsement of the popular subscription being taken up by the New York Daily *World* to electrically illuminate the Statue of Liberty in New York Harbor by flood lighting.

This is an idea which we hope every man in the electrical industry will be pleased to endorse, and in order that we may stimulate confidence in the movement and effect as quickly as possible a response from the electrical industry, we invite our readers to send contributions to this publication in amounts not to exceed $1.00. Announcement of contributions will be made in every issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, and receipts will be dispatched promptly to the contributors. The staff of this publication, comprising its Chicago, New York, Boston and Detroit offices, in amount of $1.00 per person, will start this fund with $65.00. Mr. E. H. Haughton, the enthusiastic and enterprising manager of the Chicago office of the Bryan-Marsh Division of the National Lamp Works of the General Electric Company, has made the second contribution, for his staff, amounting to $40.00.

The flood lighting of the Statue of Liberty in New York Harbor will be the most significant public demonstration of the effectiveness and beauty of electrical illumination that the industry has ever had an opportunity of assisting in.

THE THIRTY-NINTH CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

Attended by the most propitious circumstances insofar as a prosperous condition of the industry, comfortable arrangements, a well arranged program of both technical and entertainment features, and weather were concerned, the thirty-ninth convention of the National Electric Light Association goes down into history as the most successful of any ever held.

Conspicuous among the features of the technical side of the program were the recommendations made by the Committee on Constitution and By-Laws with regard to changes affecting the status of membership in the geographic sections. The aim here is to bring about the greatest possible co-operation upon the part of the local associations, combining the efforts of the smaller organizations and lending to all branches of the industry located in every part of the country the entire strength of the national organization. Another important matter was the presentation of reports upon the part of the Accounting Section, this being the first meeting of the accountants as a recognized section of the National Electric Light Association.

The Commercial Section presented an array of very practical reports and papers, and established a new mark for results achieved. The report of the Committee on Ranges occupied practically all the time of a special session and indicated the growing popularity and widespread interest in this new electrical adjunct.

The report of the Committee on Industrial Heating also attracted a great deal of attention and brought forcibly to the front the rapid strides which are being made in the application of electrical energy for industrial heating on a large and profitable scale.

The technical and hydroelectric sessions were well attended and the discussion which ensued upon the presentation of the papers and reports suggested a considerable increase in the active consideration which is being given to these subjects. The review of federal water-power legislation was particularly notable and will no doubt take its place as a classical index of the real state of affairs in this connection.

The Lighting Sales Bureau presented an important report which should have a far-reaching effect in promoting the greater utilization of both domestic and industrial lighting. There has been evident a disposition to believe that the most profitable effort might be in the direction of increasing the utilization of electrical energy for power requirements, but the great field outlined in the report of the Lighting Sales Bureau gives new impetus to a desire for a greater conquest in illuminating engineering.

The Electrical Vehicle Section made its initial effort in a most successful fashion.

The entertainment features were greatly enjoyed, the Big Frolic on Wednesday evening being participated in by probably more of the delegates and guests than had ever before attended a single function, and the enthusiasm and good will manifested did much to round out this most successful occasion.

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ACCIDENT PREVENTION.

The report of the Committee on Accident Prevention pointed out the great value of and the necessity for accident-prevention work by electric light and power companies, and the apathy which has heretofore existed among a great many of the Association members in regard to this subject. The Committee has worked out a systematic plan for inaugurating work of this kind, and it is hard to see why any company defers action upon a subject which is not only advantageous to itself, but which means so much for the welfare of employees and also has a bearing upon the creation of public good-will.

The Committee presented statistics showing the great value of prevention work. There is no question as to the practicability and effectiveness of a movement of this kind. Many companies have already brought about a reduction of 30 to 50 per cent in the total number of accidents and a still larger reduction in the number of fatal accidents. We have at a previous time called attention in these columns to the fact that the majority of accidents occurring to employees of central-station companies are not of electrical origin, but arise from other causes. The statistics presented in the report substantiate this and indicate that only 8.3 per cent of the total number of accidents are due to electric current. Nevertheless, it is to be noted that the importance of the electrical accidents is far greater than those ordinarily due to other causes. We find that of the total number of fatal accidents reported, 71 per cent were due, at least in part, to electrical causes, and that about the same percentage of the reported accidents resulting in lengthy disability were due to the same cause and occurred among linemen. Putting the case in another way, over 71 per cent of the total expenditures for compensation and for accident costs were due to electric current, and this source of danger is therefore of more importance than the number of accidents arising from it would indicate. Special attention should be given to the elimination of accidents from this source, and continued effort should be made to familiarize employees with approved methods of resuscitation from shock, so that they will be prepared to render assistance promptly when occasion arises. The total time lost from work due to accidents from electric current amounted to more than 75 per cent of the total from all causes and this puts the case perhaps in the fairest and also in the strongest light in making a comparison of causes. If fatal accidents are each counted as causing a loss of 25 years in time, then the average number of days lost due to an electrical accident is 563, which is several times that due to all other causes put together.

It is to be noted also that the greatest number of accidents occur to new employees, the statistics showing that over 40 per cent occur to those who have been in the service for less than one year. This emphasizes the necessity of instructing the newcomers in the dangers to which they are subject and in the methods for avoiding accidents.

PROTECTING TRANSFORMERS FROM LIGHTNING.

One of the most valuable papers presented at the convention was that by Mr. D. W. Roper giving the experience of the Commonwealth Edison Company in the use of lightning arresters to protect transformers from burn-outs. This experience has shown that the greatest protection is secured by mounting the lightning arrester on the same pole with the transformer, and that little or no protection is afforded by arresters mounted on line poles at intervals of 2,000 feet. By mounting arresters on every transformer pole about 90 per cent of the trouble previously experienced has been eliminated.

Protection by this method cannot be secured without some expense. That is to say, the saving in repairs to transformers is not sufficient to pay for the annual charges incurred by equipment which gives the added protection. The installation of the protective equipment is to be justified rather on the score of maintaining continuity of service and of conserving revenue which might be lost through interruptions to consumption. Whether such expense is warranted must be determined by each individual company for itself, but the author points out that expenditures for improvement of service in other ways might often be devoted to the provision of lightning arresters and thus produce greater results.

When it is not considered feasible to provide a lightning arrester for each transformer, it is at least advisable to place existing arresters on transformer poles, and to see that the larger transformers and those supplying service which would suffer most from interruption are supplied with arresters, thus reducing to a minimum the damage and expense which arises from this source.

The investigation of this question not only shows that existing types of lightning arresters are serviceable for this purpose, but it will assist the designer of arresters in perfecting his product. It will also reduce the expense of maintenance to the operating company and result in giving better service to the consumer. The Commonwealth Edison Company is now extending this policy of protection over a greater area, and another year's experience should result in additional valuable data being compiled. The delegates to the convention held Mr. Roper's work in such high regard that he was formally requested to make a further report at the next convention.

RATES.

The report of the Committee on Rate Research, while briefer than usual, contained a number of interesting points. One of the points upon which emphasis was laid was the recognition by various commissions of the necessity of considering the value of service in establishing rate schedules. It is obvious that business cannot be secured at rates higher than the value of the service and this therefore sets a maximum which is dependent, of course, upon the class of service. The

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cost of service, on the other hand, fixes a minimum price which, however, is not very definite since the estimated cost will depend upon the manner in which fixed charges and general expenses are allocated.

Attention was called to a recent case before the New York Public Service Commission for the First District, in which a rate is prescribed which will result in serving a large number of customers at less than cost. The evidence presented showed that the former rate permitted service to at least 20,000 customers at less than cost, and the reduction ordered would necessarily increase this number. The Committee points out the objections to serving any large class of customers under such conditions.

That the United States Supreme Court does not countenance the enforcement of a rate of this kind is indicated in the North Dakota Lignite Coal Case, which was decided over a year ago. North Dakota attempted to compel a railroad to carry a certain class of freight at a specified rate which would return no more than the increment cost of the service. The idea involved was to develop a particular industry at the general expense of the commonwealth, an idea similar to that at the basis of a protective tariff. In the case of the custom tariff, however, the matter is one wholly in the hands of the Government, whereas in fixing rates the interest of the utility company is also involved. While the court indicates that the utility company would not be prohibited from instituting such a rate, it is not within the province of a regulatory body to enforce such a rate.

This case, as well as many others continually coming to our attention, enforces the conviction that every utility company should be conversant with its own costs for each particular class of service, and should be prepared to defend its established rates by establishing indisputably the actual costs of service. It is necessary to know these costs in order to develop a rational rate schedule, and it is also necessary to know them to defend its rate schedule when this is attacked.

THE COST OF POWER.

In spite of the continued increases in the price of coal, and the steady advance of wages and of costs of materials of construction, the prices for electric power from central generating stations show a steady decline. This is due partly to diversity of load and partly to improved efficiency in generation.

The efficiency of the latest steam turbines stands in marked contrast to the best results of former periods. The early turbines utilized about 12 per cent of the energy in the coal, as compared to an average of perhaps 9 per cent in previous engines. With the large units of today, using high pressures and superheat, 17 per cent is being reached. Economy in fuel, combined with much lower fixed charges per kilowatt in large units, is greatly reducing the cost of power at the busbars. If distribution costs could be similarly reduced the results on rates would be striking.

SIDE LIGHTS ON ELECTRIC HEATING.

It is a significant commentary on the value of electric heating that in countless instances it gains its standing and keeps it by enabling some task to be better performed than before. Actual operating expense is often an entirely incidental phase of this class of service. In the case of the electric range, the reduction in shrinkage on meats is so important that the energy cost of such service is a secondary consideration to many owners of such equipment. Throughout an immense gamut of industrial applications one finds manufacturing jobs performed with closer control of heat when the task is done by wire rather than by flame or by inflexible steam coils. These are talking points worth elaborating, for more and more, the discriminating public is turning toward the ideal of service first and cost second.

Take the electric oven which goes into service in a great institution served by an independent power plant. The relation of the oven load to the output curve of the installation deserves careful study by the sales engineer. It is entirely possible that the energy cost of baking service for an institutional population of 1,000, requiring perhaps 75,000 to 100,000 loaves a year, may be almost nominal. The ovens are carried mainly in the valley of the power and lighting load curve; the energy consumed at that time improves the loading and hence raises the production efficiency of the generating units; no additional labor is necessary at the plant, and the quality and certainty of the product are unbeatable.

New applications of electric heat offer a wonderful field for the manufacturer and the central station. One of these is the location of a heater consuming about 1,500 watts inside a pipe organ installed in some of the more pretentious motion-picture establishments. The gentle warmth radiated keeps the organ in tune and the long-hour character of the service renders it most attractive. The investment is small and the attention required is virtually nil. The more one studies the service being rendered by special heating equipment, often of very small size, like the automobile radiator coil, the more one feels the possibilities of carefully developed apparatus for other and at present little known applications.

In the design of electric heating equipment for immediate adaptation to intelligent users' needs a good deal remains to be done. There is food for thought in the problems of kitchen motion study as they affect work at the range. It is a long way from calculations involving watts per square inch to the analysis of woman's work at a range as affected by the necessity for stooping, the relative convenience of other domestic appliances and the ability of apparatus to withstand cruel abuse. The designer will do well to weigh with more care the value of previous experience with old devices in both factory and home, when adapting some new unit or group of units to either service. Much can be learned from the successes of the manufacturer of gas and coal-fired equipment.

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Happenings in the Industry

Medals Awarded to J. J. Carty and Theodore N. Vail for Work in Long-Distance Telephony—Ohio Central-Station Men Hold Transmission Conference—Testimonial and Dinner to B. E. Sunny—Electric Range Campaign Discussed in Chicago—Electricity Rates in Chicago to Be Reduced.

Award of Franklin Institute Medals.

Walton Clark, president, presented the Franklin gold medal to T. W. Richards, of Harvard University, and John J. Carty, chief engineer of the American Telephone & Telegraph Company, at a meeting of the Franklin Institute in Philadelphia on the afternoon of May 17, 1916. The Elliott Cresson medal of the Franklin Institute was presented at the same meeting to the American Telephone & Telegraph Company, Theodore N. Vail, president, receiving it. Dr. Richards was unable to be present through illness. Dr. Carty and Mr. Vail acknowledged the honor conferred in brief and extremely interesting addresses.

The Franklin medal, which was established by Samuel Insull, of Chicago, in the year 1914, was awarded to Dr. Richards in recognition of his important contributions to chemical science. The award to Dr. Carty was in recognition of his long continued activities in the telephone service, his important and varied contributions to the telephone art, his work in the establishment of the principles of telephone engineering, and his signal success in directing the efforts of a large staff of engineers and scientists to the accomplishment of the telephonic transmission of speech over vast distances.

The Elliott Cresson medal was awarded to the telephone company in recognition of its constructive and far-seeing policy in the development of the art of telephony; in the promotion of telephone engineering; in the establishment of its telephone system in every part of the United States, and for placing all of the states of the Union in speaking communication.

The Elliott Cresson medal was provided in 1848, by Elliott Cresson, of Philadelphia, for award "either for some discovery in the arts and sciences, or for some invention or improvement of some useful machine, or for some new process or combination of materials in manufactures, or for ingenuity, skill, or perfection in workmanship."

The committee on science and arts of the Institute, consisting of sixty members, makes the awards.

A demonstration of transcontinental and wireless telephony followed and was listened to by an audience that filled the meeting hall of the old historical building of the Franklin Institute. Many distinguished visitors from scientific circles from Philadelphia and other cities were present. In the evening a banquet was tendered the visiting ladies and gentlemen by President Clark who, with the assistance of Mrs. Clark and R. B. Owens, secretary of the Institute, extended cordial greetings to all present.

Transmission and Distribution Conference at Columbus.

The conference of transmission and distribution men representing the central stations of Ohio, was held at Columbus, O., May 19, 1916, under the auspices of the Transmission and Distribution Committee of the Ohio Electric Light Assocation.

Chairman M. H. Wagner, transmission engineer of the Dayton Power & Light Company, after briefly outlining the functions of such conferences, called for the following papers to be read and discussed:

"How Should Residential Sections Be Served?" This paper, by J. B. Johnson, Elyria, O., dwelt on the advisability of laying out the distribution system with the future in mind, making all the immediate construction a portion of the final construction; also, the neatness of the construction was emphasized in order that the people served would not consider the lines an eyesore and in that way discount the degree of satisfaction obtained in electric service.

"Pole Line Records," by O. W. Jones, Columbus Railway & Light Company, clearly outlined a workable record system complete in every detail. A very interesting discussion followed, at which time the record system of the Dayton Power & Light Company was described. The value of records was convincingly discussed.

"The Use of Poles Jointly," by R. P. Wuichet, of the Dayton Power & Light Company, brought out the need for using poles jointly and gave a description of plans already in use controlling such construction. The subject was treated in a very clear and forceful manner and brought forth a great amount of discussion.

Each conference held by the Transmission and Distribution Committee has aroused greater interest and has proven more conclusively that such conferences should be held more frequently.

Testimonial and Dinner to B. E. Sunny.

A number of friends of Bernard E. Sunny, president of the Chicago Telephone Company, tendered him a dinner commemorating his sixtieth birthday, on Monday evening, May 22, at the Blackstone Hotel, Chicago. There were present about 100 friends of the guest of honor, representing the leading financial, public utility and civic organizations of Chicago, New York and other cities. A beautiful silver panel bearing cordial expressions of good will and the signatures of those present, was presented to Mr. Sunny by Dr. F. W. Gunsaulus, who paid high tribute to the moral worth of Mr. Sunny and the great good he had done in helping and encouraging the employees of the many companies of which he is the active and efficient head. Judge C. S. Cutting presided, and the first speaker after the excellent and elaborate banquet was served was Samuel Insull, president of the Commonwealth Edison Company, Chicago, who briefly reviewed and highly commended the technical and business life of Mr. Sunny. Other speakers were Theodore N. Vail, E. W. Rice, Jr., N. T. Guernsey and H. M. Byllesby, all paying strong and eloquent tribute to the achievements and integrity of the popular chief guest. Mr. Sunny responded with deep feeling in modest and fitting terms.

Among those present from New York and Boston were Theodore N. Vail, president, American Telephone & Telegraph Company; E. W. Rice, president, General Electric Company; Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company; Newcomb Carlton, president, Western Union Telegraph Company; and Thomas D. Lockwood, A. W. Burchard, J. R. Lovejoy, N. T. Guernsey, G. E. Emmons, W. J. Clark and Charles W. Price. Among others from Chicago in attendance, in addition to the speakers, were George M. Reynolds, Frederick W. Upham, J. B. Forgan, L. E. Myers, Martin Insull, L. A. Ferguson, D. R. Forgan, H. H. Kohlsaat, Clifford Arrick, G. B. Atkin, F. W. Cushing, B. J. Arnold, J. F. Gilchrist, Angus S. Hibbard, H. P. Hill, Roy O. West, Charles A. Gaunt, C. G. Dawes, J. V. Farwell, Victor F. Lawson, Theodore Robinson, D. C. Moulton, Joseph H. Defrees and Charles Schweppe.

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Electric Range Campaign Discussed.

A meeting of the representatives of electric range manufacturers and delegates from central stations was held at the Congress Hotel, Chicago, Monday afternoon, May 22. At a previous meeting held some three weeks ago in New York City a committee was formed composed of the following gentlemen, all of whom were present: J. F. Kileen, General Electric Company, Pittsfield, Mass.; H. P. G. Norstrand, Rathbone, Sard & Company, Albany, N. Y.; H. A. Lewis, Hotpoint Electric Heating Company, Chicago, Ill.; R. B. Wooley, Standard Electric Stove Company, Toledo, O.; W. R. Putnam, Utah Power & Light Company, Salt Lake City, Utah; J. C. McLaughlin, Potomac Electric Power Company, Washington, D. C.; Hartwell Jalonick, Texas Power & Light Company, Dallas, Tex.; George Weiderman, Brooklyn, N. Y.; F. M. Feiker, *Electrical World*, New York; Charles W. Price, (New York) ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, Chicago; E. A. Edkins, Commonwealth Edison Company, Chicago; J. D. Israel, Philadelphia Electric Company, Philadelphia, Pa.; Frank Rae, Jr., *Electrical Merchandise*, New York; M. C. McMicken, Portland Railway & Light Company, Portland, Ore.; R. L. Lloyd, Philadelphia Electric Company, Philadelphia, Pa.

J. M. Wakeman, general manager of the Society for Electrical Development, was elected chairman of the meeting, and discussion followed at some length as to the best method of organizing an electric range educational campaign and co-operating with the central stations. It was finally agreed that the matter of advertising be left to each individual manufacturer, with the suggestion that a good deal of educational propaganda respecting the use of electric ranges should be presented. It was further agreed that the Society for Electrical Development publish a booklet covering the electric range question in an independent way, presenting in full arguments in favor of the use of this modern utensil, the booklet to embrace the many good points of standard ranges. A committee to plan and carry out this matter was appointed, to consist of F. D. Pembleton, chairman; H. W. Alexander, F. E. Griffiths and Earl E. Whitehorne, the committee to have authority to add to its membership.

The Society for Electrical Development was also requested to prepare and issue in co-operation with the Commercial Section of the National Electric Light Association, a booklet to aid the central-station salesman in selling ranges. The meeting was considered a very successful one in advancing the interests of this comparatively new and growingly popular product. The discussion was participated in by R. B. Wooley, H. P. G. Norstrand, Hartwell Jalonick, W. R. Putnam, J. F. Kileen, George A. Hughes, F. D. Pembleton, H. A. Lewis, J. D. Israel, W. G. Stetson, J. C. McLaughlin and others.

Rates for Electrical Energy to be Reduced in Chicago.

The Commonwealth Edison Company, of Chicago, Ill., filed with the State Public Utilities Commission on May 18 a new schedule of rates for electric service in Chicago. If the commission concurs in the placing of the schedule into effect an estimated annual saving for the people of Chicago of nearly $1,000,000 will be made.

The rate reductions proposed for the different classes of service are as follows. The primary rate for general or retail service will be 9 cents (net) per kilowatt-hour for the first 30 hours' use per month of the maximum demand in the month, instead of 10 cents (net). For the next 30 hours' use of the maximum demand the rate remains the same, being 5 cents (net), and for all energy in excess of the equivalent of 60 hours' use of the maximum demand the rate remains at 3 cents.

The demand charge for large light and power or wholesale service (alternating current) will be reduced from $2.40 to $2.00 per month per kilowatt for the first 50 kilowatts of the maximum demand in the month, and all in excess at $2.00 per month; that is, the demand charge will become $2.00 per month per kilowatt. The energy charge, in addition to the demand charge, will be 3 cents per kilowatt-hour for the first 5,000 kilowatt-hours used per month, instead of 5 cents for the first 1,000 and 3 cents for the next 4,000 kilowatt-hours used per month. The remaining steps in the rate will remain the same, being 1.1 cents for the next 25,000, 0.9 cent for the next 70,000 and 0.65 cent per kilowatt-hour for the excess consumption over 100,000 kilowatt-hours per month. A minimum charge on a monthly basis is made $50 (25 kilowatts at $2.00 per kilowatt). On the yearly basis the minimum charge remains at $400 (200 kilowatts at $2.00 per kilowatt).

The demand charge for large light and power service (direct current) will be reduced from $2.60 to $2.20 per month per kilowatt for the first 50 kilowatts of the maximum demand in the month, and all in excess at $2.20 per month; that is, the demand charge will become $2.20 per month per kilowatt. The energy charges, in addition to the demand charge, will be similar to those for alternating current for the same class of service. A minimum charge for direct current on a monthly basis is made $55 (25 kilowatts at $2.20 per kilowatt). On the yearly basis the minimum charge remains at $450 (200 kilowatts at $2.25 per kilowatt).

These reductions are to be made voluntarily by the Commonwealth Edison Company, as the present city ordinance on the subject gives the company authority to charge 10 cents (net) as the primary rate for general service. They are in accord with the company's policy of voluntary reduction in rates as fast as rates can be reduced with safety from an economic point of view. Improvements in electrical art, utilizing the principle of monopoly of producing and distributing electrical energy (which permits the company to utilize diversities of demand), and increase in the density of population, enable the company to reduce its cost and hence the price to the public.

To give a concrete example of what the reduction means it may be noted that in October, 1915, the average rate paid by 141,620 customers of the company living in apartments was 7.52 cents a kilowatt-hour, the average bill to this class of customers being $1.73. With primary rate 9 cents, instead of the present 10 cents, the average rate would have been 6.98 cents a kilowatt-hour and the average bill $1.60. The minimum monthly bill will hereafter be 50 cents.

On March 1, 1916, a reduction was made in the cost of tungsten incandescent electric lamps (for renewal) and in street-post, electric-sign and other similar forms of flat-rate lighting. The proposed primary-rate reduction from 10 cents (net) to 9 cents (net), as provided in the schedule filed May 18, is to take effect July 1, 1916.

Municipal Plant Granted Permission to Extend Lines to Neighboring Town.

The Massachusetts Gas and Electric Light Commission has authorized the town of Middleboro to extend electric lines into Lakeville. This is the first instance of the Commission's authority being sought for permission to allow a municipal plant to build in another town. The law recognizes that such extensions may be made, and leaves to the Board merely the expediency of each separate undertaking. The question in this case is whether the extension is apt to jeopardize the interests of Middleboro taxpayers or consumers. The town and its lighting board being agreed as to the desirability of extending the service, which promises a good return on a comparatively small investment, the Commission would hardly be justified in withholding permission, it says. Energy will be bought from the Plymouth Electric Light Company by the Middleboro lighting department after July 1.

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Report of the N. E. L. A. Convention

A Brief Account of the Discussion at the 23 Sessions of the Meeting Which Is Said to Have Been the Most Successful in the History of the Association

The first general session of the thirty-ninth convention of the National Electric Light Association made an enthusiastic start last Tuesday when William Hale Thompson, mayor of Chicago, welcomed the delegates to the city. Mr. Thompson injected into the atmosphere some considerable suggestion and philosophy with regard to the national political situation, and of particular interest to the central-station men present was his tribute of respect to the efficiency and honesty of the management of the Commonwealth Edison Company of Chicago. He emphasized especially the recent reduction in rates which the company had voluntarily made, and which would effect a saving of over a million dollars annually to the electric light users of the city.

E. W. Lloyd, president of the Association, in his annual address called attention to the fact that this was the eighth time that the Association had held its convention in Chicago since the first meeting held here on February 25, 1885. He sketched rapidly the progress of the industry in metallurgy and chemistry, electric heating, transportation, electric lighting, motor applications, and commented particularly upon the stability today of electrical securities of many descriptions. Of course the growth of the Association, with particular reference to the work of the various sections and including the consolidation of the Electric Vehicle Association, were each commented upon in turn. He pointed out that if in response to a resolution to be offered by the Committee on Constitution and By-Laws, there were provided changes which will permit geographical sections to meet together with other associations at their annual conventions, there would be a reduction in the number of meetings that many members are called upon to attend, thus conserving both time and money. He also recommended that the president and one of the vice-presidents should be required to visit the annual conventions of the geographic sections yearly. Another suggestion was that the Association be provided with a committee on relations with other associations to consider matters of mutual interest, and he suggested that this committee be a sub-committee of the Public Policy Committee.

He reviewed the work of the Public Policy Committee and suggested an enlargement of the Association staff to include experts who could compile data, attend hearings and do much of the work for different committees and members. He called attention to the resolution which had been suggested that the Association appoint a committee to consider and bring about a standardization of an agreement among all of the elements of the industry with respect to the terminology of the business.

He offered for serious consideration the suggestion of changing the name of the Association so as to more clearly define the extent and scope of the operations covered by the membership.

The report of the Committee on the Organization of the Industry was presented by the assistant secretary, Mr. Sewall, in behalf of George Williams, chairman. As a result of the work of the committee for the year there have been added 120 Class A members: 3,579 Class B members; 19 Class C members; 27 Class D members; 93 Class E members, and 14 foreign members. Adding these to the 1,139 Electric Vehicle Association members makes almost 5,000 new members for the year, and the total at this time is 14,983, or an increase of over 1,500.

Mr. Sewall presented the report of the Question Box, and then the report of the secretary and the report of the Committee on Progress were presented by T. Commerford Martin, secretary of the Association.

J. F. Gilchrist presented the report of the Committee on Relations with Educational Institutions. This report naturally led up to the introduction of E. W. Weeks, who presented a suggestion regarding the Professor Elihu Thomson scholarship. He proposed that the Association authorize and instruct the secretary to take steps to establish by popular subscription a fund to be known as the Professor Elihu Thomson scholarship fund, the interest on which shall be annually awarded to some meritorious student or students of applied electricity in any American college or universities of good standing. The matter was referred to a committee to report to the Executive Committee.

The report of the Committee on Company Sections was presented by F. J. Arnold.

First Technical and Hydroelectric Session

The first technical session was called to order by Vice-President H. A. Wagner on Tuesday afternoon. The chairman of the section, Holton H. Scott, made an address in which he referred to the organization of the Technical and Hydro-Electric Section following the recommendation made at last year's convention. He outlined the work of the section and referred to the appointment of three new committees this year. He said that it would be the future policy, when reports were presented involving rules of practice, to defer adoption of such rules for one year and that if adopted it should be as recommended practice and not as mandatory rules.

C. G. Durfee then presented the report of the Committee on Meters. This was discussed by F. V. Magalhaes, C. H. Ingalls and C. W. Ward. The latter stated that apparatus was being developed to test current transformers without removing them to the laboratory or test room and not requiring an experienced man to manipulate it. Mr. Ingalls said that when testing meters with storage batteries, metal rheostats could often be used to advantage where fine gradations of current were not necessary, and this would sometimes permit the use of a single cell of battery instead of two cells.

The chairman then read a resolution which had been adopted by the Executive Committee, requiring that no reports be adopted by the sections except for reference to the Executive Committee of the Association which will take final action.

E. R. Weeks then read a paper entitled "Notes on Humane Method of Taking Animal Life." This paper pointed out that electrocution was painful and advocated the use of anesthetics for the purpose of killing animals. He quoted letters from Edison, Elihu Thomson, Steinmetz, Kennelly, Mailloux and Sprague supporting his attitude in this matter. He also had statements from various professors and from employees of the Kansas City Company to the same effect.

Assistant Secretary S. A. Sewall then presented the report of the Committee on Electrical Measurements, Values and Terminology. Holton H. Scott stated that many objections had been raised to the recommendation for rating lamps in lumenes on account of existing street-lighting con-

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tracts. M. G. Lloyd objected to the recommendation for transmitting the proposed list of terms to other societies on the ground that they did not represent the recognized practice of engineering societies and technical publications, and would lead to less rather than greater uniformity. A move of this kind should be taken up by a joint committee of different societies and it was not desirable that the Association should attempt to institute a code of this kind on its own responsibility. In view of these objections the report was received but not adopted.

D. W. Roper then presented his paper entitled "Lightning Protection for Transformers on 4,000-Volt Distributing Circuits." L. L. Elden, of Boston, gave estimated figures for artificial grounds on a circuit of 5,000 volts in territory where it was difficult to obtain good grounds. It was estimated that it would cost $200,000 to protect transformers worth $700,000, so that the expense of protection would amount to more than one-quarter of the value of the apparatus protected.

E. E. F. Creighton and M. O. Troy praised the work of the author and pointed out that it would result in the consumer getting better service, the saving of expense to the operating company, and the improvement in the design of arresters. Mr. Troy made a motion that Mr. Roper be requested to continue his investigation over the more extended area which is now being protected and this motion was passed.

Philip Torchio, of New York, pointed out that the grounding of alternating-current circuits did not do any damage to underground structures, as shown in a recent paper presented before the American Institute of Electrical Engineers by McCollum and Ahlborn. In reply to a question as to whether the conclusions of this paper were applicable to circuits of 2,200 volts, Mr. Roper stated that the transformers used are rated at 2,200 volts and are connected between the neutral and one outside wire of a three-phase system.

After appointment of a Nominating Committee consisting of Messrs. Junkersfeld, Berger, Davis, Torchio and Durfee, the session adjourned.

First Commercial Session

The first commercial session was called to order by President E. W. Lloyd, who introduced Chairman Joseph F. Becker, of New York City. The report of the Committee on Finance was presented by E. A. Edkins, of Chicago, and the report of the Committee on Membership was presented by H. N. McConnell, of New York City.

The report of the Committee on Publications was presented by R. R. Young, of Newark, N. J. In the discussion, L. D. Gibbs, of Boston, Mass., stated that the committee was burdened with work and suggested that the committee prepare only the copy for the different publications and turn it over to a publishing house for the detail work in connection with printing and for handling the sales of the publications. Too much haste was evidenced in the preparation of the booklets. A follow-up campaign on a single line of work each year was suggested, reference being made to this method in presenting the booklet on industrial lighting when it is issued. J. D. Israel, of Philadelphia, made a few remarks commending the work of the committee. W. H. Rogers, of Paterson, N. J., stated that the handbook should essentially answer questions that would be asked by prospective customers. R. S. Hale, of Boston, Mass., approved the plan of turning the detail work over to a publishing concern. F. D. Pembleton, of Newark, N. J., spoke in favor of the plan to employ a representative to have charge of the Commercial Section publications, their preparation and sale, and other incidental work. M. S. Seelman, Jr., of Brooklyn, N. Y., also favored this plan and that of having printers, rather than central-station men, do the publication work.

M. S. Seelman Jr., presented the report of the Committee on Salesman's Handbook, and supplemented the report by stating the value of the book, and expressing the hope that its use would become great. G. H. Stickney, of Harrison, N. J., also commented on the great value of the Handbook to salesmen.

R. S. Hale, of Boston, Mass., presented the report of the Committee on Wiring. S. M. Wilson, of Chicago, stated an increasing cost of wiring was a handicap. The rules were too severe, making installations too expensive and tending to prohibit the use of electricity. He spoke of the many wiring alterations in large office buildings necessitating large expense to keep wiring within Code requirements, and suggested that the committee take up the question of relief with the National Association of Building Managers. T. I. Jones, of Brooklyn, spoke of the need for a universal type of attachment plug, and also stated that the best way to prove the utility of concentric wiring was by trial installations.

W. H. Blood, Jr., of Boston, Mass., gave a statement of the present situation regarding concentric wiring, giving a brief history of its use. He stated a sub-committee had prepared rules for the manufacture and installation of this type of wire and fittings. However, these rules are tentative, and there was no desire to enforce them, being merely offered as a basis to work upon. R. S. Hale, in answer to questions on the anticipated reduction to be gained by use of concentric wiring, stated that average figures could not be given since the cost depended on the type of building in which the installation was to be made. He cited a number of installations in Boston that had come to his attention and gave the percentage cost reductions over conduit and knob-and-tube wiring.

W. G. Stetson, of Boston, Mass., presented the report of the Committee on Merchandising and Recent Developments in Electrical Appliances. C. I. Jones, of Brooklyn, N. Y., spoke of the results of special sales of a certain appliance each month during the year, citing as an indication of the success of this sales method the placing of 325 electric vibrators in one month. J. D. Israel, of Philadelphia, spoke of his company's success with the same sales plan, adding that special terms were given on appliances sold at the monthly sales, and that the same device was not sold in the same month during successive years, particular attention being given to making the sales seasonable. F. D. Pembleton laid stress on the need for central stations to adopt the most modern sales methods. J. V. Guilfoyle, of New York City, stated the necessity of maintaining sold appliances as energy-consuming devices, and outlined the results of a repair and inspection department formed by his company that found in one district 1,545 appliances, 1,100 of which were idle, and which were repaired and placed back in service. He thought salesmen were guilty of belittling the sale of appliances. G. E. Miller, of Cleveland, O., stated an inventory of household appliances in his city showed 7.5 per cent idle. H. Harris, of Pittsburgh, Pa., said central stations cannot use department-store methods of merchandising because their field was limited, though financial loss in electric shops should not be excused. F. D. Pembleton told of the successful sales methods of a New York City store, L. D. Gibbs thought central stations would never make a distinct success of selling appliances because they are involved in public service. W. G. Stetson closed the discussion, taking exception to Mr. Gibbs' statement, and recommending the most modern methods of sales efforts.

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First Accounting Session

The first meeting of the Accounting Section, which was held on Tuesday morning, considered principally the discussion of classification of accounts. Special reference was made to the differences existing between the National Association classifications and the classifications of various public utility commissions.

Chairman H. M. Edwards in his annual address pointed out to the accountants the responsibilities which they must realize in becoming a recognized section of the National Electric Light Association.

The Executive Committee reported through Frederick Schmitt, chairman, that representation in the National Association of Railway Commissioners would give an opportunity for looking into the marked advantages of a standard and universally recognized system of accounts.

A resolution was adopted providing that a copy of the standard classification of accounts prepared by the Accounting Section and approved by the Executive Committee of the National Electric Light Association be furnished to the secretary of each state or geographic section affiliated with the National Electric Light Association, and the members of each state or geographic section urged to adopt the standard classification as the official classification for other representative associations.

The chairman of the Membership Committee, E. J. Allegaert, announced that the organization now included 995 Class B and Class E members.

The chairman of the Committee on Classification of Accounts, William Schmidt, Jr., stated that it had been deemed advisable not to make any change in the classification of accounts. A conference has been held between the Accounting Committee of the Pennsylvania Electrical Association and the Committee on the Uniform Classification of Accounts, to take up a number of questions which have been raised in connection with the uniform classification that had been prepared by the Accounting Committee of the Pennsylvania Association.

A resolution was adopted recommending that all public service commissions and other regulatory bodies having supervision of the accounts of public service companies, standardize as far as practicable their accounting schedules and form of annual report required from utilities.

Second Commercial Session

The second commercial session opened on Wednesday morning with the presentation of the report of the Committee on Education of Salesmen, submitted by F. R. Jenkins, Chicago, chairman. Only about 150 companies were represented in the correspondence course offered by the committee; there are 1,082 subscribers to this course. About 35 per cent of these are not now connected with commercial departments of central stations, but are trying to become acquainted with the requirements for commercial work. A recommendation was made to the next year's committee that it undertake a course on the fundamentals of electricity and magnetism to be given to men without technical training.

The discussion was opened by H. H. Newman, Passaic, N. J., who emphasized the importance of the committee's work and expected that a larger enrollment would have resulted if it had been possible to start it a little earlier, since many men are still taking other correspondence courses. C. F. Harding, Purdue University, Lafayette, Ind., said technical educators usually contend that theoretical training must come before the practical; however, the reverse process has in many cases produced men who made much greater progress in utility work. The men who succeed in correspondence courses are usually those who have great determination. Theory and practice must be combined for this work, regardless of the order in which they are taken up. There is now a call for a third qualification, namely, executive ability in order to fit men for executive duties in utility companies. Such men must be well grounded in the theory and practice also.

Douglass Burnett, Baltimore, Md., urged that more active interest be taken in the correspondence course of the committee. In Baltimore many men had been taking other correspondence courses and a large part of them were lapsing. The central-station company therefore began active co-operative backing of the committee's course and the results have been very satisfactory. It is necessary to have the men pay for their courses in order that they shall appreciate their value. It is desirable to keep track of the work of the men and to encourage them. C. S. Walton, Los Angeles, Cal., said that the company there pays one-half of the cost of the course. The work has disclosed many very capable men among the employees of the company, who probably would not have been discovered until they enrolled in this course. The report was also discussed by A. H. Randel, New York City, W. H. Rogers, Paterson, N. J., J. S. Jenks, Connellsville, Pa., Mr. Jenkins closed the discussion by explaining some details of the system followed. He regretted to note that many executives have not looked into the importance of undertaking up this work. An excellent plan is one of having the men meet in classes.

The report of the Lamp Committee was presented by Frank W. Smith, New York City, chairman. He spoke of the very interesting development work now under way for producing gas-filled lamps for motion-picture use, which will be of special value on alternating-current circuits. Discussion of the report was opened by J. W. Howell, chief engineer, Edison Lamp Works, Harrison, N. J., who spoke of the improvement made in vacuum type Mazda lamps to secure greater uniformity of product. The possibilities of the gas-filled lamps are now better than those of the vacuum lamps. During the past year about 25,000,000 miniature lamps were sold and the present rate of their production is about 40,000,000 a year. Mr. Howell spoke strongly in favor of the lumen rating for lamps and also in favor of standardization of voltages. Experience has shown that the increase of lamp efficiency has resulted in increasing light used in place of reducing the expenditure for lighting.

J. W. Lieb, New York City, referred to the elimination of carbon and gem lamps and urged that this be hastened in order to help the manufacturers to reduce the number of types made and therefore to reduce the manufacturing cost. He referred to the great importance of screening high-power lamps in order to reduce their brilliancy. He strongly urged general adoption of the 50-watt vacuum tungsten lamp as the standard central-station product. The possibility of developing gas-filled lamps of less than 75 watts was also pointed out.

S. E. Doane, Cleveland, O., spoke on the standardization of lamp voltages, reviewing this movement which was started by the Ohio Electric Light Association. The last report made by its committee recommends standardization of 110, 115 and 120 volts. It was found that about 75 per cent of Ohio central stations now use these voltages and there is only one plant in the state which uses

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less than 110 volts. There is no reason why all central stations cannot use these three standard voltages. Such standardization can be brought about more easily than the standardization of Edison base sockets which was effected many years ago.

Douglass Burnett said that the voltages of lamps have now been narrowed down so that about 90 per cent of those manufactured range between 110 and 120 volts. Four voltages (110, 112, 115 and 120) are now the most common and it is easy to reduce these to the three voltages recommended. Lamps are supplied at 31 voltages between 100 and 130 volts. If these three voltages would be too rigid, it might be desirable to at least use these three values plus or minus two volts each as the standard rated voltages.

P. S. Millar, New York City, explained that the lumen rating is greatly superior to the old horizontal candle-power rating. The object of it is to secure a true measure of the total light produced by the lamp. The unit is entirely practical, and no longer in the experimental stage. S. W. Borden, Summit, N. J., described briefly the coupon plan used by his company in connection with lamp renewals.

Norman Macbeth, New York City, stated that the report of the committee concerns itself more with lighting and less with lamps, which was encouraging. He spoke in favor of using small lamps in out-of-the-way places and also for ornamental purposes. He also spoke very emphatically for giving immediate attention to means for reducing glare from high-power sources.

R. D. Donaldson, Philadelphia, Pa., said he did not believe that small lamps should be barred out as would be done by making the new 50-watt tungsten lamp the standard. C. H. Ingalls, Boston, Mass., submitted a discussion on the desirability of changing the rating to the lumen basis and the need for conducting educational work along this line. M. O. DellPlain, Syracuse, N. Y., spoke strongly against continuing free lamp renewals. Central stations should devote themselves to lighting and not to lamps. S. B. Burrows, Newark, also discussed the subject.

Electric Range Meeting

The fact that electric cooking is one of the vital present-day central-station topics was convincingly evidenced by an enthusiastic electric-range meeting which was held in the ball room of the Auditorium Hotel on Wednesday afternoon. The advance interest manifested in the report of the Electric Range Committee made it seem desirable to the officers of the Commercial Section to provide for a special meeting at which this report could be fully discussed. The wisdom of their action is indicated from the fact that over 200 attended the meeting which lasted from 2:30 to after 5:00 p. m.

The report of the committee was presented by W. R. Putnam, of Salt Lake City, and is abstracted on other pages of this issue. Supplementing the report Mr. Putnam quoted from a report of a cooking analysis recently made by the Utah Agricultural College. Under the auspices of this institution an investigation of electric cooking was made in a town of 8,000 population where about 42 electric ranges were installed. The average kilowatt-hour consumption per month was found to be 74.5 and the average price of the range installed $90. A majority of the customers considered electric cooking cheaper than coal. Mr. Putnam added that while electric cooking offers almost unlimited possibilities, it is his belief that the business will never exceed 10 per cent of the gross earnings of the central station.

An animated discussion was held following the presentation of this report in which various phases of the subject were discussed. H. W. Alexander, of New York, gave a resume of the meeting which was held under the auspices of the Society for Electrical Development at which the question of general publicity for electric cooking was considered by manufacturers, central stations and others. Mr. Alexander described the literature which it is intended to publish to aid in promoting the business. Collective national advertising on the part of the manufacturers does not at this time seem feasible, he said.

A. W. Childs, of Los Angeles, thought that an effort should be made on the part of central stations to agree on one or two types of ranges that can be made standard, and thus have a tendency to reduce the cost of manufacture. He suggested a three-burner type of range with a bake oven and warming oven. He also thought it desirable to have the range equipped with a plug so that it would be possible to attach any lamp-socket device to the same circuit. He brought out the point that installation expense had to be carried by the central station and he thought the central station was the natural headquarters of the development of the electric-range business. In regard to water heating, Mr. Childs thought this is a problem that will be solved shortly as the expected high demand of electric ranges, because of the good diversity-factor of the business, has not occurred.

R. J. Patterson, of Waterville, Me., also recommended that a receptacle be added to the range so that the socket appliances used for cooking could be conveniently used in the kitchen. He thought, however, that this was a matter to be taken care of in wiring for the range rather than in its manufacture. He described his experiences with electric water heaters and thought that the question is not so much the efficiency of the unit as the efficiency in applying the heater to the water.

L. D. Gibbs, of Boston, outlined the methods of advertising ranges employed by the Edison Electric Illuminating Company of Boston. His experience has been that the Saturday evening and Sunday papers give the best results for this class of advertising as these are the issues read in the homes. He also thought better results could be obtained by using the real estate columns and advertising apartments and homes that are equipped for electric cooking. Much co-operative work is done in Boston between real estate dealers and the company. He stated further that street-car advertising of electric ranges gives the public the impression that they are in the same class with other popular commodities and are no longer an expensive luxury.

C. E. Michel, of St. Louis, explained that in order to gain the co-operation of the local dealers and contractors the Union Electric Light & Power Company has agreed to absorb an amount up to $15, of the cost of any range installation made by them. This plan resulted in much activity being displayed in promoting the use of electric cooking.

W. G. Stetson, of Boston, stated that he did not believe electric water heaters were at present successful because of the high cost of using them. He thought that the electrical industry can learn much from the gas companies in the matter of selling ranges and many of the same selling ideas can be employed.

E. J. Condon, of Angola, Ind., criticized the activities of range manufacturers towards forcing lower rates in communities by advertising rates in neighboring towns, usually served by a municipal plant.

Others who discussed the report were S. W. Borden, of Summit, N. J., R. B. Snyder, Milwaukee, Geo. A. Hughes, Chicago, C. S. Walton, Los Angeles, and Hartwell Jalonick.

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Second Accounting Session

The second accounting session was opened by the presentation of the report of the Committee on Form of Annual Report, which was read by G. M. Moore, New York City. Discussion was opened by L. M. Wallace, Boston. He said that the Massachusetts Commission now has a very simple report and it is desirable for all commissions to use forms nearly as simple. J. C. Van Duyne, New York City, thought that a great mass of information required to be reported on is but very seldom used. E. C. Scobell, Rochester, N. Y., said efforts are being made to get the Public Service Commission and the State Tax Commission to agree on a single form of report instead of the duplication now required. Chairman H. M. Edwards said that member companies have nothing to hide and are ready to furnish any information called for by the commissions. However, he has found that as a rule when the reports are published they no longer have value and their elaborate preparation is expensive and burdensome. Simplification is evidently needed and the Association will co-operate with commissions in trying to bring it about. Others who discussed the subject were F. L. Hall, Providence, R. I., and E. J. Fowler, Chicago.

The report of the Committee on Customers' Reports was presented by E. J. Fowler, Chicago. Replying to H. B. Vincent, Philadelphia, regarding photograph of meter dial readings, J. M. Hogan, Buffalo, N. Y., said this method is used for taking records of demand meter readings, because these are turned back each month. Good results are obtained. It is not necessary to use this method for regular meter readings since any single error will rectify itself next month. H. C. Schlegal, New York City, said that this camera for photostat system is excellent for demand meters and special meter tests where it is necessary to have a positive record, but its general use for all meter reading is not warranted. It also requires care in taking the record, and an extra man to develop and re-read the record. E. C. Scobell, Rochester, said it had been adopted for demand meters in that city and is being tried out for regular meters, but he felt somewhat dubious about its value for the latter purpose. E. J. Fowler suggested that means for stamping the reading on a card would be more valuable than photographing it, and H. L. Brown, Chicago, explained a device that accomplishes this. L. H. Heinke, Grand Rapids, Mich., asked about the relative cost of typed and manuscript bills. Mr. Fowler said after the first difficulties were overcome it has proved to be cheaper and produces a much more legible result. The subject of meter constants was discussed by J. M. Hogan, H. C. Schlegal and J. C. Jacobus, Detroit, E. J. Fowler, Chicago, H. Spoehrer, St. Louis, F. L. Leightner, Brooklyn, and T. R. Malone, Long Island City. The opinion most commonly expressed was that meter constants should be eliminated if possible. Others who discussed the committee's report were E. D. Dreyfus, Pittsburgh, and L. F. Hall, Providence.

The report of the Committee on Purchasing and Store Room Accounting was presented by H. F. Frasse, Brooklyn, N. Y. The discussion on this was quite lengthy and was participated in by F. J. Farley, Brooklyn, F. L. Leightner, Brooklyn, J. C. Van Duyne, Brooklyn, F. L. Hall, Providence, W. H. Bogart, New York City, C. Martin, Chicago, E. C. Scobell, Rochester, J. H. Hunt, San Francisco, J. O Moore, Long Island City, N. Y., E. D. Dreyfus, Pittsburgh, W. F. Stevens, Boston, and Chairman Edwards. The points dwelt on mostly concerned themselves with the advantage of having all purchasing and store-room accounting handled by the purchasing department.

Second and Third General Sessions

The second general and executive session was held on Tuesday evening with President E. W. Lloyd in the chair. The evening was devoted to the reading of the report of the Committee on Public Policy presented by W. W. Freeman.

The third general and executive session was held on Wednesday morning, the presentation of the treasurer's report of W. H. Atkins being the first order of business.

The report of the Committee on Rate Research was presented by Alex Dow, and a subsequent discussion participated in principally by Messrs. Lloyd, Dow and Lieb indicated the necessity for the members of the Association giving to *Rate Research*, the official publication of the Association, a greater degree of co-operation and support. Mr. Lieb spoke particularly to this subject, and urged upon the members an appreciation of the very effective work which the Rate Research Committee was carrying on. President Lloyd announced that there was under consideration the plan of publishing as complete a compilation as possible of the rates of electric light and power companies in cities of 40,000 population and over. These publications would be in loose-leaf form and would be revised every three months.

The report of the Committee on Constitution and By-Laws was presented by R. S. Orr, who called attention principally to the amendments affecting the membership of geographic sections, and permitting, if the suggestions recommended are adopted, the members of geographic sections attending conventions of other associations so as to minimize the time and expense necessary for these members for attending the meetings in which they are particularly interested. Another amendment was with regard to geographic section work and would allow, in the event of the chairman of the geographic section not being able to attend a meeting of the national executive committee, the executive committee of the geographic section electing a representative, providing that no one representative thus elected would attend more than two meetings of the national executive committee. Another amendment would substitute for the word "income" of electric light and power companies the word "earnings."

The report of the Committee on Geographic Sections was presented by L. D. Gibbs. Interest at this session centered principally in the discussion of this report. J. B. Klumpp suggested that he would recommend to the geographic sections that the reports of the standing committees of the National Association presented at the annual meeting be taken up for specific discussion at the stated meetings of the geographic sections.

J. E. Davidson described the work of the Northwest Section and indicated the desirability of establishing other sections in other parts of the country.

Leon H. Scherck and J. C. DeLong, speaking respectively in behalf of the Eastern New York Section of the Association and the Empire State Gas and Electric Association, voiced the sentiments of the members of these organizations as to a wish to co-operate with the National Association, but expressed a doubt as to the desirability of the geographic section taking the place of the local organizations. These gentlemen also raised the question

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as to duplication of effort and asked for information from other sections.

O. H. Simonds, president of the Mississippi Section, said that it was highly desirable that there be an extension of the geographic section work. Where there was only a sparsely settled community and a comparatively few large electric light and power companies, it was difficult to hold a convention that would attract the attention and interest of important men in the industry. For places of his kind there was no doubt as to the advisability of establishing strong geographic sections.

F. J. Baker said that undoubtedly if the state associations could maintain their autonomy and their identity so far as name was concerned, that it might be easier to have them affiliate with the National Association as geographic sections.

President Lloyd expressed his opinion that after a careful consideration of the whole subject there did not appear to him to be any insuperable obstacles in the way of establishing geographic sections even where strong local associations are already at work. The great thing to be accomplished was a broadening of the usefulness of the local associations through affiliation with the National organization, thus securing the influence of a wider viewpoint and a more effectve and dominating organization.

Mr. Gibbs in closing the discussion stated that there was no intention upon the part of the officers of the National organization to have the local associations lose their identity in any sense. It was not a case of the local associations giving up anything to the National organization; rather it was a case of the National organization giving up a great deal to the advantage of the local associations.

Owing to the lateness of the hour, J. M. Wakeman, general manager of the Society for Electrical Development, instead of presenting a formal address, gave a rapid survey of what had been accomplished by the Society with respect to Electrical Prosperity Week and the "Wire Your Home" campaign, and outlined some of the plans with regard to the next great event which has been designated as "America's Electrical Week."

First Electric Vehicle Session

The first session was called to order Wednesday afternoon by Chairman W. H. Johnson, of Philadelphia, Pa., who, in his address, spoke of the affiliation of the Electric Vehicle Association of America with the National Electric Light Association, and the benefits to be derived from the merger. He predicted the broad scope of the electric-vehicle industry will be amplified under the new association arrangements. Comments were made on the activities of the organization during the year.

Secretary A. Jackson Marshall presented his printed report for the seven months since the last convention of the Electric Vehicle Association, which summarized the work in connection with the establishment of the Electric Vehicle Section of the National Electric Light Association. The report reviewed the many details of work passing through the secretary's office, emphasis being placed on the publicity gained for the electric vehicle. A. C. Downing, of Detroit, commended the work of the secretary.

H. M. Edwards, of New York City, presented the treasurer's report. F. W. Frueauff, of Denver, Colo., presented the report of the Constitutional Revision Committee, reading a draft of the new constitution, which was adopted by vote. J. D. Israel, of Philadelphia, presented the printed report of the Membership Committee. G. A. Freeman, of Chicago, presented the printed report of the Committee on Standardization. A. J. Marshall spoke on standardization of charging plugs, stating a communication had been received from England in regard to odd-size plugs. He then presented the report of the Committee on Motion Picture Films.

Harry Salvat, of Chicago, read a paper on "Greater Garage Service." Gail Reed, of Chicago, in speaking from the manufacturers' standpoint, said the relations with the garage owner could be improved, but the latter's troubles must be remedied by himself on his own initiative. He should not be keenly competitive, and should place his service on a flat-rate basis, with a firm business foundation. He outlined the efforts of the manufacturers in their attempts to aid garage owners, speaking of their sales, service, accessories sales and publicity work. He advised garage owners to associate themselves with the Section, choose a committee to promote their own interests and relations with other factors in the industry. R. L. Lloyd, of Philadelphia, discussed the paper in brief from the central-station man's point of view. R. Macrae, of Chicago, stated that the friction between garage owners and manufacturers retarded to a great extent the progress of the industry, and that the general impression given that the electric vehicle was foolproof was a detriment. Robert Bland, of Evanston, Ill., upheld the garage owner's viewpoint in an urgent manner, stating the controversy was local to Chicago, but nevertheless serious. The garage owner should give the very best service, regardless of the manufacturers' activities. He asked for the appointment of a committee to confer with the manufacturers and garage owners on the question of the adjustment of their relations.

Second Technical Session

The second technical and hydroelectric session was called to order by President E. W. Lloyd on Wednesday afternoon. E. B. Meyer presented the report of the Committee on Underground Construction, which was discussed by D. D. Clarke, Frank T. Adams, and Frank W. Smith. The latter supplemented the information as to joints on 25,000-volt cable, and stated that over 600 joints of the Conducell type are now in service for the United Electric Light & Power Company. Of these, 200 are on 19,000 volts and a few on 25,000 volts. They have been adopted for general use as well as for emergencies In answer to Mr. Clarke's question, Mr. Meyer said that the tile conduit compared in the report to stone conduit had not been installed with cement filling.

T. C. Martin then presented Part II of the report of the Committee on Progress, which was accepted without discussion.

Henry J. Pierce then read a paper on "Federal Water Power Legislation" in which he pointed out the need for legislation permitting the development of water powers, told of the existing laws on the subject and compared the provisions of the Ferris, Myers, Shields and Adamson bills now pending in the national Congress.

R. J. McClelland then presented the report of the Committee on Overhead Lines and Inductive Interference. This was discussed by W. H. Blood, Jr., of Boston; H. B. Vincent, of Philadelphia; Walter P. Schwabe, of Thompsonville, Conn.; C. W. Lewis, of Chicago; John B. Fisken, of Spokane; C. A. Sears, of Keokuk; and John M. Drabelle, of Cedar Rapids, Iowa.

Mr. Blood spoke of the proposed Electrical Safety Code drawn up by the Bureau of Standards, which he said provided for construction which would never fail under any circumstances, and was too stringent to be practical. The

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first draft was utterly impossible, but it has been gradually improved, although still very objectionable in many of its provisions, and in the minuteness of its specifications. While the Bureau of Standards cannot enforce any such rules, they are put out with the prestige of the Government, which will mean much to commissions and courts, and they will probably be made law in some states. He questioned the authority of the Bureau to do such work, which was not covered by the organic act creating it.

Mr. Fisken agreed with Mr. Blood that the Bureau of Standards was exceeding its proper functions. Statistics in the State of Washington show that two-thirds of the industries are more hazardous than the electric industry and he thought that they might well be attended to first. The electric companies want a rest from regulation, which has been requiring a great deal of the time of officials, and a chance to attend to business. In his state the large companies will be compelled to follow the rules, if adopted, on account of the penalties which will be attached, and the public will have to pay the bill in the form of rates. The smaller companies probably will not be compelled to follow the rules closely. The loading zones specified in the rules are not applicable to local conditions. A certain line 120 miles long experiences both extremes of loading conditions. He cited the California inductive interference order, under which a telephone company can require transposition of power lines, as an example of unwarranted governmental activity.

Mr. Vincent stated that the rules will undoubtedly be adopted in Pennsylvania. Mr. Schwabe pointed out the necessity of the small companies participating in the conference on the safety code. Mr. Sears asked for co-operation among the power companies, as in Iowa and Illinois the telephone companies are attacking the power interests. Mr. Drabelle said that the hearings recently held in Iowa were largely for political effect, and that the small companies could have more influence than the large companies if they would attend such hearings.

Third Commercial Session

The third commercial session opened with the submission of the report of the Power Sales Bureau, by George H. Jones, Chicago. This bureau has, during the past year, co-operated with similar organizations, and particularly with the Power Committee of the American Institute of Electrical Engineers. The growth of industrial heating resulted in the formation of a special association, which has now been merged into the Commercial Section of the N. E. L. A. Electric furnaces and electrolytic work are commanding increased attention also. It was urged that provision be made for the better interchange of power sales information. The report recommended particularly that: (1) The name of the organization to be changed to Industrial Sales Bureau. (2) There should be four divisions of the work, first, electrochemical; second, general power, including railway supply; third, electric heating; fourth, isolated plants. (3) The officers of the Industrial Sales Bureau should be chairman, vice-chairman and secretary, to be appointed by the Executive Committee of the Commercial Section. The detail organization of the four proposed divisions was also explained. The object of the entire reorganization was in order to prevent duplication, and to secure co-ordination of effort.

A paper by C. J. Carlsen, entitled "Central-Station Service in the Manufacture of Artificial Ice," was next presented. Discussion on it was opened by H. H. Holding, Newark, N. J., who believed that the depreciation of mechanically operated plants should be figured nearer 10 per cent than 5 per cent. Mr. Anderson, Chicago, who is the owner of three electrically operated ice plants and is now building a fourth plant, said there had been no room for criticism of the central-station service. The first plant built by him earned a rate of about 2.5 cents per kilowatt-hour, whereas now his rate is less than one cent. His plants make about 340 tons of ice a day. R. H. Tillman, Baltimore, spoke of the value of keeping accurate records of plant results. In Baltimore there are now a large number of small plants, largely for refrigerating, and not so much for ice-making, which have about 3,000 horsepower in motors installed for driving ammonia compressors. Mr. Hobart, Chicago, who is consulting engineer on many electric ice plants, spoke of the exceptionally favorable load of these plants. R. H. Knowlton, Philadelphia, observed that when central-station power is used the plant will keep a much more accurate record and watch its operation more closely than in the case of isolated plants. Mr. Leonard, Nashville, Tenn., said that in the South all ice used is distilled-water ice, and trouble has been experienced in convincing owners of plants of the merits of raw-water ice. Mr. Osborne, vice-president of the Consumers Company, the largest ice dealer in Chicago, said that if the water is sufficiently pure for drinking purposes there is no reason why it cannot be used for making ice. H. Cochrane, Chicago, spoke of the case of small towns, in which it was an excellent plan to use exhaust steam from the lighting plant for operating ice plants as auxiliary to the central stations. The latter need not retail the ice, but need simply to dispose of it to local dealers.

The report of the Committee on New Industrial Applications for Electricity was presented by Philip Torchio, New York City. He said that numerous suggestions had been obtained from members and officers of the Commercial Section. The association has a large membership of engineers, who could co-operate in the study of application of electricity. Letters were read from Alex Dow, Detroit, and Farley Osgood, Newark, N. J., on the proposal. Mr. Osgood pointed out that there is urgent need for co-operation of the different divisions of the central-station industry. Commercial men should not undertake technical research work, nor should the technical men undertake purely commercial work; both can work together to excellent advantage, however. F. C. Hart, Boston, Mass., pointed out that there are many calls for applications of electricity of such efficiency as to equal or improve on the cost by other methods. The application of electric heating is still commercially crude. Co-operation is necessary in order to secure a 100-per-cent load-factor. M. O. DellPlain, Syracuse, N. Y., cautioned against the disclosing of secrets of industrial processes of different plants. Tact and a high standard of ethics is called for. H. H. Newman, Passaic, N. J., felt that the ethics of the salesman were as high as those of the engineer.

D. B. Rushmore, Schenectady, N. Y., spoke of the co-operation between the American Institute of Electrical Engineers and the National Electric Light Association. Intelligent direction of work is necessary to avoid duplication. Readjustment of the industry and of its organizations are needed from time to time. At present it is doubtful whether the engineers of the industry are being utilized to the best advantage in the development work. Discussion was closed by Mr. Torchio, who said that average customers are not now in position to get technical information on best methods and equipment, so as to obtain the best all-around results of standardization of apparatus and methods.

The report of the Industrial Heating Bureau was presented by C. F. Hirshfeld, Detroit. He stated that the requirement of industrial electric heating is that it shall produce a more economical result, all things considered, in

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order to justify its use. Seven chief advantages of electric heating were pointed out in detail, also matters that need special attention. R. H. Tillman, Baltimore, asked about what percentage the large industrial heating load now carried by the leading central stations is due to the automobile industry. Dr. Hirshfeld said not over 30 per cent. Mr. Parker, Schenectady, N. Y., said an excellent application of electric heating has been found in sherardizing. R. H. Knowlton, Philadelphia, asked regarding the comparative merits of the new process of indirect heating of enameling ovens by gas and electric heating. Dr. Hirshfeld said that it is claimed to be able to obtain equally good results by indirect gas heating and electric heating. It is probable, however, that for certain classes of production each of the methods referred to will be found to be especially well adapted.

Second Electric Vehicle Session

The second session of the Electric Vehicle Section was opened by Chairman W. H. Johnson Thursday morning. The session began with the presentation by W. A. Manwaring of Philadelphia, Pa., of the report of the Committee on Traffic and Good Roads, a report on the subject of good roads being made for the first time, which stated advantages of, methods of building, and results of tests on good roads. There was no discussion of the report.

A. Jackson Marshall, of New York City, read the report of the Committee on Insurance, which recommended the placing of insurance with companies giving preferential rates for electric vehicles. Rates and practices in different cities were given.

P. D. Wagoner, of Long Island City, N. Y., presented the report of the Committee on Legislation, which was a digest of recent legislation in the different states in regard to use of electric and other vehicles. C. A. White, of Boston, Mass., made a few remarks on the Massachusetts law on abolishing headlight glare.

S. V. Norton, of Akron, O., presented a paper on "The Relation of Tires to the Efficiency of Electric Vehicles." J. W. Freeman, of Philadelphia, Pa., and H. N. Muller, of Pittsburgh, Pa., brought up questions as to use of road and scleroscope tests. R. L. Lloyd, of Philadelphia, Pa., commented on the use by purchasing agents of the information contained in the paper.

James H. McGraw, of New York City, presented the report of the Committee on Federal and Municipal Transportation, which pointed out the many practical applications of electric vehicles in federal and municipal service. Data were given on the different classes of service, range of operation, costs and maintenance. The position of the central station in relation to municipal service of electric cars was pointed out. In the discussion, F. W. Smith, of New York City, spoke of the committee work on vehicles for parcel-post delivery, and also of the attempts made in urging central stations to take advantage of their opportunities in their relations with municipalities to promulgate the use by them of electric vehicles. H. N. Muller stated much harm was done to the industry by salesmen's overdrawn statements in their efforts to make sales, his remarks being answered by J. W. Freeman, who spoke from the salesman's viewpoint. W. J. Miller, of Newark, N. J., commented on the lack of reciprocity between central stations and electric vehicle manufacturers. R. L. Heberling, of Philadelphia, brought out points in regard to the correct application of electric vehicles for different duties. R. L. Lloyd commented on the paper in general. In closing the discussion, Mr. McGraw offered a suggestion that at the next convention one session of the Vehicle Section be held at a time when no other section sessions were in progress and that a broad range of topics be chosen for this session in order that a large and representative attendance be secured from the different factors in the industry. In discussing the lack of responsible co-operation among manufacturers and the indifference of central stations to the electric vehicle industry, he brought out some pertinent facts and suggested ways for remedying the present conditions.

C. W. Squires, of Long Island City, N. Y., presented a paper on "Industrial Truck Applications." There was no discussion on this paper.

J. W. Freeman, in the absence of F. E. Whitney, of Philadelphia, Pa., made an abstract of the latter's paper on "Electric Troubles and How to Eliminate Them." Owing to the lateness of the hour discussion of this subject had to be dispensed with.

Third Technical Session

R. S. Orr presided at the third technical session, held on Thursday morning. The report of the Committee on Accident Prevention was presented by Charles B. Scott. It was discussed by C. W. Ward, of Pittsburgh; W. L. Abbott, of Chicago; Frank T. Fowler, of Chicago; and H. L. Gannett, of Chicago. Mr. Ward said that the use of rubber gloves had been restricted because they impeded the fingers of the workman. He exhibited thin gloves which had stood a test of 20,000 volts and which obviated this difficulty. He also exhibited horsehide gloves for mechanical protection and a third pair of gloves to be worn under the rubber and over which the rubber gloves would slide easily; also a rubber sleeve for protection of the arm.

Mr. Abbott proposed to ventilate the rubber glove by openings on the back of the hand, where protection is not so necessary. Referring to resuscitation, he said that shocks from low voltage seem to prove more fatal than shocks from 20,000 volts and over. Mr. Fowler called attention to the fact that successful resuscitation had been carried out with mechanical devices and he urgently favored the appointment of the new commission as proposed in the report. Mr. Scott pointed out the urgent necessity of training employees in the prone-pressure method of resuscitation, which is always available.

I. E. Moultrop then presented the report of the Committee on Prime Movers. This was discussed by Ludwig Kemper, of Albert Lea, Minn.; W. L. Abbott, of Chicago; E. D. Dreyfus, of Pittsburgh; J. W. Parker, of Detroit; M. J. Shugrue, of Brooklyn; C. H. Baker, of Newark, N. J.; J. B. Klumpp, of Philadelphia; and P. M. Downing, of San Francisco.

Mr. Abbott said that the chain-grate stoker was the only automatic stoker that was capable of handling the coal used in the Middle West. He explained the difference in coal as it left the mine and as received at the power house with respect to moisture content, and said that the condition of the weather during transit would affect the daily coal bill by several hundred dollars. Mr. Parker stated that commercial stokers are made as simple as possible and could often be improved. He had had success with clinker grinders used with West Virginia coal. He said that mechanical tube blowers for cleaning boilers had given satisfaction and raised the efficiency of boiler operation considerably, while the danger of cutting is not great. Mr. Shugrue said that the automatic coal sampler described in the report was not satisfactory because it rejects the slate and large lumps. Mr. Baker stated that mechanical tube blowers had proved satisfactory and the Public Service Electric Company had just placed a large

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order for additional equipment. He asked a number of questions and called attention to the fact that some of the committee data, such as those referring to condensers, were incomplete in some essential particulars. Mr. Klumpp read a communication from the McIntosh & Seymour Corporation in regard to Diesel engines. The writer stated that the charts given in the report were misleading in some respects, as there are no stand-by costs with this type of engine. The construction costs are also given at too high a figure. Mr. Klumpp explained some of these inconsistencies by the fact that the manufacturers base their figures upon present output, while the Committee figures are taken from engines which have been in service for several years. Mr. Downing disagreed with the statement in the paper by Mr. Harisberger that there had been an overdevelopment of water power on the Pacific Coast, so far as this applied to California. He also disagreed with a statement of the Committee that hydroelectric power is no cheaper than steam power. The cost of a transmission line is usually included in these comparisons, but this is not justifiable, for in California the so-called transmission line is in reality a distribution line.

Resolutions were adopted as proposed by the Committee requesting the American Society of Mechanical Engineers to recommend a new and logical method of rating boilers, and requesting the engineering societies to recommend methods for determining the head on water wheels under test when in spiral casings, in closed or open flume.

Mr. Moultrop then presented the report of John Hunter, who is the Association's representative on the Committee of the Uniform Boiler Law Society to secure the adoption of the A. S. M. E. boiler code.

L. L. Elden then presented the report of the Committee on Electrical Apparatus. This was discussed by E. G. Reed, of Pittsburgh; W. H. Fellows, of Washington; C. E. Stephens, of Pittsburgh; R. F. Schuchardt, of Chicago; M. O. Troy, of Pittsfield, and Charles Penrose, of Philadelphia.

With respect to the Committee's recommendation for secondary transformer voltages of 115-230 volts, instead of 110-220 volts, Mr. Reed called attention to the inconvenience owing to the present use of the latter and the desirability of operating new transformers in parallel with old ones. Mr. Fellows explained the use of a watt-hour meter in place of the cycle recorder mentioned by the Committee, when the latter is not available. Mr. Stephens referred to street-lighting systems and stated that mercury-arc rectifiers may be used on circuits up to 100 arc lamps, and that current transformers could be used for still larger numbers. He disagreed with the Committee as to the power-factor of series circuits with a reactor shunting each lamp. He also referred to the use of pole transformers having two windings, in place of the autotransformer which has been customary. The former requires no cutout and avoids some of the grounding troubles. Mr. Schuchardt spoke in favor of the standardization of terminal markings and referred to a protective device which he has used on rotary converters for street-railway service. Mr. Troy discussed the change in the standard of transformer secondary voltage, and announced that the committee of the Electric Power Club had finally agreed to follow the ruling of the N. E. L. A. committee in this matter. Mr. Penrose favored the use of double windows in substations to avoid the transmission of noise, rather than to use solid walls without windows.

Third Accounting Session

The third accounting session opened on Thursday morning with the presentation of a paper on "A Correspondence Course in Accounting" submitted by A. L. Holme and J. R. Wildman. This paper gave an outline of a course in accounting which it is proposed to give by correspondence to employees of member companies. The course is laid out for four years of which the first two are elementary, the third an intermediate and the fourth is an advanced course. The work of each year covers eight principal divisions. It was stated that, if 500 subscribers could be secured to take up this course, the annual cost per student would not be over $15.

Discussion of this matter consumed most of this session. The general consensus of opinion was that this course was greatly needed and the undertaking should be heartily encouraged. J. W. Lieb, New York City, suggested including some work on terminology. J. C. VanDuyne, Brooklyn, said an accounting course has been given in Brooklyn with considerable success. Douglass Burnett said that accountants had taken a prominent part in the extensive educational work carried on in Baltimore. E. J. Fowler, Chicago, recommended a broadening of the course to include inventories. Others who discussed the subject were H. F. Frasse, Brooklyn, A. H. Randel, New York, F. L. Leightner, Brooklyn, E. C. Scobell, Rochester, and T. H. Collins, Brooklyn.

The report of the Question Box Committee was then submitted. It was briefly discussed by F. L. Hall, Providence, R. I., and A. L. Holme, New York City.

The Nominating Committee then submitted a list of nominees for officers for the Accounting Section for the ensuing year which were then unanimously elected as follows:

Chairman, J. L. Bailey, of Consolidated Gas, Electric Light & Power Company, Baltimore, Md.; vice-chairman, Paul R. Jones, of H. L. Doherty & Company, New York City; treasurer, C. E. Calder, Dallas, Tex.; secretary, Frederick Schmitt, of New York Edison Company, New York City. Directors, J. H. Gulick, Chicago; R. W. Symes, Detroit; R. H. Ballard, Los Angeles; F. L. Hall, Providence; H. Spoehrer, St. Louis; W. E. Long, Philadelphia, and E. J. Allegaert, Newark.

Fourth Commercial Session

The report of the Lighting Sales Bureau opened the fourth commercial session on Thursday morning. It was presented by John F. Learned, Chicago, who explained the organization of the five subcommittees of the Bureau and the work of each.

The paper by Earl E. Whitehorne, New York City, on "The Way to Make a Salesman" was next presented. It was briefly discussed by H. H. Newman, Passaic, N. J., and W. H. Rogers, Paterson, N. J.

The report of the Committee on Commercial Aspects of Highway and Municipal Lighting was presented by T. F. Kelly, Dayton, O. The discussion submitted by F. C. Pyott, San Francisco, was read by Mr. Shields, Streator, Ill. It was stated that the best way to interest city authorities in improved street lighting is to put in a trial installation of the proposed lighting along a street, leaving the old lighting in place and to arrange to throw over instantaneously from the old lighting to the new and back again; this makes

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a very effective demonstration of the improved character of the lighting proposed and usually results in obtaining much more liberal outlay than originally anticipated.

G. H. Stickney, Harrison, N. J., said that street lighting usually means carrying out the ideas of city authorities rather than of furnishing the best street-lighting service. On account of the meagerness of funds usually set apart it has been well that merchants have supplemented the street-lighting by so-called white-way lighting. While it is advisable to use large lamps where they are especially adaptable, it would be wrong to use them indiscriminately, because it is evident that many streets that are forested densely or have many curves call for a large number of relatively small lamps. S. N. Clarkson, St. Louis, submitted a discussion through F. D. Beardslee, St. Louis, in favor of continuing with ornamental lighting systems and showed the value these have possessed.

Ward Harrison, Cleveland, said that in many cities there is only so much money available for street lighting and therefore it is desirable, by securing the co-operation of merchants in paying for the installation of white-way lighting posts, the city paying for operation, to secure some 25 or 30 per cent more money available for street-lighting purposes, since the fixed charges on installation form an important element in street-lighting costs. M. S. Seelman, Jr., Brooklyn, described the very successful merchants' lighting in use in that city. It provides a revenue of about $150,000 a year to the central-station company. One of the five 100-candlepower lamps provided on each post burns all night. Special sales of these decorative posts are held each February. W. B. Bell, Paterson, N. J., said it was a good scheme to attend meetings of city, town and county authorities, and keep in close touch with the work of public lighting committees. Norman Macbeth, New York City, said it was a good plan to get manufacturers' engineers to give advice to a city council or similar body one after another, thus producing such varied recommendations and such a great confusion of the entire lighting proposition that the city must call in expert advisers to solve the problem. The result usually will be that improved lighting and more liberal expenditures will prevail. The report was also discussed by A. W. Young, Camden, N. J., and L. H. Scherck, Poughkeepsie, N. Y.

An illustrated lecture and demonstration was then given by William A. Durgin, Chicago. It was entitled "Lighting—a By-Product or a Buy-Product." The common statement now being made that lighting is likely to become a by-product is having a deterrent effect on lighting men in general even though at present electric lighting still furnishes over half of the central-station load. However, the use of lamps of the highest efficiency has not yet become so general as will be the case doubtless in the near future. If conditions continue unaltered, a decrease in income from lighting, together with its being placed in the by-product class, is bound to result. Mr. Durgin cited the extraordinary increase in the amount of light that can be purchased for a dollar and gave figures on the character and the change in relative value of the lighting load in Chicago. What is apparent is that this is a time to reorganize the lighting business, if it is to remain the mainstay of the industry. This can be done by active work along three lines: (1) securing much higher intensity of illumination than now generally prevails; (2) urging the general use of semi-indirect or pure indirect systems of illumination; (3) advocating the use of color filters and color control of light.

Mr. Durgin showed by simple and yet very effective demonstrations that the intensities generally used are very much lower than that of daylight. An increase of illumination to intensities of 9 or 10 foot-candles should be brought about. It will reduce eye strain due to poor lighting, if secured judiciously. By showing a bare lamp compared with indirect illumination Mr. Durgin demonstrated the great superiority of the latter and made an emphatic plea for giving close attention to the matter of eliminating the increasing glare from the more powerful lamps coming into use. He showed also the ready means by which artificial daylight can be secured where true color values are of importance, both in industrial plants and in establishments handling dress goods, etc. The possibility of obtaining very beautiful as well as more effective lighting from the color standpoint was shown by means of the lighting of a miniature room by daylight, by ordinary low-intensity incandescent lighting and by means of slightly amber-colored semi-indirect increased lighting. All of the three means chiefly spoken of open vast opportunities to the lighting industry, since each of them requires greatly increased use of energy, and therefore these offer the means of much more than off setting the increased efficiency of light sources.

This splendid lecture was briefly discussed by F. D. Beardslee, of St. Louis, Norman Macbeth, of New York, and Arthur Williams, of New York.

Third Electric Vehicle Session

The third session of the Electric Vehicle Section was called to order by Chairman W. H. Johnson Thursday afternoon. The joint report of the Committee on Operating Records and the Committee on Garages and Rates was presented by W. P. Kennedy, of New York City. This was followed by the presentation of the report of the Committee on Central Station Co-operation by E. S. Mansfield, of Boston, Mass., which gave a review of the committee's activities in this direction. H. A. Wagner, of Baltimore, Md., spoke at length of the future of the electric vehicle and the demands to be met. He stated the manufacture was yet in its infancy, even after 20 years of development. The manufacturers are making but small profits, which is not to be said for manufacturers of gasoline cars. A cause of the slow growth of the electric-vehicle industry is due to the sales methods of the manufacturers, who look for aid from the central stations. Agents have not been given the proper inducements for the sale of electric cars, and the manufacturers have not put forth the efforts to establish the number of agencies there should be. Manufacturers should use the same methods used by gasoline car manufacturers, especially regarding the extension of deferred payments. Central stations can aid greatly by establishing agencies and garages for electric vehicles if none exist in their communities. He suggested that each central station order for use or resale one electric vehicle during this year, and stated it was his intention to order 25 electric trucks when he returned to Baltimore. He suggested the appointment of a committee to look into manufacturers' conditions and seek the co-operation of central stations and manufacturers. P. D. Wagoner, of Long Island City, N. Y., commented on Mr. Wagner's remarks, and spoke from the manufacturer's point of view. He stated details of production programs and the fact that the manufacturers' facilities were more than adequate to supply the demand. He expressed the opinion that the future of electric was brighter than that of the gasoline vehicle business.

President E. W. Lloyd, of the National Electric Light Association, addressed the meeting, expressing his pleasure over the affiliation of the Electric Vehicle Association with the National Electric Light Association. He spoke of the co-operation that would result, and placed emphasis on the need of the electric-vehicle manufacturers to consult the commercial managers of central stations. He predicted that the parent organization would institute a propaganda very satisfying to the members of the Electric Vehicle Section.

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P. D. Wagoner presented a paper on "Battery Service—A Unit in a Comprehensive Plan for the Successful Exploitation of the Electric Vehicle." Gail Reed, of Chicago, spoke of results of a battery-service system maintained in Chicago for commercial vehicles. The figures on upkeep of batteries, he stated, were a very convincing answer to the prospective customer's usual questions on the subject. Mr. Bentley, of Chicago, one of the managers of the battery-service establishment referred to by Mr. Reed, gave more details as to the operation. Satisfactory battery service is being given for nearly 200 vehicles. The greatest difficulty encountered is in the difference of battery equipment used in different makes of electric cars, prohibiting universal service. R. L. Lloyd, of Philadelphia, Pa., questioned the amount of dead mileage under battery-service conditions, especially in large cities. In closing the discussion, Mr. Wagoner stated that data collected proved that loss of mileage using battery service was not great, figures on the practice in Boston, Mass., being given. He read two letters from electric-vehicle owners in Spokane, Wash., testifying to the proficiency of battery service and the electric car in general.

E. P. Chalfant, of New York City, presented a paper on "Passenger Vehicle Problems and Activities." Frank W. Smith, of New York City, discussed the paper, and took exception to the statements regarding co-operative advertising, stating what had been done by the Electric Vehicle Association and who had paid for it.

Chairman Johnson called for the report of the nominating committee, which was presented and adopted by unanimous vote, the following officers being elected for the ensuing year: Chairman, E. S. Mansfield, Boston, Mass.; vice-chairman, G. B. Foster, Chicago, Ill.; treasurer, H. M. Edwards, New York City; secretary, A. Jackson Marshall, New York City; executive committee: W. H. Johnson, Philadelphia, Pa.; Arthur Williams, New York City; Frank W. Smith, New York City; P. D. Wagoner, New York City; Charles Blizard, Philadelphia, Pa.; J. W. Frueauff, Denver, Colo.; G. A. Freeman, Chicago; Charles A. Ward, New York City; H. G. Thompson, East Orange, N. J.; E. P. Chalfant, Detroit, Mich.; James H. McGraw, New York City; H. W. Suydam, Toledo, O.

W. P. Kennedy, of New York City, presented a paper on "Central-Station Promotion of Electric-Vehicle Use." J. B. Fisken spoke of the success of his company in promoting the use of electric trucks in his territory, and expressed the opinion that their use would become quite general in the West. R. Macrae, of Chicago, stated the load to be obtained from electric vehicles was overestimated, and that it was attractive only because it was off-peak. In closing the discussion Mr. Kennedy explained the limits in this regard which were brought out in the paper.

A motion was passed which embodied a very sincere vote of thanks to the outgoing officers for their efforts, and expressed the wish that the new officers receive the unqualified support of every member of the organization in furthering its progress during the year.

Fourth Technical Session

Holton H. Scott presided at the final session of the Technical and Hydro-Electric Section on Thursday afternoon. The report of the Committee on Power Supply for the Electrification of Steam Railroads was presented by Peter Junkersfeld. Frederick Darlington then read a paper entitled "Central-Station Electric Systems and Railroad Power." This paper and the report were discussed together.

The discussion was opened by Samuel Insull, of Chicago, who traced the development of the unification of power supply. This originated in the smaller communities where a single company operated both street railways and the lighting and power system. Later, in states such as California, where hydroelectric power was used for all purposes there was also unified supply. In the Central West the different utilities were usually separately developed. The Commonwealth Edison Company began supplying street-railway current because one of the elevated roads was financially unable to build its own power plant. Unification is more important to the small plants than to those operating in large cities. Neighboring towns should have a common supply of energy even when the systems are separately owned. Advantage comes both from the use of large generating units and from the diversity of the different loads. The fact that municipal plants are not amenable to these combinations is a fundamental objection to municipal ownership. The importance of the steam-railroad business to the central-station is that it is spectacular. If the Commonwealth Edison Company supplied all the power used in Chicago the maximum demand would be about 800,000 kilowatts, and of this the steam railroads would use but 15 per cent, while the manufacturing concerns would require about twice as much. It is thus evident that it is more important to get all manufacturing business, after which the railroad business will come as a matter of course. By the time the railroads entering Chicago are electrified, their total load will not require more than two or three generating units of the size in general use by that time. Power companies should be prepared to furnish energy to the railroads whenever it may be required, but it is not their place to push the matter. The railroads will electrify when the success of electrification is assured and when the necessary investment seems to them to be warranted.

G. E. Miller, of Cleveland, pointed out that the central-station output varies with the business activity of the times. It is a barometer of prosperity. While the business done by transportation companies varies similarly, their power requirements are very nearly constant. Revenue from this source is the most stable of any business available for the central station except perhaps the pumping of water.

John B. Fisken, of Spokane, spoke of the electrification of the Chicago, Milwaukee & Puget Sound Railway, over which he had just travelled in the locomotive cab. He mentioned several of the advantages of electrification. Regenerative braking eliminated brake wear and flat wheels. In crossing one mountain range he observed that 30 to 35 per cent of the energy used on the up-grade was returned to the line on the downgrade. It is unnecessary to change locomotives at every division point. Comfort to the traveling public is greatly increased, owing to the lack of jarring, the purity of air in tunnels, and the smooth starting. The engine driver preferred the electric locomotive, as he anticipated less trouble with it.

W. N. Ryerson, of Duluth, stated that his company supplied the street railways operating in Duluth, Minn., and Superior, Wis. The business of this street railway fell off greatly on account of the coincidence of business depression and jitney competition. The greatest decrease in the power bill, however, was only 15 per cent.

The report of the Committee on Street Lighting was presented by Preston S. Millar, and was discussed by Ward Harsison, of Cleveland, who warned against the use of too small units and also against too great spacing of units, which was encouraged by the use of large units. He pointed out that the distribution of light flux from the lamp is more important with wide spacing.

Peter Junkersfeld then presented the report of the Nominating Committee, which was accepted, and the secretary instructed to cast the ballot for the following officers: Chairman, R. J. McClelland; vice-chairmen, P. M. Downing, J. T. Hutchings, Farley Osgood, Charles Ruffner; executive committee, O. B. Coldwell, Thomas Sproule, I. E. Moultrop, Stuart Wilder; secretary and treasurer, S. A. Sewall.

The session then adjourned.

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Fifth Commercial Session

The fifth commercial session began on Thursday afternoon with the report of the Committee on the Chairman's Address, submitted by T. I. Jones; this was accepted.

The report of the Subcommittee on Subsurface, Municipal and Other Construction was read by N. F. Obright, Chicago, who supplemented the report by reading from the article on the construction of the Wilson Avenue water tunnel, Chicago, which is to be published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN in the next issue.

F. E. Richards, Newark, N. J., mentioned the Passaic Valley sewerage system, on which the contractors using steam equipment underbid those using electrical equipment and then lapsed their contracts, which were taken over by the contractors who had found use of electricity so satisfactory.

A paper on "The Resistance Heater as a Load Builder" was read by E. F. Collins, General Electric Company, New York City. A. H. Tracy, Chicago, opened the discussion by calling attention to the need for more detailed information in order to be able intelligently to go after the business of electric heating of enameling ovens. He cited numerous cases of explosions and fires of gas-heated ovens and wondered how much reduction in insurance rates could be obtained through installation of electrically heated ovens. The safety of these ovens was also discussed by L. H. Scherck, Poughkeepsie, N. Y., and R. D. Donaldson, Philadelphia. C. F. Hirshfeld, Detroit, said that the fire hazard was greatest with direct-heated gas ovens. In the case of all ovens, when the production is pushed inflammable vapor is given off in increased quantities and when the proper temperature and composition of vapor and air mixture is produced the liability of explosion or ignition is great. Indirect-heated gas ovens are also dangerous, if the operator first turns on the main burners and then the pilot flame. Electric ovens are the least hazardous.

The report of the Subcommittee on Electric Furnaces was presented by R. H. Tillman, Baltimore. M. O. Dell-Plain, Syracuse, N. Y., reported tests on a single-phase arc furnace used for high-grade alloy steel. An average consumption of 735 kilowatt-hours per ton of cold scrap metal was found. E. S. Crosby, Detroit, urged the need for accurate and reliable data. Different local conditions of a plant and industry call for greatly different power consumption. In the three electric steel furnace plants in Detroit the power-factor runs from 87 to 98 per cent and the annual load-factor from 35 to 60 per cent. This electric process has supplanted the converter process for high-grade products and competes with the open-hearth furnace on a cost basis. Mr. St. Johns, Chicago, said the best policy was to back up only such processes and furnace equipments as were proven to be of known quality and reliability. The subject was also discussed by George H. Jones, Chicago; R. H. Knowlton, Philadelphia; Mr. Beaver, Kansas City; S. J. Gates, Milwaukee, Wis., and R. H. Tillman, Baltimore.

The report of the Subcommittee on Electric Welding was presented by S. R. Dresser, New York City, who also read some comments submitted by the Interborough Rapid Transit Company on its practice with electric welding. A letter from S. W. Stratton, of the Bureau of Standards, was read offering the co-operation of this organization in conducting investigation work. George H. Jones, Chicago, said that small plants using the spot-welding process usually require a special service and have a very poor load-factor. On account of the very violent load fluctuations the voltage of the line is greatly disturbed. It has been found necessary, therefore, to charge specially for this special service to secure a reasonable return. In one case this resulted in reducing the transformer equipment from 150 to 15 kilowatts. A. E. Oltz, Hammond, Ind., had found the same trouble and that it could be overcome by using a motor-generator set with heavy flywheel, the motor running off the three-phase supply. Such a set could very well be operated with a 3 or 5-horsepower motor. Quite a number of spot welders could be operated from such a set because they are used only for a small fraction of a minute and at considerable intervals, therefore having a large diversity-factor. C. W. PenDell, Chicago, referred to a load of 200 kilowatts in a single-phase spot welder which is being used with a newly developed dummp reactance. Alfred Herz, Chicago, explained this reactance which he had developed so that it could be automatically cut in on the line as the welder was cut out. It makes use of a 400-ampere switch which is remote-controlled from a three-way primary snap switch so that the welding and dummy loads are interchanged so rapidly as to cause no perceptible drop in voltage on the line. The inductance load is about five per cent of the power load. The paper was also briefly discussed by A. W. Young and S. R. Dresser.

The report of the Subcommittee on Competitive Power Sources was read by E. F. Whitten. R. F. Benzinger, Erie, Pa., opened the discussion by referring to the need for meeting competition of efficient types of gas engines working on natural-gas supply at 30 cents per 1,000 cubic feet. A. W. Childs, Los Angeles, F. W. Bullock, Jamestown, N. Y., H. K. Stein, Batavia, N. Y., and Mr. Moore, Paterson, N. J., described how this sort of competition was met. The very high maintenance cost and unreliable service of the gas engine will eventually demonstrate the inferiority of this form of isolated power, especially in such industries where constant speed and steady power supply are important, and will finally bring about the use of electric motors.

H. S. Seelman, Jr., Brooklyn, stated that the Buckeye locomobile described in the committee's report has now been discarded. The investment was some $10,000 for a 75-horsepower plant; the service was unreliable and expensive and therefore electric motors will now be used. Several cases of isolated plants displaced by electric service in a very satisfactory manner were described by H. H. Holding, Newark, N. J., C. W. Leber, Elizabeth, N. J., A. E. Oltz, Hammond, Ind., J. B. Stuart, Jersey City.

Company Section Sessions

At the first session of the Company Section, Chairman F. J. Arnold presided and considerable interest was manifested in the papers read. It was suggested that companies have group meetings, or small meetings in different departments, where the men will feel more at home and will acquire the training of discussing and presenting papers when they would be timid about doing so before the larger body.

The report of the Committee on Company Sections was presented by F. J. Arnold, chairman.

The report was discussed by E. A. Edkins, Chicago, Douglass Burnett, Baltimore; J. S. Cruickshank, Baltimore; A. L. Atmore, Philadelphia; J. C. Hobbs, Pittsburgh; K. A. Auty, Chicago, and George P. Mangan, Washington.

In answering the question of "what is the matter with our company sections?" Mr. Edkins said that there was no

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question but that in a great many instances the straw bosses and foremen in companies had used their position as a club to coerce many of their members to join the company section, with the result that the coal passers and men of all ranks who are not equipped to receive any benefit from this membership had become members. Mr. Edkins did not mean to infer that men of lower rank should be kept from membership, but that they should not be induced to join until they were properly qualified by educational means to derive some benefit from this membership. He thought the plan of company sections brought out by the committee offered the most logical solution of the problem.

Douglass Burnett said that he had felt there was a need for placing the information contained in the proceedings in some more concrete and tangible form for the use of the men in subordinate positions.

Mr. Hobbs said that the dropping off of membership in the company sections was due largely to a lack of vigorous and attractive programs. He believed that it was necessary to have some recreation at the meeting as well as highly valuable papers and discussions for the intellectual portion of the membership.

A paper on "The Company and the Company Section" was presented by M. S. Seelman, Jr.

The paper was discussed by T. H. Collins and C. W. Hafstrom, Brooklyn, C. W. Ward, Pittsburgh, and Frank Murtha, Philadelphia.

A. L. Atmore read a paper on "Financing Company Sections."

Douglass Burnett read a paper on "Company Section Educational Work." The papers by Mr. Burnett and Mr. Atmore were discussed jointly by C. W. Ward, Pittsburgh; F. L. Leightner, Brooklyn; H. Spoehrer, St. Louis; D. C. Bruce, Baltimore; Thomas Kelly, Dayton; Frank Murtha, Philadelphia; B. R. Jones, Chicago; E. J. Doyle, Chicago, and J. C. Hobbs, Pittsburgh.

Sixth Commercial Session

The sixth session of the Commercial Section was called to order Friday morning by Chairman R. S. Orr. Oliver R. Hogue, of Chicago, presented the report of the Committee on Industrial and Yard Lighting, which was illustrated with a large number of lantern slides. The report was discussed by A. B. Spaulding, Jersey City, N. J.; J. N. Adam, Elizabeth, N. J.; F. C. Hard, Boston, Mass.; F. D. Burr, Denver, Colo.; O. L. Johnson, Chicago; S. B. Burrows, Newark, N. J.; G. H. Stickney, Harrison, N. J., and Mr. Hogue.

R. S. Hale, of Boston, Mass., made a brief announcement regarding an exhibit of concentric wiring.

H. L. Doherty, of New York City, gave the details of a campaign instituted by the *New York World* for the installation of an illuminating system on the Statue of Liberty.

F. H. Scheel, of Chicago, presented the report of the Committee on Residence Lighting.

At this point, President Lloyd, of the Association, was introduced by the chairman and addressed the meeting He laid particular stress on the necessity and development of commercial departments by central stations. In words of advice to the younger members of the section he stated that the best advantages could be obtained by keeping in close contact with all of the activities of the National Electric Light Association.

The discussion on Mr. Scheel's report was participated in by T. Wiesendanger, of Milwaukee, Wis.; W. B. Bell, of Paterson, N. J.; W. D. Hodgson, of Glens Falls, N. Y., and M. S. Seelman, Jr., of Brooklyn, N. Y.

S. B. Burrows, of Newark, N. J., presented the report of the Committee on Lighting of Stores and Public Buildings. Discussion on this report was made by H. H. Newman, of Passaic, N. J.; R. B. Ely, of Philadelphia, Pa., and M. S. Seelman, Jr. Closing the discussion, Mr. Burrows again brought out two principle points of the report, namely, that the salesman must know his business and must have the proper amount of enthusiasm.

In the absence of Chairman A. K. Young, of the Committee on Electrical Advertising, J. G. Learned, of Chicago, presented the report, which, however, was not read, but incorporated in the minutes of the meeting. In commenting on the report, Mr. Learned stated that the Lighting Sales Bureau has laid a firm foundation and developments along this line were sure to be of a broad nature.

Chairman Orr turned the meeting over to Vice-chairman Becker, who called for the report of the Nominating Committee, submitted by R. R. Young, of Newark, N. J. The report was accepted and the following officers were elected: Chairman, E. A. Edkins, Chicago; vice-chairman, C. J. Russell, Philadelphia, Pa.; vice-chairman, J. G. Learned, Chicago; secretary, F. D. Beardslee, St. Louis; members of the Executive Committee to fill vacancies, F. H. Gale, Schenectady, N. Y.; Henry Harris, Pittsburgh, Pa.; T. F. Kelly, Dayton, O.; H. R. King, New York City; M. S. Seelman, Jr., Brooklyn, N. Y., and R. H. Tillman, Baltimore, Md.

Two amendments concerning the regulation of members of the executive and other committees were adopted, after which the last session of the Commercial Section was adjourned.

Fourth General Session

The fourth general and executive session was held on Friday morning with President Lloyd in the chair. The Doherty gold medal for the best paper read before a company section was awarded to B. H. Blaisdell of the Manila, P. I., section, and was entitled "The Power Plant Department's Part." The Harriet Billings medal, founded by Arthur Williams, was awarded to G. J. Leibman, of the Brooklyn Edison Company, for a paper entitled "Reviving Unused Subsidiaries." The special prize of $25.00 given by H. F. Frasse, was awarded to G. R. Jones, of the Public Service Company of Northern Illinois, for a paper entitled "The Utilization of Waste Material." Mr. Frasse has been so encouraged that he has asked the officers of the Association to announce four prizes for the coming year with the provision that at least eight papers must be entered in competition.

An address was made by Ell C. Bennett, Mercury of the Jovian Order, outlining plans for a closer co-operation upon the part of the National Electric Light Association and the Jovian Order. Mr. Bennett stated that the great work of the Jovian Order was to establish in every city or town wherever there was the nucleus of electrical men, a local chapter operating under charter from the central office to undertake the work of consolidating the interests of all the elements entering into the development of the electrical industry. There was a great opportunity for these local organizations to establish a community effort to educate the entire public to the advantages derived from the utilization of electrical energy in every form. He also called attention to the probability of establishing within the Jovian Order a clearing house for all of the electrical associations of the country.

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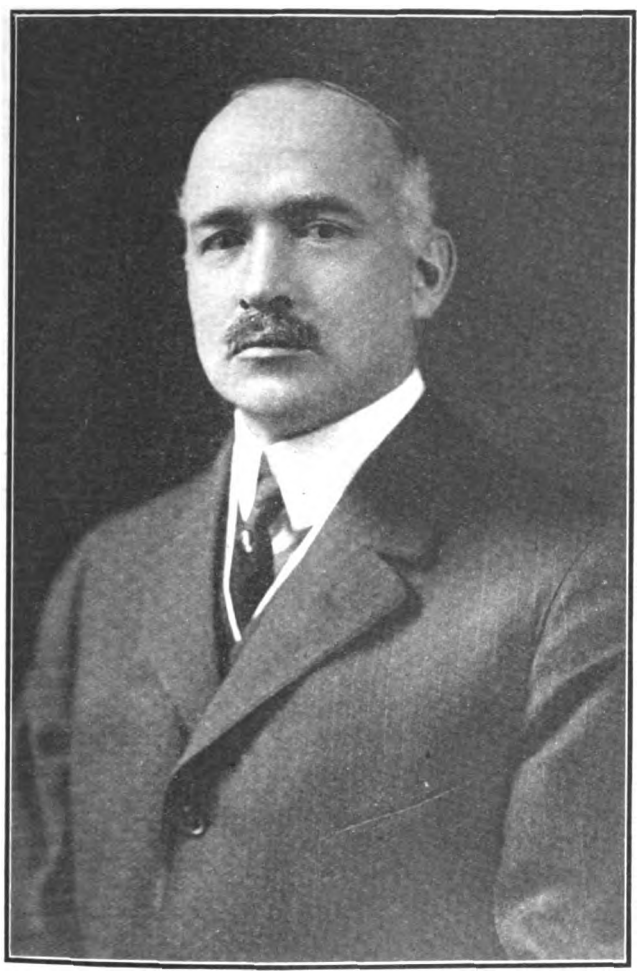
Secretary Martin in his report on memorials made touching reference to a number of the strong men conspicuous in the development of the industry who had passed away during the year. He referred particularly to James I. Ayer, William Stanley, Emil Rathenau, Enos M. Barton, J. A. Hill, Louis Duncan, Henry Floy, J. C. Manley and G. R. Stetson.

The suggestions of the Committee on Constitutional Amendments were adopted, providing for the members of geographic sections to join in convention with other associations provided that the expenses incurred were equitably divided among all the members represented. Another amendment to the constitution provided that the president of the geographic section or the chairman of a special section not being able to attend a meeting of the National Executive Committee, the executive committee of the section could then select a representative, provided that such representative would not attend more than two meetings of the National Executive Committee in succession. Another amendment provided for a change from the previous terminology affecting dues payable to the Association, and changed the expression to read "$25.00 plus one-fiftieth of one per cent of the operating revenues of the member companies." The words "operating revenues" are substituted for the word "earnings."



H. A. Wagner,
President-Elect, National Electric Light Association.

The report of the Resolutions Committee paid high tribute to G. A. Freeman, Master of Transportation, and his principal assistants, Ray D. Lillibridge and J. C. McQuiston; to the daily papers and W. E. Keily in charge of the daily press bureau; to the technical press in recognition of the great constructive work done all during the year, and with particular reference to the special issues published signalizing the convention; to the "Convention Daily"; to the hotels of the city of Chicago; to the Chicago Telephone Company; to the Commonwealth Edison Company; to the General Convention Committee, especially to Samuel Insull, L. A. Ferguson, Homer Niesz, G. A. Freeman, Oliver R. Hogue, W. L. Abbott, E. A. Edkins, John A. Gulick, Dana H. Howard and Mrs. E. W. Lloyd; to Henry A. Pierce, for his notable address on "The Utilization of Undeveloped Water Powers of the Country"; to the various standing committees of the Association, and particularly to the engineers, not members of the Association, who contributed time and effort; to the President, the Executive Committee and the office staff who have brought the Association to the highest point in achievement ever recorded by the Association; to the Exhibition Committee for its beautiful display, particularly to J. W. Perry, chairman, and H. G. McConnaughy, secretary.

An interesting interlude was the resolution offered by Charles W. Price, President of the Electrical Review Publishing Company, Inc., as follows:

WHEREAS, information has been received from members of the Baltimore delegation to the effect that the First President of the National Electric Light Association, Mr. J. Frank Morrison, one of the pioneers and founders of our industry, is now suffering from severe illness at his home, 5 North Carey Street, Baltimore, Md., and

WHEREAS, Mr. Morrison presided at the first annual convention of this Association held in this city in 1885, and also presided at the six following semi-annual conventions of this Association during the three years of his presidency, and

WHEREAS, we are specially reminded of Mr. Morrison's official connection, through the use at our executive sessions of the gavel presented to him by a committee of this association upon his retirement from our service,

THEREFORE, Be it Resolved, that the delegates to the 39th convention of the National Electric Light Association hereby express their sincere sympathy to Mr. Morrison in his sickness, and extend their best wishes for his speedy recovery, and that the secretary is hereby directed to convey these heartfelt sentiments to Mr. Morrison.

In commenting on the resolution, Mr. Price said: "Permit me to say that just 31 years and three months ago yesterday on February 25, 1885, the National Electric Light Association was born at the Grand Pacific Hotel in this city. As one who was present on that occasion and assisted in a modest way in its organization, recollections crowd upon me. But no feature stands out more conspicuously in my memory of that gathering of about 90 almost entirely unacquainted earnest men than that of the sturdy, forceful, unique personality of our first president, J. Frank Morrison, of the Brush Electric Company, of Baltimore.

"In looking back over the years—and it does not seem that there could be so many—it is my belief that Mr. Morrison was the one man in the electric illuminating field of that period to be selected for this pioneer position; and the work he so ably and far-sightedly carried on almost a third of a century ago has augmented and influenced not only electric lighting but the entire electrical industry and greatly added to the progress of the world. In just a word of history: this first convention was called to order Wednesday forenoon at 11 o'clock by W. A. Hovey, associate editor of the ELECTRICAL REVIEW, and, after a temporary organization presided over by George S. Bowen, of the Van Depoele Company, of Chicago, permanent officers were elected as follows:

President, J. Frank Morrison, of Baltimore, Md.

Vice-presidents, H. M. Cleveland, of Hartford, Conn.; J. H. Yarborough, of Nashville, Tenn. and E. R. Weeks, of Kansas City, Mo.

Secretary and treasurer, W. A. Hovey, of New York.

"Since that date the National Electric Light Association has had 28 other presidents, and of this total of 29 all but four are still alive. The third president and one of the first vice-presidents, Edwin R. Weeks, was in attendance at this

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convention. No president except the first served more than one year, if I remember right, and it was indeed fortunate that this term restriction did not apply in those early formative days when so little was known and understood of electricity and its wonderfully flexible and varied uses.

"Therefore, today it seems most fitting that this Association in its present remarkable and unparalleled success and advancement should pause for one kindly moment and extend this tribute to one who did so much for us in our early days and who now lies stricken at his home in a distant city."

Douglas Burnett in seconding the motion for the adoption of the resolution, said that it was particularly appropriate and fortunate for the Association that Mr. Price was present to introduce the sentiment. He called attention to the fact that when the convention convened nearly a third of a century ago Mr. Price had drafted the constitution with his own hands, and had selected the name "The National Electric Light Association." During all these years there had come about a very considerable development in the work of the Association, and there had been many assaults upon the name originally selected, and it was at this particular time when again the question of changing the name was being considered that so much of sentiment was revealed with regard to the original designation.

The Committee on the President's Address, through J. B. McCall, president of the Philadelphia Electric Company, warmly commended Mr. Lloyd for the many points he had suggested for the practical upbuilding and expansion work of the Association. Particular reference was made to the development of company sections, and the broadening of the influence of the Association so as to bring into contact with it every element in every section of the country. The co-operation of the Association with the National Bureau of Standards was also declared of prime importance, and also the president's suggestion as to increasing the financial responsibility of the Association; with reference to the suggestions made with regard to change of name, the committee confessed that in view of the sentiment attached to the retention of the present name it would refer the suggestion to the consideration of the incoming executive committee.

Henry L. Doherty asked the support of every member of the Association to the project now being developed for the electric illumination of the Statue of Liberty in New York Harbor. He said that this was one of the greatest opportunities for impressing upon everyone in the country the beauty and utility of flood lighting, and asked that the subscription being taken up by the New York *World* be contributed to by every electrical man in the country.

The Committee on Nominations presented the following recommendations for officers for the ensuing year, and the secretary was instructed to cast the ballot. The officers are therefore as follows:

President, H. A. Wagner, Baltimore, Md.

Vice-presidents, W. F. Wells, Brooklyn, N. Y.; R. S. Orr, Pittsburgh, Pa.; R. H. Ballard, Los Angeles, Cal.; Alex Dow, Detroit, Mich.

Treasurer, W. T. Atkins, Boston, Mass.

Executive Committee, M. R. Bump, M. J. Insull, W. H. Johnson.

Meeting of Class "D" Members.

The annual meeting of Class "D" members of the National Electric Light Association comprising electrical manufacturing interests was held at the Auditorium shortly after noon on Wednesday, J. W. Perry, chairman, presiding, with Secretary H. G. McConnaughy in charge of the records.

Mr. Perry in his interesting review of the work of this arm of the National Electric Light Association spoke of the courtesies that had been received from the officers of the Association and the Edison Company of Chicago, and particularly of the assistance and many visits to the exhibition of President E. W. Lloyd, of the N. E. L. A.

Chairman Perry appointed a committee on nominations consisting of Charles W. Price of New York, chairman, J. C. McQuiston of Pittsburgh and F. D. Killion of Chicago, who reported in favor of the re-election of the three directors whose terms expired. On motion the recommendation of the committee was unanimously approved and thereupon J. W. Perry, Charles Blizard and John Mustard were re-elected members to serve for the ensuing three years.

Votes of thanks were extended to Chairman Perry and Secretary McConnaughy for the gratifying success of the present well managed and attractive electrical exhibit, and to President E. W. Lloyd of the National Electric Light Association and official associates for assistance and courtesies extended to the class "D" members.

The Executive Committee of Class "D" members is now constituted as follows:

J. W. Perry, H. W. Johns-Manville Company, New York.

Charles Blizard, Electric Storage Battery Company, Philadelphia, Pa.

S. E. Doane, National Lamp Works of General Electric Company, Cleveland, O.

J. F. Gilchrist, Federal Sign System, Chicago, Ill.

F. H. Gale, General Electric Company, Schenectady.

J. C. McQuiston, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

John Mustard, Wagner Electric Manufacturing Company, St. Louis, Mo.

C. L. Peirce, Jr., Hubbard & Company, Pittsburgh, Pa.

Homer E. Niesz, Commonwealth Edison Company, Chicago, Ill.

F. R. White, Baker R. & L. Company, Cleveland, O.

Secretary of the Committee, H. G. McConnaughy, Dearborn Chemical Company, 165 Broadway, New York.

Power Sales Bureau of N. E. L. A. Holds Successful Dinner.

The first dinner given under the auspices of the Power Sales Bureau of the National Electric Light Association was held at the University Club, Chicago, Ill., on the evening of May 23. The event was a "get-together" meeting of power salesmen, and with an attendance of over 200 was very successful both in a social and business way. A number of members of the Commonwealth Edison Company Glee Club enlivened the occasion with songs, many of them being topical of those present.

George H. Jones, power engineer of the Commonwealth Edison Company, vice-chairman of the Power Sales Bureau, acted as chairman and toastmaster.

L. A. Ferguson, vice-president of the Commonwealth Edison Company, gave a cordial greeting and followed with some interesting figures on his company's relative sales of energy for power and lighting. He was followed by Joseph L. Becker, United Electric Light & Power Company, New York City; R. S. Hale, The Edison Electric Illuminating Company, Boston, Mass.; Prof. John C. Parker, University of Michigan; Dr. C. F. Hirschfeld, Detroit Edison Company, Detroit, Mich.; F. J. Pearson, electrical engineer, Marshall Field & Company, Chicago; J. M. Curtin, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; R. H. Tillman, Consolidated Gas, Electric Light & Power Company, Baltimore, Md., J. P. Mallett, Society for Electrical Development, New York City, and H. H. Holding, Public Service Electric Company, Newark, N. J.

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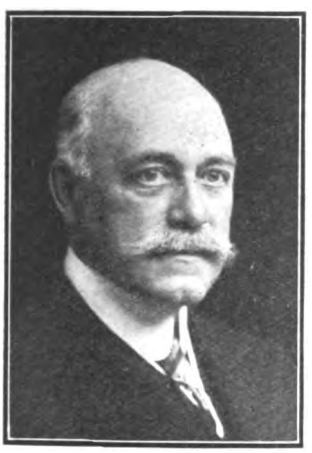
Impressions of the N. E. L. A. Convention

Statements from the Secretary and Chairmen of the Various Sections Regarding the Work Accomplished

THE THIRTY-NINTH CONVENTION.

BY T. C. MARTIN
Secretary, N. E. L. A.

In reply to your inquiry as to my general impressions concerning the success of the convention, I would say that we are still a few laps from the finish,



T. C. Martin.

besides which, as a small part of the machine, I have not had time except in a general way to crystallize my knowledge and impressions. It will probably be another week before I know just what we did, but unless I am mistaken, we have reached a high point in our convention record of work done, just as we have reached the highest point thus far in Association finances, membership and service to the industry during the past year. The very fact that we prepared nearly 2,500 pages of advance reports and papers for the convention, very nearly twice as much as we had ready for San Francisco last year, and much more than twice as much as was available at Philadelphia in 1914, tells its own story as to the work of the convention represented in four solid days of meetings, often with four parallel sessions, and with 23 or 24 individual sessions, at which over 100 reports and papers were submitted for discussion. This really seems to be more work than such a convention can digest even in four days, but, with the parallel method, the problem is not quite so serious as it seems at first glance.

At the moment, it is difficult for anyone to tell just what were the real high spots in the work of the week. It is at least interesting to note that for the first time we had electric-vehicle sessions and not less than three of them, that we had two company-section committtee sessions, that we had meetings of the Power Sales Bureau and Lighting Sales Bureau, both of them novelties, and that we even broke out into a new line of departure with a meeting devoted specifically to electric ranges, at which no fewer than some 200 men wrestled and wrangled cheerfully to their heart's content. We have also had at this meeting our first treatment and discussion of the subject of industrial heating, so that I am quite inclined to think that next year we shall be hitting it up in some new field and blazing out other new pathways for central-station development and enterprise.

As to the courtesy and hospitality with which we have been received, it is almost needless to say that this could not have been fuller or more generous. Chicago has a warm place in its heart for this great and growing association, of which it was the birthplace 30 years ago, and each time we come back the welcome is warmer. There is no city in the country, moreover, which affords better lessons in central-station economy and efficiency and high ideals of public service, so that it is very hard indeed to get away when so much can be learned.

ELECTRIC VEHICLE SESSIONS.

BY WALTER H. JOHNSON
Chairman, Electric Vehicle Section.

In giving a statement of my opinion as to the impressions gained from the meetings of the convention just closed, I would say emphatically and briefly

W. H. Johnson.

that it was very successful. The sessions of the Electric Vehicle Section have been characterized by a spirit of friendly co-operation, due no doubt to conditions which are the direct outcome of the affiliation of the Electric Vehicle Association with the National Electric Light Association. It is felt that the propaganda of the Electric Vehicle Section will be broader in its scope, more diversified in its interests and more intensive in procuring the best results.

Perhaps the most significant feature of the sessions has been the large amount of constructive criticism offered to the electric vehicle manufacturers, garage owners and central stations. The manufacturers, particularly, were subjected to criticism in regard to their selling methods and seeming lack of sympathy with the garage owners and central stations. Their position, while protected in a very able manner, was undoubtedly changed by the constructive attitude displayed by the other factors of the industry, and it is certain that they have left the convention with the assurance that the proceedings have unquestionably been in their interest, and that there is a great deal to be accomplished by lending their energies in hearty and sincere co-operation.

The attendance at all of the sessions of the Electric Vehicle Section have been very gratifying. In fact, it has been greater than was expected, due, of course, to the fact that there was a greater number of delegates to be drawn from. This feature is one of the great advantages of the merger with the National Electric Light Association. It saves many delegates the loss of time in attending two conventions and brought to the sessions some that were not in a position to attend separate conventions. Their presence and their counsel have given added impetus to electric-vehicle promotion.

WORK OF THE COMMERCIAL SECTION.

BY J. F. BECKER
Chairman, Commercial Section.

The Commercial Section program of the thirty-ninth convention of the National Electric Light Association has presented to the delegates subjects of no little importance. The general interest and discussion created by the reports of the standing committees indicate that the enthusiasm and interest of these activities are appreciated by the membership. The accomplishment of the revision of the Salesman's Handbook as presented by that committee gives to the members a properly indexed encyclopedia on electrical salesmanship data which is invaluable.

The interest and discussion created by the report of our Lamp Committee indicate the necessity of devoting an entire session to this important subject at our future meetings.

The report of the Committee on

J. F. Becker.

Ranges necessitated parallel sessions, at which there were present over 200 delegates, the presentation and discussion of the report occupying the entire afternoon.

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The subjects presented by the Power Sales Bureau were of considerable interest and developed considerable discussion, particularly the paper, "Resistance Heaters as a Load Builder," presented by E. F. Collins, of New York. The discussion on this paper indicated the necessity of appointing a committee for further investigation of this subject, the report to be submitted at a later meeting. The entire subject of electric heating, furnaces, welding, etc., has created considerably more interest than heretofore, and the fact that these subjects are now being presented to our membership indicates the possibilities for the growth of this class of business.

Presentation of the paper on "New Industrial Applications for Electricity," by Philip Torchio, of New York, indicates strongly the inclination on the part of the operating engineers of our central-station properties, together with the engineers of our larger manufacturing interests to co-operate with the commercial men in the study of developing applications for electricity hitherto unknown. With this interesting action on the part of prominent engineers it would seem that the Commercial Section has an opportunity for co-operative work, and arrangements should be made in the appointment of committees for consultation with the Technical Section on a subject of this character. This report also points out the necessity of education of the consulting engineers acting independently of the central-station interests, and who generally through lack of knowledge of central-station conditions and rates recommend isolated plants. With co-operative work with our engineering friends a process of education of this profession might be inaugurated.

The Lighting Sales Bureau presented for the consideration of the members interesting developments of electric lighting. This is particularly true of the lecture rendered by William A. Durgin, of Chicago, under the heading of "Lighting—A By-Product or a Buy Product." This practical and masterly rendering of an important subject was the most practical thing presented during the sessions of the Lighting Sales Bureau, and we feel that we are to be congratulated in having secured Mr. Durgin.

TECHNICAL AND HYDRO-ELECTRIC SESSIONS.

By H. H. SCOTT
Chairman, Technical and Hydro-Electric Section.

The usual interest which is manifested in the meetings of the Technical and Hydro-Electric Section was in much evidence this year and perhaps to a greater extent than at any previous convention of the Association. The attendance was most gratifying at each of the four sessions and the discussion brought out many points of vital interest.

Perhaps the most important feature of the entire convention from the standpoint of the Technical Section was the address by Henry J. Pierce, of Seattle, Wash., entitled, "Water Power Legislation," which dealt with the need for legislation which would encourage the development of water-power projects.

The report of the Committee on Prime Movers, presented by I. E. Moultrop, of Boston, was another interesting and important feature of the convention. The recommendations for standard practice embodied in this report cannot fail to be of great value to

H. H. Scott.

the industry. Likewise, the report of the Committee on Underground Construction, by E. B. Meyer, of Newark, which deals with the latest practice in this class of work brings out much that should be of permanent benefit.

The report of the Committee on Power Supply for the Electrification of Steam Railroads, presented by Peter Junkersfeld, Chicago, makes some important recommendations that should materially aid central-station companies in working harmoniously with the railroads, looking to the ultimate supply of energy for the operation of steam trains.

THE 1916 EXHIBITION.

BY J. W. PERRY.
Chairman, Exhibition Committee.

The exhibition maintained by class D members was notable this year, par-

J. W. Perry.

ticularly for the display of electric vehicle, electric-cooking ranges and electric-flag signs. Attention being given to electric cooking by central-station companies has resulted in great development in the manufacture of electric ranges and cooking appliances and this feature of the exhibition was accorded considerable attention. In nearly every case actual demonstrations of electric cooking were made by the manufacturers.

The use of the Auditorium Theater afforded opportunity for decorative effects unusual for such an exhibition. The regular lighting of the theater was supplemented by numerous high candlepowered lamps which formed a part of the exhibition.

In view of the activities of the Accounting Section of the National Electric Light Association, a number of manufacturers of machines used in accounting, such as tabulating, bookkeeping and billing machines were displayed for the first time, indicating the importance which is being attached to efficiency in this field.

As a graceful appreciation of the presence of distinguished visitors, Secretary McConnaughy made use in the exhibition hall of the largest American flag ever made. It measured 60 feet by 90 feet and was lowered at frequent intervals from the ceiling of the hall to the floor, extending the full width of the hall.

Considering the short space of time given the Committee for arranging the theater for the exhibits and in view of the fact that a false floor was laid over the entire theater above the seats, it is with considerable satisfaction that we report that we were able to complete all arrangements in less than 48 hours. It is also unusual on such occasions to be free from complaints which was the case at this exhibit.

ACCOUNTING SECTION ACTIVITIES.

BY FREDERICK SCHMITT
Secretary, Accounting Section

A conspicuous feature of the Section meetings was the attendance by representatives of the Interstate Commerce Commission and the various Public Utility Commissions, who took prominent part in the discussions following the presentation of papers and reports, especially the report of the Committee on the Classification of Accounts. The ability of the Accounting Section to create a common or neutral ground on which the various related interests could congregate and discuss matters of mutual interest in itself more than justifies the existence of the Accounting Section.

The first year's work of the Accounting Section had been admirably laid out by Chairman Edwards, each Committee having some prescribed duty to perform, and very definite progress toward creating uniformity in accounting practice throughout the entire electric light industry was accomplished. In addition to the valuable committee work, numerous requests were received from member companies for assistance, which was promptly and satisfactorily rendered. The need of a comprehensive correspondence course in accounting was early noted, and as a result of an excellent paper on this subject the Executive Committee was authorized to create and offer during the year an accounting course available to all members of the National Electric Light Association. It is indeed difficult to overestimate the value that would result if all accountants associated with the electric industry could through this accounting course be familiarized with what is regarded as the best practice in this important branch of the industry.

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Abstracts of N. E. L. A. Papers and Reports

A Brief Digest of the Literature Presented at the Thirty-ninth Annual Convention of the National Electric Light Association at Chicago, May 22 to 26—General, Commercial, Technical and Hydroelectric, Electric Vehicle, Company Section and Accounting Sessions

General Sessions

Report of Committee on Progress.

BY T. C. MARTIN.

The report deals as usual with the general conditions of the industry and furnishes a variety of statistics as to its present development in the United States in plants, investment, earnings, etc. Some foreign data are given also. This is followed by a section on steam generating plants and apparatus (hydroelectric plants and long-distance transmission being dealt with separately in Part II). Then comes a section on lamps and lighting, arc and incandescent, and special features, followed by a few pages on sign lighting. The next section is devoted to electric furnaces and industrial heating, while in natural sequence comes a discussion of advances in domestic electric cooking and heating and devices therefor. The succeeding division of the text deals with miscellaneous industrial motor applications. Electricity on the farm and in rural communities next receives attention. A chapter is given up to the electric vehicle. The final section deals with relations with employees and others.

Report of Committee on Relations with Educational Institutions.

The Committee on Relations with Educational Institutions has maintained the same organization which prevailed during the preceding year, and has carried on its work in the same manner. Two most interesting meetings of the general committee have been held, one of them a meeting of the members of the committee only, and the second a joint meeting with the Public Policy Committee. Some interesting data were presented by the subcommittee devoted to finding summer employment for students which, as a part of its work, had conducted an inquiry regarding the students which had been employed by the central-stations during the past summer. While some of the information obtained was a little surprising, in the main it was found that these under-graduates from the engineering schools were most acceptable employees, and apparently had been employed with direct profit to the companies as well as to the students. In the appendix will be found a tabulation, in condensed form, of the information gathered from the various companies. There was a very considerable amount of discussion on the best way of bringing about a thorough understanding between the professors and students on the one hand and the public-utilities on the other, as to each other's views and attitude. The Committee has given much consideration to the advisability of having an interchange of lectures between prominent representatives of the universities and the utilities, but it was pointed out that, especially in university life, there were so many matters of varied interest presenting themselves all the time that it was very difficult to get together any very representative body to listen to a lecture, unless it was by some very well-known and much advertised person. In view of this, it was thought that perhaps more could be accomplished in the way of affording the students opportunity to keep posted on what the utilities were doing and how they conducted their work by arranging so that popular graduates, now employed by the utilities, who had not been out of college long enough to lose their acquaintance, should be the ones to go before the college bodies and deliver the contemplated course of lectures. In the discussion which took place, the same idea previously expressed was again brought out, that not only was it most desirable from the standpoint of the interests of both the utilities and the colleges to offer an opportunity for employment of students during the summer months, but that many of the college professors would be very glad to devote their summers to work in the utility organizations, provided it could be arranged on some basis that would afford them an opportunity to get, in a short time, a rather broad view of the work of the company, and to get the atmosphere indicating the company's general policy and its attitude towards its customers, the public, and its employees.

Report of Committee on Company Sections.

During the progress of the year's work of the Committee on Company Sections many radical ideas and serious complaints were received from a large number of Class B members. A careful study of these difficulties was made and the Committee has endeavored to evolve some recommendations which are designed to convert any existing feeling of dissatisfaction among the Class B members into one of progressive enthusiasm. The Committee has arranged for two Company Section sessions during the convention at which a program of seven papers describing methods of conducting various branches of the activities in company sections will be presented. The expense of printing almost 100,000 copies of these papers did not seem warranted until this branch of the Association's work was better established. Those Class B members attending the Company Section sessions will receive copies of the papers, or they can obtain them in advance from the official of their company who will represent the company at the convention. Every member of the Association should enter into the discussion of this report. This can be done by active discussion in the sessions or by sending written discussion to the chairman of the Committee on Company Sections.

Report of Committee on Industrial Ap-

The Committee calls attention to its Interim Reports on methods of taking orders for service and on rates for farm service with particular reference to payments for line extensions. It notes the continued usefulness of filed rate schedules of member companies and of *Rate Research* published weekly and asked for a wider use of the latter publication. As to types of rates, it is noted that the earlier recommendations of the Committee are having increased acceptance, and a special recommendation is made that rates should be so formulated. Under the head of "Rate Theory" the Committee presents dicta of the Supreme Court of the United States, and of the Public Utilities Commission of Maine, as illustrating and confirming past statements of equities and economics by the Rate Research Committee which have been made the subject of criticism. The Committee also comments on the Inter-Mountain rail rate case before the Interstate Commerce Commission and on three decisions by State Commission as showing the development or application during the past year of important rate theories. As an example of bad theory the Committee discusses the faulty rate method of the Cleveland "three-cent" municipal plant.

Opinions are expressed as to the value of a minimum charge in rate making for residential service and as to the proper use of controlled flat rates; and the suggestion is made of a modified billing method as tending to possible reduction of customer costs. The Committee concludes that progress has been made during the past year in the recognition of correct rate theory and in the standardization and wider use of correct rate forms.

Report of Committee on Geographic Sections.

A report of the first year's work of a new committee in a new field of activity. The report of the Committee is important in that it is the first step toward the formation of a National Public Utility Association with the National Electric Light Association as a nucleus. Among other important recommendations the Committee urges the extension of membership privileges in Geographic Sections to public utility companies other than central stations, and also the extension of Geographic Section convention privileges to employees of such other public utility companies. A summary of the Committee recommendations is published on page 19 of the printed report.

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Commercial Sessions

Report of Publications Committee.

The report shows a gratifying increase of approximately 13 per cent of the Class A members subscribing to the Commercial Section literature. The Christmas booklet prepared by the Committee had a very large sale and met with such success that 240,000 copies of this publication were sold. This is the largest sale of any single publication of the Section. A house-wiring booklet was issued and met with very excellent success, but because of the condition of the paper market, the Committee was able to issue only one edition for lack of paper. In spite of adverse conditions, the work had a sale of more than 137,000 copies and the Committee was obliged to refuse orders for 15,000 more. The report closes with a recommendation that the Section have at the general office a paid representative who shall have charge of Commercial Section publications, their preparation and sale, and other incidental work.

Report of Salesman's Handbook Committee.

The Electrical Salesman's Handbook Committee reports the publication of a third edition of the Handbook with some radical changes and a large number of additions, bringing the material down to date. A new and comprehensive system of indexing has been adopted, under which additions or subtractions may be readily made, retaining useful matter without confusion or repaging. Especially valuable additions have been made to the Lighting and Vehicle Sections. All half-tone cuts are printed on a specially surfaced paper, showing pictures to much better advantage. The Handbook includes sections on salesmanship, lighting, power (with a steam heating appendix), electric heating and electric vehicles. To all new members a desk file and pocket binder have also been issued. Six thousand copies of the new Handbook have been printed. The Handbook Committee, now technically a sub-committee of the Publications Committee, suggests that it will be in the interests of efficiency to have it organized as a separate committee under the Executive Committee of the Commercial Section.

Report of Committee on Wiring.

The Committee reports that it has accomplished two preliminary steps. First, the manufacturers in general have agreed on a classification of plugs and receptacles as to size, with a limit between the small and large sizes at 660 watts. Secondly, the National Electrical Code now clearly recognizes that several receptacles of 660-watt rating or less may be connected to a single branch lighting circuit, just as several sockets may be connected, even if the sockets are of 250 or 660-watt rating. The requirement that each receptacle must have a separate socket is now clearly not a part of the Code, although it may be a local requirement. Distinct progress has been made toward some general agreement on type and dimensions, although the attitude of some manufacturers makes it inadvisable for the Committee to offer any formal recommendation at this time. Progress along the line of concentric wiring has been slow, but chiefly because of delay in getting wire and fittings for field experience. There seems to be no apprehension that the underwriters will interfere with experimental installations, and when it has been shown that the system is safe, its general advantages will appeal to all users. The Committee anticipates no serious objection from the underwriters, but the manufacturers have been so busy that there has been no opportunity to obtain the field data on solid-neutral panelboards upon which final conclusions should properly be based. The safety code has had consideration, the Committee co-operating with other committees and the interests concerned. An arrangement with Mr. Cushing similar to that of last year for the use of his *Manual on Standard Wiring* has been continued, and will, the Committee is confident, result to the advantage of the Commercial Section. The question of standardization was referred to this Committee jointly with the N. E. L. A. committees, but as the matter was being well handled the Wiring Committee took no formal action except to approve the work. The Committee reports progress on the question of adopting a standard color or distinguishing mark for the neutral or grounded wire; on standardizing the outer end of portable cords; and on standardizing the connection to electric ranges. The Committee recommends that it be continued, since it is central stations alone that are interested in doing effective work toward reducing the cost to the public of wiring for electric service.

Report of Committee on Merchandising and Recent Developments in Electrical Appliances.

The Committee of 1916 has based its work on what it believes to be a cardinal principle in constructive effort, viz., that the work of each committee should follow logically that of the preceding year and be used as the foundation for the work of the following year. For this reason the Committee this year has simply taken the same general lines followed in previous years, and by the appointment of sub-committees to investigate the different branches of the appliance business, has endeavored to correct and bring up to date the subjects treated in previous. During the progress of its work several unusual matters have been brought to the attention of the Committee, or referred to it, and the Committee states that it is glad to be able to report that in the several conferences with central-station members and representatives of the manufacturers, there has been every evidence of hearty co-operation, and a very earnest attempt to protect the interest of all the parties concerned. Certain of the manufacturers, who are seeking for a more uniform method of publicity in the sale of heating appliances, requested that a sub-committee be appointed to confer with them in regard to the matter. The Committee, finding itself obliged to refer constantly to the merchandising report of 1915, finally obtained subscriptions from member companies in sufficient number to warrant the printing of a new edition, in the hope that every appliance salesman will have a copy and make the fullest possible use of its information.

Report of Committee on Education of Salesmen.

The Committee has confined its efforts to introducing and conducting the correspondence course in commercial engineering, as outlined in the report of last year. This course is intended as a practical commercial course, and the Committee has kept in mind the fact that it is for the education of men now employed by member companies. This course and others to follow are intended to obviate the necessity of special educational departments in most of our member companies, and are being compiled and distributed to the companies at a small expense, with the belief that the Association can and should issue all courses suitable for its membership. The member companies are urged to organize their employees into classes. The benefits of this method cannot be overestimated. This report contains a list of the companies and the number of students enrolled, as well as the states represented in the course. It appears that out of 1,123 Class A member companies we have only 149 companies in the course, and it is apparent that there is still a large number of the smaller companies that have not taken advantage of the course. Where some one person in the company takes an active interest in putting this course before its employees no difficulty is found in obtaining subscribers and in organizing a class. A method which appears to work to the best advantage of all parties is for the company to advance the $12 cash price, which price is returned to the company by the employe in monthly payments of $2. It is recommended that the educational work be so standardized as to make it a simple matter to add special correspondence courses for any branch of the business for which there appears to be sufficient demand. The proposed Course No. 1 is intended to give the student a fundamental knowledge of magnetism and electricity, by which he can acquire sufficient foundation to carry on any of the other special courses which are adapted to the work in which he is engaged.

The Way to Make a Salesman.

BY EARL E. WHITEHORNE.

This paper presents in a forcible manner some of the qualifications of the central-station salesman and discusses the general attitude and point of view he should have of his work and its excellent possibilities. One of the first things he should realize is that he is in business for himself for, being connected with a growing industry with splendid possibilities, he should make it his business to be a big success. The author touches on the imperative need for the salesman to have spirit and potential, as well as training, and he summarizes his qualifications as a sort of decalog: (1) good impression, principally a matter of clothes and face; (2) necessary general and special knowledge to secure the interest of the prospect; (3) personal contact, influence and acquaintance in the community; (4) ready command of all arguments and data of what he sells; (5) determination to secure the order at the first call, if at all possible; (6) self-confidence and willingness to take responsibility without calling in special assistance; (7) aggressiveness

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in developing new business on his own initiative; (8) maintenance of friendly relations with former customers and readiness to sell further service; (9) co-operation with electrical contractors, dealers and other electrical interests; (10) co-operation with his fellow salesmen.

Report of Lamp Committee.

In the introduction the work of the Committee is briefly reviewed. Lamp sales are shown to have increased by 10 per cent over 1913, with which year comparison is made because of disturbed conditions during 1914. The general trend of lamp sales may be clearly determined by reference to table and curves presented, Mazda sales being four times the combined sales of all other types. The higher efficiency lamps now practically dominate the field and the fact is emphasized that carbon lamps have dropped to 5.3 per cent and the gem to 15.68 per cent of the total sales. Tables 2, 3 and 4 set forth other comparative details. Miniature lamp sales aggregated over 1,000 000 in 1915. Under "Development" is covered progress made by manufacturers during the year—largely refinements in manufacture. The introduction of 50-watt Mazda B and 75-watt Mazda C lamps is reported, as is also the introduction of a line of Mazda C lamps from 220 to 1,000 watt for service on 220-250-volt circuits. The dates of commercial introduction of all sizes of Mazda multiple lamps, original list price and reductions made to date are illustrated. Fixture development, which is reviewed briefly, includes little that is radically new. Applications of incandescent lamps, particularly the type C, are touched upon, and the necessity explained for careful supervision of customers' lighting equipment, a number of examples of good and bad application of the new units being illustrated. Under the heading "Bureau of Standards," is reported co-operation with the Bureau and other committees of the Association on the subject of incandescent lamps and related questions. The proposal to rate lamps in lumens instead of candlepower is treated, the Committee endorsing in principle the universal adoption of the lumens as the unit of light flux. Regarding standard operating voltage, in view of the diverse interests involved, the appointment of a special committee to deal with the subject is recommended. Municipal street lighting is reviewed, with particular reference to the application of the Mazda lamp, a summary of information furnished by more than 25 per cent of member companies being presented. Fig. 24 indicates strikingly the downward trend in the cost of electric illumination over a period of nearly 20 years. The report concludes with a chapter on company lamp policy. The Committee finds that in no branch of the electric lighting business is the customer and public better informed than on incandescent lamps. It is generally agreed by member companies that they should control, for the protection of their customers, the lamp situation in their respective communities by whatever plan that may seem wise according to local conditions.

Report of Electric Range Committee.

Electric cooking has been demonstrated to be successful and should be pushed by a large majority of central stations. This report deals with some of the problems involved in rapidly developing electric cooking. National advertising campaigns in publications that reach the housewife should be vigorously pushed; these should be supplemented by special advertising on the part of the central stations. Fairly satisfactory types of electric ranges are on the market; the central station, at the start at least, will have to push the sale of ranges. It is absolutely necessary for the manufacturers and the central stations to co-operate on questions of design, construction and the merchandising of electric ranges. Each central station will have to adopt the form of rate which adapts itself to existing rates. Household cooking and baking in restaurants, bake shops, etc., can be profitably handled on a three-cent rate; cooking in hotels, etc., requires a somewhat lower rate; water heating requires a rate of one cent per kilowatt hour or less. Central stations must prepare to heat water electrically for a considerable number of their electric cooking customers; present types of electric water heaters are efficient. storage of hot water is generally very inefficient; a beginning only has been made in the solution of the water heating problem.

Central-Station Service in the Manufacture of Ice.

BY C. J. CARLSEN.

Comparatively few people have even a slight conception of the enormous proportions of the ice industry in this country. The Census Reports for 1914 (not yet compiled for 1915), giving returns from 3,068 ice manufacturing establishments, show an output for the year of 20,628,678 tons of artificial ice, valued at $62,314,055. Figures for natural ice are proportionately much greater. For the Chicago territory alone, the natural ice handled for the season of 1915 was about 1,250,000 tons, and for the Hudson River territory, for the same year, 1,520,620 tons. Weather conditions make harvesting of high-grade natural ice an uncertain venture and the tendency is towards manufactured ice, with its great possibilities for central-station service. Storage houses for natural ice, when destroyed or depreciated, are seldom rebuilt, and this is strikingly shown in the records of storage houses for the Hudson River territory. For the year 1900, this territory had a natural ice storage capacity of 4,791,400 tons and harvested 4,606,800 tons; for the year 1915 this storage capacity had dropped over one and one-half million tons to 3,201,943, with a harvest of 1,520,620 tons. Comparative figures are about the same for the Chicago territory. The subject is covered in a general way, the object being to point out the great opportunities and possibilities for central-station service in this branch of industry as well as to present such practical working data as may be of value to prospective ice manufacturers and manufacturers of ice-making machinery and equipment, as well as to central-station interests.

Report of Committee on New Industrial Applications of Electricity.

The report is presented as an introduction to the discussion of the subject as to whether the Technical and Hydroelectric Section should or should not participate in the work of the Association in the study and discussion of new applications of electricity. It points out the necessity of avoiding duplication of work of existing committees within and outside the Association. It calls attention to a field of usefulness, first, in gathering, studying and disseminating technological information upon new or untried processes and applications of possible interest to central stations, and, second, in giving professional engineers, through joint society and committee meetings, papers and discussions, a better and fuller understanding of the economic relation of the central station to the industrial developments in the territory served.

Report of Committee on Industrial Electric Heating Bureau.

Industrial electric heating is defined as any application in which direct conversion of electric energy to heat energy is the desired result. The development of industrial electric heating is then briefly given with considerations of the effect of energy cost upon the cost of product. Attention is called to the fact that energy cost is very often a very small part of the total cost of industrial processes and that the use of electric heating often reduces these other costs to a great extent. As an indication of the extent to which electric heating is now used industrially it is stated that the four companies now represented on the Committee have a connected industrial heating load of between 60,000 and 70,000 kilowatts. The more prominent advantages of electric heating are then enumerated and this is followed by a discussion of the methods available for taking full advantage thereof. A plea is made for the safe and sane development of this field by making adequate studies of every process which it is desired to electrify before actually doing so. The Committee then recommends the appointment of sub-committees to accumulate data in a number of named industrial heating fields and the appropriation of a sufficient sum to defray the expense of collecting and disseminating such data. An appendix gives an approximate list of present day applications of electric energy to industrial heating problems.

Report of Sub-Committee on Commercial Aspects of Municipal and Highway Lighting.

LIGHTING SALES BUREAU.

The report emphasizes the fact that general street lighting is a "good-will" asset and shows that the revenue from this source can be increased by keeping in close touch with municipal authorities and civic organizations, offering direct and indirect co-operation in regard to improvements in street lighting. The committee recommends that central stations maintain close relationship with all ornamental street-lighting movements and the report mentions the different methods of securing funds for such systems, recommending that the central stations should control these. Highway lighting to be paid for by state, county or township authorities is being neglected and the committee points out the possibilities for development and recommends that central station companies interest their local good road and automobile clubs in the lighting of highways in their territory.

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Report of Sub-Committee on Industrial and Yard Lighting.

LIGHTING SALES BUREAU.

This report covers 12 primary sections each of which has one or more subdivisions. The introduction is an explanation of the purpose of the report and presents figures and statistics to give an idea of the size of the field to be obtained. Under the "Method Used to Obtain the Industrial Load," is given the general practice of various central stations in their campaigns to obtain factory lighting. The methods of three industrial companies are discussed in detail. Some feature of one or more of these methods is used by all central stations in making an industrial campaign. The "Design of Industrial Lighting Systems" covers a discussion of the types of lighting, intensities, distribution, reflectors and calculations as well as specifications and recommendations for lighting installations. Under "Lamps Used," is a discussion of the various illuminants that can be utilized to give desired results. In "Data Upon Typical Installations" the committee has attempted to assemble photographs and statistics from as many different classes of industry as possible. The photographs selected show illumination by various types of units and give some idea of the final results that can be obtained if correct lighting is installed. Under "Arguments for Good Lighting," the report advances the principal arguments held by salesmen to show why good lighting is advantageous and should be installed. This discussion includes the effect of illumination on efficency, accidents, spoilage decrease, increased output, increased accuracy, better inspection, reduction of eye strain, improved working conditions and improved inspection. "Load-Factors" show the desirability of the lighting load to the central station and how by its use the load curve of the station may be brought more nearly to a straight line, thus raising its load-factor and using for a longer interval each day the capital tied up in machinery. "Maintenance" shows by figures and curves why a system should be kept in first-class condition when once installed. "Color Value" covers the arguments and reasons for using a color-matching light in many industrial pursuits. The second general section of the report deals with yard lighting. The lighting of railway yards is given considerable space, due to its importance. Discussion of existing conditions as well as recommendations and requirements for good lighting is set forth. Other yard lighting includes the lighting of playgrounds, beaches, building construction, tennis courts, trap shooting and other outdoor sports, police protection, ice cutting, etc. The "Lighting Code" is a discussion of the policies followed both abroad and in the United States, in legislating for the illumination of factories, and gives extracts from certain codes including the one prepared by the Illuminating Engineering Society. The committee has attempted to cover in this report general specifications for industrial and yard lighting. It cannot be hoped to cover adequately so large a field in a first report. It is hoped that the report will serve as a basis for subsequent work upon these lines.

The Resistance Heater as a Load Builder.

BY EDGAR F. COLLINS.

This paper deals principally with the applications of electric heat to industrial processes that require temperatures not over 950 degrees Fahrenheit. Three different types of units are suitable for this purpose; these are the air heater, the hot-plate or imbedded unit, and the immersion heater; each of these is described and illustrated. The author recommends automatic electrothermostatic control. A comprehensive table of common industrial applications of electric heating requiring less than 1,000 degrees Fahrenheit is given. It gives the temperature range, type of heating best adapted for purpose, and best method of control. Several heating processes are described and the advantages of electricity therefor pointed out. The disadvantages of coal and gas-heated ovens are also set forth; these are all overcome by electric heating.

Report of Sub-Committee on Sub-Surface, Municipal and Other Construction.

POWER SALES BUREAU.

The use of electricity for all construction operations has grown to be an important part of the central station power load. In this report an attempt is made to describe the manner in which electric motors have been applied for some large undertakings, and figures are given showing the amount of current used for various operations. As the starting and operating characteristics of large motors will be of importance in designing supply lines, test results are given in a number of instances.

Report of Sub-Committee on Electric Furnaces.

POWER SALES BUREAU.

This report reviews the present status of the electric furnace, particularly the electric steel furnace, and tables are given showing the size, type and other data relating to furnaces in operation or under construction in this country and Canada. Some operating cost data are given for electric steel furnaces. Brief reference is made to the electric furnace for non-ferrous metal melting, and forging ovens, as well as a large furnace operated by a central station to improve load-factors and act as "load regulator."

Report of Sub-Committee on Competitive Power Sources.

POWER SALES BUREAU.

This report deals with the characteristics of various prime movers, which are available as power sources competitive to central-station service. Only the newer and more efficient types are considered, such as the Diesel and semi-Diesel oil engines, the gas engine as operated with producer gas, the locomobile steam unit and the uniflow and poppet-valve steam engines. Certain data are given bearing upon the cost of installation and operating costs of these engines. Their importance as central station competitors is discussed, showing certain advantages and disadvantages of each type.

Report of Sub-Committee on Residence Lighting.

LIGHTING SALES BUREAU.

This report treats the subject of residence wiring strictly from a sales standpoint, recommending the adoption of sales methods that have proved successful in other lines of merchandising. A brief outline is given under the head of possibilities, showing by statistics just what the opportunities are in this business. Under the head of campaigns, the report covers many talking points, enumerates various methods of securing business and illustrates several successful campaigns. It covers the cost and plans of campaigns with a complete outline of several that have proved successful. The relation of the electrical appliance to the securing of residence business is clearly shown, including numerous talking points on this phase of the business; advertising also is touched upon emphasizing the advantage of offering bargains in this work. Several particularly clever advertisements are reproduced as are representative form letters, booklets, etc. Due consideration is given to the relation of the contractor with the central station, bringing out steps that have been taken toward closer co-operation. Facts, figures and experiences given in this report should be valuable to central stations planning a residence campaign.

Report of Sub-Committee on Lighting Stores and Public Buildings.

LIGHTING SALES BUREAU.

This report presents the importance of the lighting salesman's work; also the necessity for his keeping in close touch with commercial affairs and commercial organizations. The value of illuminating engineering advice from a new-business point of view, as well as the necessity for keeping fully informed on civic matters as well. The relation of the lighting salesman to the appliance department. The report considers further the methods of securing store business and improving the installations of present customers. It presents the general practice in securing properly lighted windows, both from those customers who are using competitive illuminants and those whose windows are improperly lighted with electric light. It calls attention to the fact that show-case lighting and the use of interior signs have not been pushed to the same extent as other details of the installation. The value of illuminating engineering service in planning the lighting of public buildings is emphasized, particularly from an advertising point of view. It is further pointed out that the central station has a field in the proper illumination of buildings under construction. In connection with all these points, the committee presents the importance of correlating the salesman's efforts with those of the advertising department and the necessity of keeping in touch with both the subject-matter of advertisements and the time that these are to appear.

Report of Sub-Committee on Electrical Advertising.

LIGHTING SALES BUREAU.

The report treats of the various forms of electrical advertising and the relation they bear to the central station. Considerable attention is paid to flood lighting on account of it being a comparatively new form of electrical advertising, and numerous photographs are included to show striking forms of this new kind of lighting. Flood lighting is being put to various uses, namely, for billboard and bulletin board lighting, for public buildings, monuments, fountains, rifle ranges and gun clubs, for construction work at night, for winter sports, such as skating rinks where the ice surface can be made as light as day without the use of poles, for pageants, theater and hotel fronts and in fact for innumerable purposes. The report illustrates the type of projector to be used as well as how to place it, and sufficient data are given to enable the central station to become thoroughly acquainted with flood lighting and its uses. The report dwells at some length on the subject of the electric American flag.

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Central stations are contributing in no small degree to the campaign for preparedness by putting Old Glory out in blazing lights. The electric flag campaign was started in Toledo and a brief outline of the methods used in putting up the signs in this city is recorded. The electric flag campaign should not be confused with electric advertising for there is no advertising feature in it. It is a national movement backed by the central stations to incite civic pride and national patriotism by lighting the stars and stripes of the flag. The report makes several important recommendations in treating this, the most important branch of electrical advertising. First, that central stations so far as possible make term payment propositions to their customers; second, that central stations keep all signs relamped and maintained under a flat rate, for dusk to midnight burning; third, that central stations have one or more electric signs of their own; fourth, that central stations give special effort to factory signs. The report recommends to central stations that they agitate the slogan sign as it is good publicity for the city and a powerful electrical advertisement. In conclusion, the report deals with the results of investigations made by central stations on roof signs, bulletin and billboard lighting, outlining and other forms of electric advertising.

Report of Sub-Committee on Electric Welding.

POWER SALES BUREAU.

The report briefly presents an historical outline of electric welding and describes the various processes now in use. The field for its use, the general features from the standpoint of the central station and the comparative costs for various work are briefly dealt with. The major portion of the report consists of a compilation of data similar to that now contained in the *Salesman's Handbook* for other types of machines. The strength of welds made electrically has not been discussed. This and other similar details have been left for future papers. The report concludes with a bibliography of 84 references to articles and books on the various phases of the subject.

Report of Committee on Industrial Applications of Electricity.

The report is an introduction to the discussion of the subject as to whether the Technical and Hydro-Electric Section should or should not participate in the work of the Association in the study and discussion of new processes and new applications of electricity. It points out the necessity of avoiding duplication of work of existing Committees within and outside the Association. It calls attention to a field of usefulness. (1) In gathering, studying and disseminating technological information upon new or untried processes and applications of possible interest to central stations, and (2) in giving professional engineers, through joint society and committee meetings, papers and discussions, a better and fuller understanding of the economic relation of the central station to the industrial developments in the territory served.

Technical and Hydroelectric Sessions

Report of Meter Committee.

This report deals principally with a description of recently developed instruments and meters and with methods of testing instrument transformers. The testing of meters with portable batteries is described. Standardization of design and maintenance method is recommended for instrument transformers. A lecture on meters, with lantern slides, has been prepared for use in meetings of company sections. An addendum to the "Electrical Meterman's Handbook" has been compiled, bringing it up to date.

Report of Committee on Electrical Measurements, Values and Terminology.

The Committee unanimously recommends the abandonment of the horizontal candlepower as the basis of the luminous rating of lamps and the adoption of the total emitted lumens. It recommends that the *Transactions*, bulletins and all other publications of the Association be edited in exact accord with the terminology reports already submitted by the Committee and approved by the Association. It recommends that all references in the publications of the Association to English units of measure be followed by their metric equivalents in parentheses. The Committee also submits a list of abbreviations and guides for style in text and tables with the recommendation to the Executive Committee of the Association that it be transmitted to all of the leading engineering societies and technical publications in America.

Lightning Protection for Transformers On 4000-Volt Distributing Circuits.

BY D. W. ROPER.

The paper gives the result of an investigation made for the purpose of finding and removing the causes of interruptions to service, due to lightning, on the 60-cycle distribution system in Chicago. As a result of this investigation the following changes in practice were made: (1) Transformers were purchased without primary terminal boards. (2) The terminal boards were removed from all transformers already installed, as fast as these were returned from the line to the storeroom in connection with changes made on account of increased capacity, or for other reasons. (3) All lightning arresters were moved from line poles to the transformer poles and additional arresters were installed on transformer poles, so that in 1915 there were about 9,300 transformers protected in this manner and about 6,300 transformers without arresters. Records of troubles are given which show that the burnouts due to lightning have been reduced from about 1.2 per cent to 0.25 per cent, and the transformer fuses blown by lightning have been reduced from about 15 per cent to 1.2 per cent per annum. The financial results of the investigations are given, which show that the saving in repairs due to the installation of lightning arresters will alone not warrant the arresters, but that the installation of the arresters is of advantage on account of the great improvement in service. Suggestions are given for the guidance of others who are desirous of improving their service during lightning storms.

Report of Committee on Underground Construction.

This report is a collection of material showing the practice of the large companies, treated under different headings.

Underground Alternating-Current Distribution.—Primary fuse boxes in which the fuses are immersed in oil have been developed and are in satisfactory operation. Manhole oil switches are used by a number of companies up to 10,000 volts. Transformers operating in multiple have proved a valuable means of safeguarding service and relief plugs on transformers seem to be unnecessary. Junction boxes are used by most companies to sectionalize the cable system.

Stone Conduit.—Conduit made of limestone screenings and Portland cement is used by one member company. This company has installed about 10,000,000 feet of stone conduit and reports that while it has had a number of severe burn-outs of high and low-tension cables, it has never had a single case in which the trouble has been communicated to other cables through the duct walls in the same stone conduit.

Building Manholes in Quicksand.—The building of manholes in soil where the water level is only two or three feet below the street surface has been accomplished by means of a modified open-caisson type of construction. In the building of such manholes the labor cost is about double that of the ordinary manhole.

Use of Trucks.—Of the twelve companies reporting nearly all use electric trucks for their cable work. In pulling in cable some companies use I-beam uprights in the manholes and others install cable by means of a pulley or snatch-block anchored in the manhole. Lighting facilities for work at night are recommended on trucks. A portable storage-battery lighting outfit is most desirable for lighting manholes while making cable repairs at night.

Cable Jointing.—There has been placed on the market a new type of cable-insulating form made of thin sheets of mica. In this type of joint, porcelain spacers are used to hold the conductors in place. This type of joint construction is used by two companies on emergency work on account of the reduced time required to make repairs. No tests or actual experience on feeders operating at over 16,000 volts are yet available. For 25,000-volt service a new type of joint made under a vacuum process has been developed. In this joint a wire gauze is used over the insulation. The sleeve in this type of joint is filled with a fluid compound the same as that used for impregnating the cable. Cables in which this type of joint has been used have been in operation for about seven months and no failures have developed in the joints. Two companies report a considerable advantage in putting up the material for cable joints in unit packages. The packages are prepared at the cable factory and the insulating material is made up and laid in cans in the order required to make up the joint. As the exact quantity of material required is sent out in each package, more uniform joints are secured. There is also considerable saving in the storeroom, as these packages can be more quickly and easily handled when delivered.

Testing Cables.—A portable instrument to measure direct current in single-conductor cables without opening the circuit has been used by a number of companies. A new method of trouble hunting is employed by several. A megohm test on Edison feeders has been found advisable as a check on the insulation of low-tension feeders. It is believed that where trouble is experienced due to moisture,

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the fault lies either in the joints or in faulty sheaths.

Other subjects treated are cable tunnels under rivers, manhole cleaning, tagging of cables, pole connections from underground systems, cooling of duct lines, and special apparatus.

Report of Committee on Overhead Lines and Inductive Interference.

The report consists primarily of a review of the year's developments in connection with public regulation of line construction. The various movements in this direction are of the greatest significance to the industry. The most important element is the National Electrical Safety Code, which, after nearly two years' work by the Bureau of Standards, is to be submitted for final discussion at a conference in Chicago during the last week in May. The Safety Code, while it will undoubtedly tend to eliminate improper construction, embodies in its present preliminary form material increases over present practice, and its possible influence in increasing construction costs and hindering development is viewed with apprehension. The work of the National Joint Committee on Overhead and Underground Line Construction has been suspended pending completion of the Safety Code. The State Commissions in Pennsylvania, Missouri and Wisconsin, which have been planning to issue orders governing line construction, have likewise delayed action until the Safety Code is available. In California, Order No. 39, issued in August, 1914, has not been called into effect. In Iowa, the Railroad Commission, after a public hearing, has authorized a committee to investigate and report on the subject of rules covering inductive interference, the issue most emphasized being that of interference with ground-return telephone circuits. In regard to inductive interference with ground return circuits, the Committee conducted a poll of its members and without exception no liability was acknowledged for interference with this type of circuit. In Connecticut, the Utilities Commission has under discussion the issuance of an order making mandatory the joint use of poles on streets and highways for telephone and telegraph circuits, power circuits up to 5,000 volts and electric railway circuits up to 700 volts. In view of the tendency of the various movements toward public regulation of line construction to involve requirements which will occasion increased construction costs, particularly in the case of minor distribution lines serving small loads, the Committee has collected in an appendix data as to the present economic status of these lines. The conclusion is that this class of line is at present unremunerative and that increase in construction cost will seriously restrict the future building of light lines and hence the serving of small and scattered loads.

Report on Hydroelectric and Power Transmission.

BY T. C. MARTIN.

Part II of the Report on Progress deals specifically with hydroelectric and power-transmission topics. It begins with reference to general conditions and summarizes a good deal of legislation which has been in progress during the winter, but which at the time the report was written had not culminated in the actual passage into a law of any of the proposed measures. There is a great deal of miscellaneous information as to hydroelectric development, and the conditions surrounding it, showing the imperative necessity of liberal treatment of enterprise and capital, and the further development of these natural resources. This section is followed by considerable matter as to new water-power plants and systems, although under the present restricted conditions these are relatively few. Some little space is given to a discussion of a few special features connected with apparatus and this is followed by some foreign notes, although here again, it is evident that the expansion of the last few years has relatively been far behind that of the preceding period.

Report of Accident Prevention Committee.

There is a wide lack of appreciation, among members, of the benefits to be derived from accident-prevention work. The movement is practicable and effective. The reappointment of a Commission on Resuscitation is advocated. Trial of the Bureau of Standards Safety Rules is recommended. Specifications for linemen's belts are given. Five appendices give an analysis of accident reports, a discription of safety devices which are recommended, a report of tests of rubber gloves, a systematic plan for accident-prevention work, and a plan for stimulating interest and education in public safety.

Report of Committee on Prime Movers.

Steam Power.—The feature of the past year is the phenomenal increase in size of steam turbines. The Detroit Edison Company has ordered a 60-cycle unit of 45,000 kilowatts (50,000 kilovolt-amperes) from the General Electric Company, consisting of a single turbine and single generator. The Westinghouse Company is building a three-cylinder, two-stage unit of 60,000 kilowatts, with three generators, for the Interborough Rapid Transit Company. There has been a notable advance in the development of turbogenerator units of small and moderate capacity. Condenser development has kept pace with the turbine. The size of the boiler unit is growing and there is agitation for higher steam pressures. Pressures of 300 pounds per square inch have already been reached and 500 pounds is now being considered. Boiler rating needs revision, as the present method is not rational. Coal sampling is considered and various stokers are described.

Water Power.—Tendencies in hydraulic design are considered, also reliability of turbines and their troubles. The difficulties of measuring head on water wheels are mentioned, and an appeal made for a standard method. Appended to the report are articles by J. Harisberger on "Storage Conditions, Manipulation of Storage and Effect on Power-Plant Efficiency of Division of Load Among Units"; by P. M. Downing on "Reliability of Hydraulic Prime Movers and Causes of Shut Down;" and by R. M. Wilson on "Influence of Ice on Hydroelectric Developments."

Gas Power.—There is little or no activity at present in gas-engine and gas-producer work for power purposes, caused no doubt by the improved economy and lessened cost of steam turbines. The development of the heavy-oil engine is very active and much real progress is being made, but the power obtained from one cylinder remains comparatively small. Just at present the builders of these engines are devoting much of their time to marine work. The oil supply has again been reviewed.

Report of Committee on Electrical Apparatus.

The Committee records such success as has been achieved in co-operating with other societies in the standardization of certain details in the construction of electrical apparatus. Further efforts have been made during the year toward securing the adoption of the uniform service rules for motors which were recommended to the Association last year. The Committee has actively co-operated with the A. I. E. E. in furthering the use of the new *Standardization Rules*, and directs attention to certain features of these rules which should be thoroughly understood by purchasers of electrical apparatus. A résumé of the year's developments in the construction of generating and converting apparatus deals with such subjects as alternating-current generators, synchronous converters, phase advancers, transformers, and miscellaneous developments in lightning arresters and switchboard construction and equipment. The present state of the industry with respect to street-lighting service is outlined, with particular reference to the operation of type C incandescent lamps. Following established customs, recommendations bearing on many of these subjects have been submitted by the Committee for the consideration and study of those interested in central-station practice.

Report of Committee on Street Lighting.

The primary purpose of street lighting is to promote facility and safety of movement during the hours when sunlight is not available, and the report is therefore confined to the technical problems encountered in meeting these requirements. The relation of street illumination to artificial lighting in general is pointed out and the historical development of street lighting as a police aid is discussed. The science of illluminating streets is treated under the following heads: Intensity, Distribution and Direction of Light; Glare, Lamp Sizes; Lamp Locations; Fixtures; Recent Installations. A technical description of various systems of distribution is given. In conclusion, the Committee reports that in addition to the foregoing technical matters, it has considered the questions of standard forms of specifications and contracts together with that of costs, but that these matters cannot be made a part of a report at this time.

Report of Committee on Energy Supply for Electrification of Steam Railroads.

The electrification of present steam railroads seems destined to be carried out on a much more extensive scale. At the same time, electricity-supply enterprises are destined to show great expansion in territory served and in output of energy, taking advantage of the diversity-factor. The Committee reviews what has been accomplished in the supply of purchased electrical energy for railway purposes. The Chicago situation is described. Economic reasons why central power companies should supply power for railway purposes are set forth. A curve is given to show the results of the concentration of railway, light and power load in Chicago. Another curve shows estimated power requirements. Electricity-supply companies should plan their work with such far-sightedness that a possible steam-railroad demand could be readily added to the existing business with the minimum of expenditure. The form of equitable contracts for supplying electrical energy in bulk is discussed, and the principal fea-

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tures of existing contracts of this nature are set forth. Reasons for electrification of present steam roads are reviewed.

The concluding recommendations are (1) That member companies operating in cities having railroad terminals should plan well for the future, and put themselves in a position to supply every electrical, industrial and street-railway need, in order to furnish energy most advantageously for the electrification of steam railroads. (2) That member companies, operating along trunk-line railroads having mountain divisions or other divisions of dense traffic, plan to supply every electrical need. (3) That in any electrification project, there must be early and close co-operation between the railroad company, the central power company and the manufacturers, in order to secure the best ultimate results for all parties interested. (4) That the fundamentally sound economic proposition of centralized production and distribution of electrical energy should be applied with the co-operation of experienced judgment and properly controlled imagination, and as an economic matter, not be restricted by municipal or even state boundaries.

Central-Station Electric Systems and Railroad Power.

BY FREDERICK DARLINGTON.

The paper argues for increased centralization of power service. Figures show that less than 25 per cent of the power used in the country is supplied by central stations. The cost of producing power is a heavy tax on industry which can be greatly reduced by drawing more on central-station systems, and depending less on isolated plants. When a larger proportion of the power used in the country is supplied by central-station systems, larger generating plants and improved transmission lines will deliver power more cheaply and more reliably than is now done. Obsolescence is a serious cause of loss with small power plants, but not with large systems. With larger generating plants more extensive interconnection and unification of systems will be profitable. Power companies should be monopolies to prevent duplication of lines, etc., and should be under government supervision as to rates. The public should be educated to the advantages of unified power service and to favor monopoly of control. Railroads should be operated with electric power supplied by the central-station systems of the country. This will result in greatly extending and unifying existing systems and cheapening power. Three types of electric locomotives, the direct-current, the single-phase, and the three-phase, are all standardized to use power from central systems, thus enabling railroads purchasing central-station power to use the best type of locomotive for each particular case. Power from central-station systems will greatly enhance railroad electrification and at the same time the addition of railroad loads will enable the central stations to furnish cheaper and more reliable power.

Electric Vehicle Sessions

Relation of Tires to Efficiency of Electric Vehicles.

BY S. V. NORTON.

Defining the efficiencies of the electric pleasure car and the electric truck, this paper discusses the characteristics of the ordinary solid, the cushion and the pneumatic tire as regards their construction and application for obtaining efficiency under different vehicle and road conditions. Under each type of vehicle the different kinds of tires available for use with it are noted and serviceability outlined. The paper constitutes a very serviceable guide for the selection of tires for different vehicles to meet various conditions. In outlining tire efficiency tests, the different methods of testing are given and commented upon.

The value placed on comfort, reliability, safety, carrying capacity, speed and cost of operation determines the type of tire to be used on an electric vehicle, and as one quality is valued more highly than another the choice will be made.

Industrial Truck Applications.

BY C. W. SQUIRES, JR.

The electric industrial truck has been forging ahead rapidly, particularly during the past three years, because it fills a recognized need for improved methods of handling raw material and merchandise internally. Contrary to what is perhaps a popular belief, the economies which may be affected inside the freight terminal, inside the plant and the warehouse are several times greater than those which may be affected in long haul and road transportation. The one-ton electric will displace the hand truck at a ratio of 15 to 1.

The paper gives an outline of the principal types in extensive use, the "electric stevedore" in lengths of 6 to 10 feet stated as having the most universal use. A short description is given of the electrical and mechanical features of this type. The various fields covered, the adaptations of the truck to local conditions and its possibilities are outlined and illustrated. The specific services for which the electric truck is applicable are so many that its increased use in large numbers is inevitable.

Electric Truck Troubles and Means Taken to Eliminate Them.

BY F. E. WHITNEY.

This paper brings out points in connection with the elements that go to make up the complete electric vehicle, namely, batteries, tires, motors, controllers, ampere-hour meters, wiring, wheels, bearings, springs, lights, warning signals and miscellaneous parts, where troubles have been met and improvements made, enabling the manufacturer to reduce the weight, increase mileage range, and reduce power consumption and maintenance cost. These different elements are taken up under separate heads, present-day practice outlined and suggestions for improvements made.

The advantages derived from a battery-service system are stated, and it is urged that service systems should cover not only battery maintenance but also chassis, body, tires, including painting as well as storage and washing. Experiences in connection with furnishing such service are given, together with advantages to the truck owner, and relations between central stations, manufacturers and garage owners in co-operating to give the service. The plan appeals strongly to the small user of trucks and aids in the sales and popularity of the electric vehicle.

Greater Garage Service.

BY HARRY SALVAT.

Greater co-operation between manufacturers and garage owners for the promotion of the electric-vehicle industry is the keynote of this paper, which presents the garage owners' aspect of the situation.

Manufacturers' inspection of cars, to the detriment of the garage man, and to the irritation of the car owner, results in the latter believing an electric car too delicate and requiring too much attention. Then, too, it is claimed that manufacturers discourage the attempts of the garage owner to sell supplies, taking away the profits of a by-product of the latter's service; also manufacturers do not give commissions on sales when leads are furnished by the garage owner. These tendencies do not exist in the relations with gasoline car manufacturers, the garage owner becomes discouraged with these conditions, together with small returns for electric-car service, and either the business is discontinued or the garage is converted to the care of gasoline cars exclusively, which, in turn, works to the detriment of the car owner and manufacturer.

The solution of these questions lies in co-operation—the creation of friendly relations—between electric-vehicle, battery and tire manufacturers and electric-garage owners, in order to make better conditions prevail in this industry. Another aid lacking, though prominent in reference to gasoline cars, is that of newspaper and magazine publicity.

The paper outlines some of the difficulties encountered in giving garage service and enumerates the character of service given for an electric car in comparison with a gasoline car.

Joint Report of Committee on Operating Records, Garage and Rates Committee.

BY W. P. KENNEDY AND G. B. FOSTER, CHAIRMEN.

The committees have supplemented their previous findings, which have been very complete, with graphic illustrations to bring out the facts and figures already developed. Four graphs have been submitted. The first shows the daily operating cost of commercial electric vehicles for different carrying capacities, as proved normal under the varieties of service this type of vehicle is employed. The second graph gives an indication of the energy consumed in charging batteries in public garages or where groups of vehicles are employed. A second copy of this graph is given, and it is requested that operators record their individual experiences on it, and forward the graph to the committee. The third graph is a method of obtaining the approximate number of commercial electric vehicles that can be garaged on various quantities of garage floor space. A chart showing an analysis of the cost of garaging commercial electric vehicles furnishes a comprehensive list of all the elements

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to be considered. Costs for the elements are given, these being normal in large cities, which, because probably the maximum to be required, are variable.

Battery Service—A Unit in a Comprehensive Plan for the Successful Exploitation of the Electric Vehicle.

BY P. D. WAGONER.

This paper points out that battery service was instituted because of a pressing need fostered by abnormal conditions and is what the title of the paper states. It is part of a plan to bring to a satisfactory basis the central station and the vehicle user and manufacturer. The development of battery-exchange systems, enabling the user to be billed for battery service by the miles covered by the vehicle was the method used to solve the question, and insures continuity of satisfactory operation for the vehicle user and continuity of off-peak energy sales for the central station. That the battery-service system is a success is evidenced by tabulated results on both the small and large electric vehicles. Battery service and battery exchange are different in that the former results to the user in a substantial reduction in truck investment, no charging apparatus or garage investment, unlimited mileage and continuous service from trucks, busy season difficulties and bad roads overcome, relief from care of batteries and a reduction of all items of battery cost, including current, to a definite monthly basis of miles traveled. Which is something more than that resulting from battery-exchange service.

Electric Passenger Vehicle Problems and Activities.

BY E. P. CHALFANT.

Reasons for the failure of the development of substantial growth, both in volume and in prestige, of the electric pleasure car industry during an existence of 16 years are discussed in this paper. The electric pleasure car has not shared in popularity and increasing sales with the gasoline car. This is due to the failure of the manufacturers to properly educate the general public regarding the utility of the electric car, and the failure of the central station to make it easy to own and operate the electric car by an adequate distribution of charging and boosting stations.

The electric of today is practical, economical and efficient, capable of performing 95 per cent of the demands made upon the gasoline car. The remaining 5 per cent is the surplus which sells a million gasoline cars a year. The status of the electric car regarding this surplus is becoming more favorable, such as greater radius of operation, fulfillment of speed demands, sustainment of speed on up grades and cost and ease of obtaining energy for operation.

In educating the public concerning the utility of the electric vehicle, central-station interests must aid the manufacturers with financial and constructive co-operation, and must also lend physical co-operation for the convenience of car owners.

This paper also gives brief discussions on the relations between power station officials and electric-car dealers, local problems, resale of used cars, development of new fields, building up local popularity and the psychological effects of the past history of the electric vehicle.

Central-Station Promotion of Electric Vehicle Use.

BY WILLIAM P. KENNEDY.

This paper discusses questions as to the manner in which the union of the central-station and vehicle interests is to be made of mutual advantage. The query is made whether the electric-vehicle development shall be classified by central stations with their present activities for the promotion of domestic utilities or whether the development be regarded on a par with new business of great magnitude. The latter attitude is warranted by present conditions.

The line of competitive attack upon other types of transportation apparatus can be made on the basis of guaranteeing the superior economy of the electric vehicle, and assuring owners of the low cost of operation by providing a garage service covering the upkeep of the complete vehicle in constant working condition at a flat rate per annum. The central stations have the ability to provide such service and there are many advantages to be gained for so doing. The industry should recognize the temporary opportunity in this particular field of exploitation, to take its cue from the activity of the automobile industry, and add to its revenue by capitalizing upon the change in transportation methods.

Company Section Sessions

The Company and the Company Section.

BY M. S. SEELMAN, JR.

The paper is written from the standpoint of the large company and the large-company employees. It takes the ground that owing to rapid and not too carefully selected increase in numbers many company sections have a considerable percentage of membership which is of little value to the association and which is unable for sufficient reasons to obtain from the National Electric Light Association the worth of its money. It is true that the companies themselves furnish to company-section members educational and entertainment features of value much greater than the fee paid, but this is company activity and should be differentiated from N. E. L. A. advantages. The advantages of Class B membership are set forth and are not considered of very great value to a number of company-section members. The suggestion is made that an Associate Class B membership with nominal dues of $2 be created and that this sum should not include proceedings, bulletin notes, handbooks or other publications, which may, however, be obtained by such associate member at a fixed price cheaper than a non-member. Mr. Seelman says he is not sure that this is the correct solution, but is certain that this is a problem of the association which must be solved.

Financing Company Sections.

BY A. L. ATMORE.

This paper touches briefly on the benefits to be derived from company-section work and discusses the advantages and disadvantages of various methods of financing which are being used to a large extent among the sections as follows:

First.—In which the parent company pays the entire running expenses of the section, basing its annual appropriation for this purpose on a budget submitted by the section at the beginning of each fiscal year—the members paying their N. E. L. A. dues in full.

Second.—In which the parent company pays the entire running expenses of the section, but makes no definite appropriation, the various costs being charged to the company expense accounts as they occur and the members paying their N. E. L. A. dues in full.

Third.—The same as the first method with the exception that the parent company pays one-half of the N. E. L. A. dues of the members in addition to meeting the entire cost of running the section.

Fourth.—In which the parent company pays one-half of the N. E. L. A. dues of the members and appropriates a sum equivalent to this amount for the running expenses of the section, the budget then being prepared to meet the amount appropriated by the company.

Fifth.—In which the members pay their N. E. L. A. dues in full and also pay the cost in whole or in part of running the section.

Uniform methods of financing are also discussed, and a detailed description is given of the accounting system used in the Philadelphia Electric Company Section. The author hopes that the opinion set forth will result in a full discussion of this important subject and that greater uniformity in methods will follow.

Company-Section Educational Work.

BY DOUGLASS BURNETT.

Fostering the educational activities of central-station employees with the active assistance of the company section is an efficient means of improving the personnel of a central-station company. With the educational idea as a motive, the company-section organization and activities crystallize along lines that multiply the attendance, interest, and accomplishments of Class B members and result in a division of employees into groups corresponding roughly to the company departments, each holding monthly meetings in addition to the section meetings. The educational plan issued by the management, offering to advance the price of tuition to be repaid by the employee, with cash refunds by the company to the employee on meritorious completion of the educational courses, has induced some 500 employees of the Consolidated Gas, Electric Light & Power Company of Baltimore to undertake a variety of educational courses in a number of institutions. The paper analyzes the principles which should guide the company in planning educational work and which should guide those responsible for the company-section activities in organizing and operating the section, and gives ample illustrations of Baltimore Company methods.

Company-Section Entertainment and Recreation.

BY ALEXANDER D. BAILEY.

This paper discusses the functions and scope of the entertainment and recreative features of company-section work, and de-

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scribes the organization necessary and adequate to best carry out these activities, which are rapidly assuming importance in the life of the companies themselves. The management should be where it logically belongs, in the hands of the company-section members. The value of athletic, musical and miscellaneous entertainment features in increasing interdepartmental co-operation and general good fellowship among the employees is pointed out.

Formation and Methods of Conducting Company Sections.

BY E. C. STONE.

Welfare work carried on by a company for the benefit of its employees is not a philanthropy; it is a business proposition through which the company expects full return in the better organization obtained. The company section is believed to be the best vehicle through which to carry on the welfare work of the Class A members of the association. The success of the company section demands that it have something of real value for every member of the organization. There are many different kinds of men to be dealt with, hence there must be many different kinds of activity in the section. An intimate knowledge of the tasks and habits of all the members of the section is essential to success. The activities of the section are best carried on by committees representative of all departments and interests. Some of the more important branches of section work are entertainment, education, the monthly publication and emergency relief. In order to obtain the best results as many section members as possible should be given an active part in the section work.

Employees' Activities—Should They All Be Under the N. E. L. A. Company Section?

BY JOSEPH D. ISRAEL.

It has been found in some of the companies that in addition to the company section there are also maintained athletic association, savings fund, library and many other forms of organization. In nearly all cases this entails the payment of separate dues by the employees to a number of funds. It has been suggested by some that it would be more advisable to cover all of this work through a single organization, which could appoint sub-committees to look after various activities of the employees. This matter has been discussed at considerable length by many of the member companies and the officers of employees' associations. There is a diversity of opinion as to the advantages and disadvantages of the several methods which have been proposed to overcome the difficulties. The paper classifies the conditions into three general groups:

The Company N. E. L. A. Section as an independent organization.

The Company N. E. L. A. Section as a branch of several intra-organizations.

The Company N. E. L. A. Section as a governing body embracing all employees' organizations.

The paper then considers employees' activities under the educational, welfare and entertainment topics, to determine how these may best be conducted under one of the three general groups. The individual views of a number of correspondents are recited as indicating the trend of thought on this subject, in the presentation of arguments pro and con covering the various methods suggested. The conclusion is reached that centralization is a necessity. One organization ably administered should adequately care for all of the needs of each employee. The Company N. E. L. A. Section should be a branch of several organizations combined under the administration of a central committee of employees.

Accounting Sessions

Report of Committee on Classification of Accounts.

BY WILLIAM SCHMIDT, JR., CHAIRMAN.

The main work of the committee has been to take up in the last few months a study of the differences existing between the N. E. L. A. classification of accounts and the classifications of accounts of the various public utilities commissions. A comparison has been made with the systems of 21 state commissions and the Interstate Commerce Commission. This comparison comprises about 400 pages and has been made without reading the text of the accounts. Therefore no criticism is offered and the next committee appointed is urged to read the text and make criticisms. It is hoped that the next committee will find no trouble in arranging with the National Association of Railway Commissioners to either adopt the N. E. L. A. classification of accounts, or a classification that will be agreeable to all.

Report of Committee on Customers' Record.

BY E. J. FOWLER, CHAIRMAN.

The report consists principally of a classification and compilation of the nearly 600 replies to a list of questions sent out by the committee and of the forms accompanying these replies. There are three main divisions to the report, namely, questions, replies and forms regarding meter-reading information, preparation and handling of the bill, and ledger information. The committee has made explanatory comments and suggestions regarding most of the compilations of replies and has selected and reproduced what seemed to it to be the best and most representative forms. The replies have been classified into five divisions according to the size of the member companies, based upon the number of customers or meters, so that the information is available in useful form for all companies, both large and small. A brief description of the new method of typewriter billing and ledger posting now being tried out by the Commonwealth Edison Company, of Chicago, is added. Adding typewriters are used. The magnitude of the customers' record expense throughout the country is shown by the fact that there are about 5,800,000 electric lighting customers; at an average of 15 cents per bill, the billing costs about $10,500,000 a year.

Report of Committee on Purchasing and Stores Accounting.

BY H. F. FRASSE, CHAIRMAN.

The report of the committee covers the methods in use by the various companies in the purchase of materials, and the storing, delivery and accounting for these, with the duties of the various officials. The manner of ordering material is fully described. The method of passing and registering invoices in the purchasing department as a check against duplicate payments is gone into very carefully. The filing of requisitions and price lists, catalogs, folders and other printed matter dealing with material handled by the purchasing agent is described, and should, as brought out in the report, be considered of great use in indexing under lines of goods for easy reference. A perpetual inventory under the jurisdiction of men reporting directly to the purchasing agent is recommended. The sale of scrap material and the manner of reducing the metal components of discarded machinery to the best shape for quick and proportionate momentary return are clearly shown. The committee recommends the establishment in company organizations of an appliance committee, consisting of the purchasing agent, general sales agent and any other men qualified to pass on electrical appliances, this committee to select all electrical appliances to be sold by the shops. The report concludes with detailed descriptions of the operating methods of the Edison Electric Illuminating Company of Brooklyn, the Detroit Edison Company, the Empire District Electric Company, the Commonwealth-Edison Company, and the Edison Electric Illuminating Company of Boston.

Report of Question Box Committee of The Accounting Section.

BY EDWIN A. BARROWS, CHAIRMAN.

The committee has aimed to assist members in obtaining information on accounting subjects through the Question Box and also by direct correspondence. Decisions of utility commissions on accounting matters have been filed and it is the endeavor to gather all information bearing on the general subject of electric utility accounting, so that all questions can be readily answered.

Report of Committee on Form of Annual Report.

BY C. H. HODKINSON, CHAIRMAN.

The report contains an exhaustive and comprehensive comparison of the annual report forms of all federal and state regulating bodies having control over electric light and power companies. Extremely wide differences and inconsistencies are brought out in the comparison of these reports with one another and the necessity is clearly shown of standardizing the various schedules in order that they may be of real value to public service commissions, public service companies and the general public. Valuable suggestions by member companies bring out salient points of vital importance and in many instances show the seemingly unnecessary burden and expense a great many member companies must bear in order to furnish information required by their respective commissions, which information is apparently of little or no valube. The aim of the Committee on Form of Annual Report has been to simplify and standardize all schedules and submit for association approval a concise, concrete and standard form of annual report to be recommended to all public service commissions having control over electric utilities.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

SPECIAL FEATURES OF THE ELECTRICAL EQUIPMENT IN A STORAGE-BATTERY FACTORY.

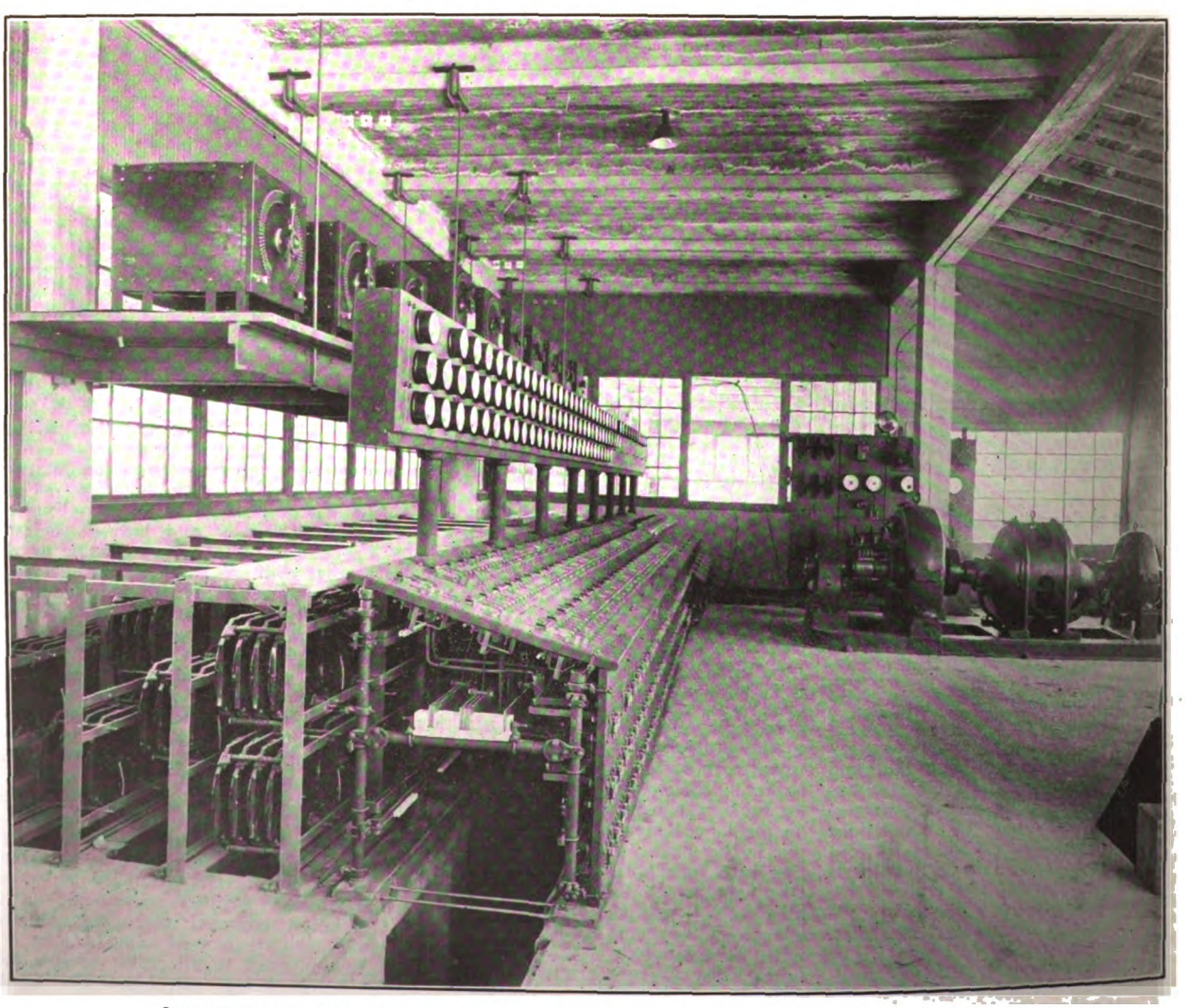
Installation in the New Prest-O-Lite Storage-Battery Plant.

As an important part in its program for the production on a large scale of electric storage batteries for all purposes, the Prest-O-Lite Company, Incorporated, of Indianapolis, Ind., has recently completed the installation of an electrical charging apparatus having many new features which should be of interest to electrical engineers and operating men.

The installation provides 96 independent charging circuits, controlled from a desk having 16 slate sections by an operator who is in full view of every forming table on the main floor of the plant. The current supply has been carefully worked out with the idea in view of utilizing the discharge current from the batteries on the forming tables by passing it back through a booster generator, where it is raised to the charging voltage and then used over again. The exact method by which this is accomplished is described later. Another of the striking features of this installation is the novel method of automatically disconnecting the incoming alternating current, which is 4,100 volts, and disconnecting the direct-current generators from their loads to prevent the discharge of the batteries back into the machines in the event of any great fluctuation in the alternating-current voltage, overloading of the apparatus, or racing of the motor.

The control desk by means of which the current is regulated for each of the 96 charging circuits is distinctly a new departure. It is said to be the second largest deskboard installation of its kind in the world, one larger having been made up in this country for shipment to the Japanese Government.

Control-desk applications in the past have been limited to moderate and high-voltage alternating-current installaiions. In this case the control desk was made for heavy-capacity, 140 to 250-volt, direct-current service. While first consideration might indicate that control-desk con-



General View of Desk Control Board and Motor-Generator Set in New Storage-Battery Factory.

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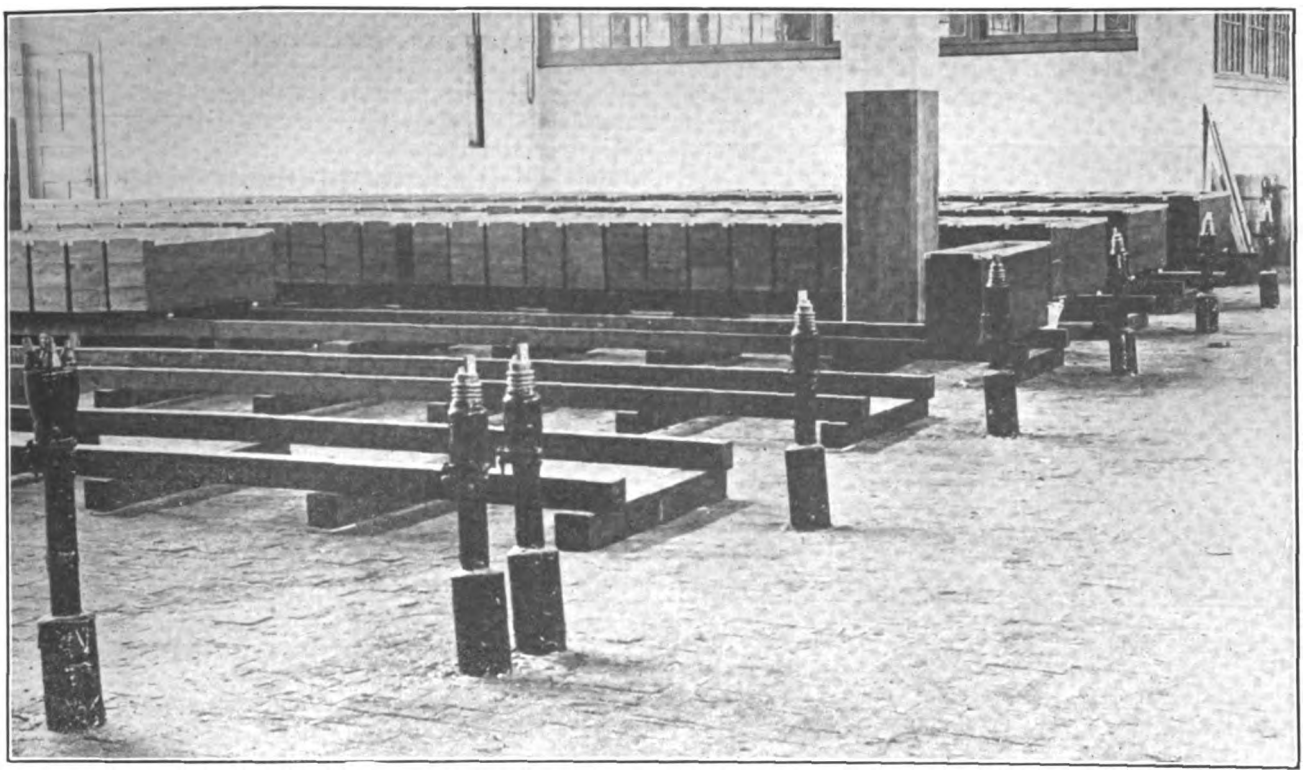
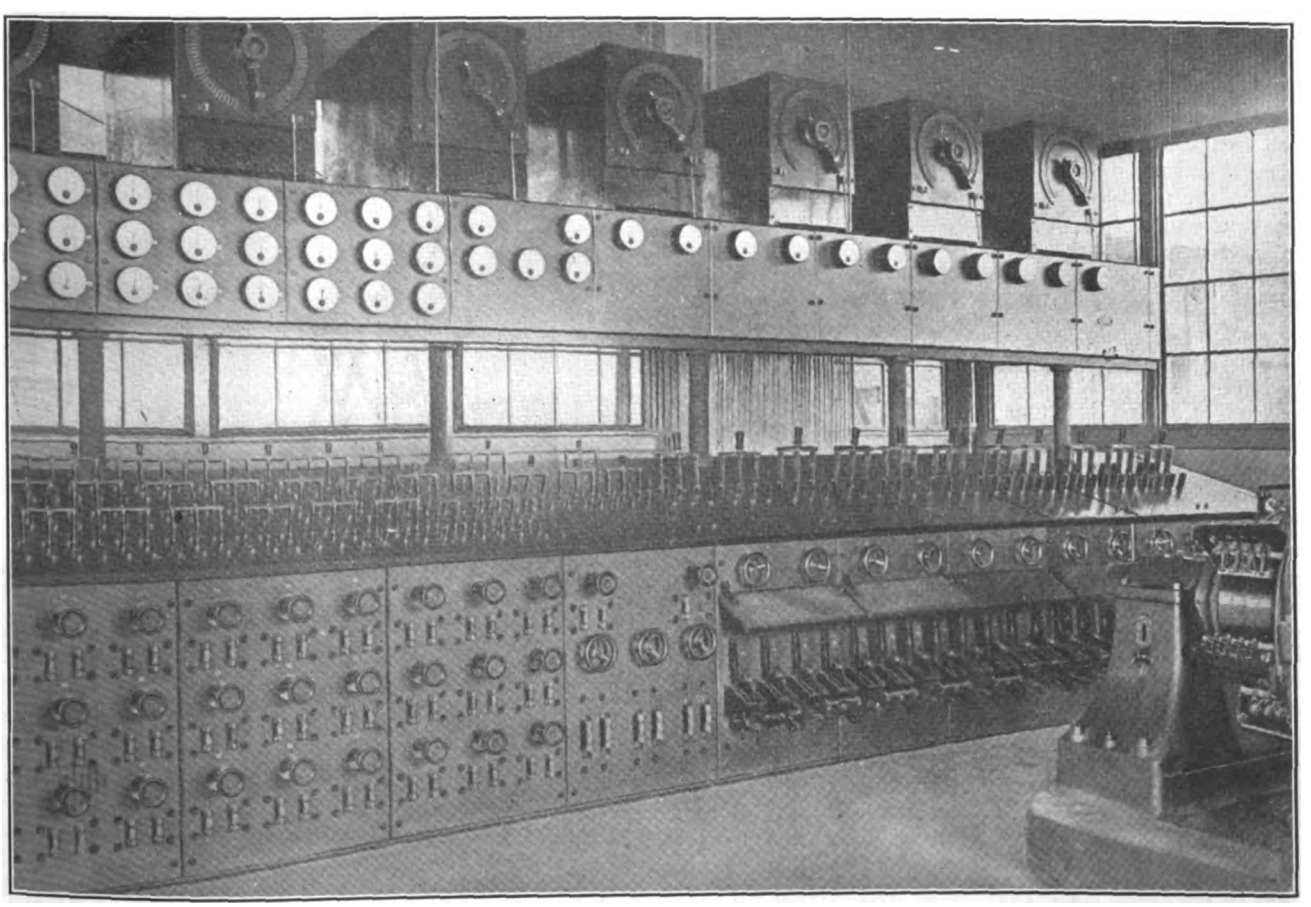


View in One of the Battery Forming Rooms of the Prestolite Company's New Factory Showing Circuit Terminals in Foreground.



Close View of Right End of Desk-Type Control Board for Battery Forming and Charging—Prestolite Factory.

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struction is not adapted to the handling of heavy-capacity circuits, yet, in view of certain local conditions, it will be apparent that for this installation a control desk has many advantages not possessed by the ordinary panelboard.

In view of the fact that the apparatus was to be used in the "forming" of storage-battery plates, it was important

General View in Factory.

that switches, etc., be protected from fumes resulting from the plate-forming operations. Furthermore, in view of space limitations and the innovation of certain scientific production methods by the Prest-O-Lite Company in the manufacture of batteries, it was essential that the equipment be compact and so arranged that the operator would have an unobstructed view of the entire "forming" department in order to receive signals from operators working over each table. The choice of the control desk to make possible the highest efficiency in this respect worked out admirably.

The desk proper consists of 16 slate sections, which are supported by framework above a channel-iron base. Knife switches are mounted on the inclined surface of the desk, each switch having an identifying nameplate.

On the front of the lower vertical surface of the sections at the right-hand end of the desk are mounted rheostat handwheels and circuit-breakers giving complete control and overload protection for each main charging circuit. The sections for the branch circuits include fuses, transfer jacks for transferring circuits, and rheostat handwheels.

Raised above the desk just described, at such a height as to allow the operator an unobstructed view into the forming department, is an instrument frame supported by means of posts. The panels on the instrument board correspond to those on the lower section of the desk or benchboard. On these are mounted meters, each having a nameplate which corresponds with the nameplate on the apparatus controlling the same circuit from the benchboard. The leads to the meters run up the hollow supporting posts from the desk below. Each section of the desk, with its corresponding instrument-frame section, is a complete unit in itself.

The rheostats are placed behind the desk and are operated by handwheels on the front vertical section of the desk, being connected by means of shafts. The rheostats are so constructed that by means of tapered segments, arranged alternately front and back, exceedingly fine regulation of the heavy current is made possible.

The circuit switches on the control desk are three-pole, double-throw switches, with an extra contact blade on the lower or discharge side. A rheostat is connected with each switch in such a manner that in the charging position the two halves of the rheostat are connected in series, while in the discharging position the halves are in parallel.

The entire control equipment is installed in a fumeproof glass room supplied with fresh air from an outside source. It is in this room that the operator works. It will be seen that while enjoying a full view of the entire floor in the forming department by a line of vision between the top of the benchboard and the bottom of the instrument frame, the entire apparatus is completely removed from the destructive acid fumes.

The current is carried from the control desk to the forming tables by lead-covered cables in underground fiber conduit. The terminals at the tables are specially designed potheads, there being one, two and four conductors, according to the carrying capacity of the circuit and the location of the table. The potheads protrude through the floor, which is constructed of acidproof brick laid in asphaltum. The lines of batteries on charge are connected to the potheads during the forming process by means o flexible cable.

The incoming alternating-current supply is protected at the terminal pole by a pole-top switch, equipped with horn-gap arresters, and an aluminum-cell electrolytic lightning arrester located at the point of entrance to the building.

Current is supplied to the control desk by one 200-kilowatt, 250-volt, direct-current generator, which is direct-connected to a 4,100-volt synchronous motor. There is also a 50-kilowatt, 100-volt booster generator, direct-connected to the other end of the motor shaft.

The direct-current machines feed into three busbars and are so arranged that when a line of batteries is being discharged, the current from them is carried through the 100-volt generator where the voltage is raised from 150 volts, which is the discharge rate, to 250 volts, and is then returned to the charging buses, thus effecting a large saving in current.

The motor-generator set is controlled by a four-panel vertical board arranged as follows. The first panel carries

Single-Conductor Terminal.

Four-Conductor Terminal.

the 4,100-volt alternating-current incoming line from the light and power company's plant. On this panel are also mounted two circuit-breakers, one for the factory lighting system and the other for 220-volt, three-phase power. Panel two controls the 4,100-volt, 365-kilovolt-ampere synchronous motor. Panel three controls the 100-volt direct-

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current booster. The fourth panel controls the 250-volt direct-current generator.

An alarm circuit is provided, connecting the trip coils of both direct-current circuit-breakers and the incoming-line oil switch. The alarm circuit is controlled by time-limit relays so that if the outside power supply drops down too low or is suddenly cut off, the motor will be automatically disconnected from the incoming line and the direct-current generators will be disconnected from their loads, thus preventing the direct discharging of batteries back into the machines. The alarm circuit provides the same protection to the apparatus in the event of an overload on the apparatus.

Much credit for this unique installation is due to Esterline & Angus, consulting engineers, of Indianapolis, and to the manufacturers of the different units in the apparatus used. The control desk was furnished by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; the motor-generator set and controls by the General Electric Company, Schenectady, N. Y.; rheostats by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.; special lead-covered cable and potheads, by the Standard Underground Cable Company, Pittsburgh, Pa.; fiber conduit by the Fibre Conduit Company, Orangeburg, N. Y.; and cable for machine connections by John A. Roebling Sons Company, Trenton, N. J.

Insurance of Contractors as Influenced by Legislation in the Various States.

At the request of the Insurance Committee of the National Electrical Contractors' Association, Lynton T. Block, manager of the Utilities Indemnity Exchange, of St. Louis, Mo., has prepared a statement showing the effect of the laws in the several states upon the association's plan for reciprocal or inter-insurance.

More than twenty states have enacted specific laws authorizing the conduct of reciprocal insurance, and bringing the activities of reciprocal insurance exchanges within the control of state insurance departments. In states where a license is issued, the Utilities Indemnity Exchange has been granted a license. In no state has adverse legislation been enacted prohibiting this form of insurance. However, workmen's compensation laws in some of the states either require state insurance or are such that the stock form of insurance company is best adapted to serve the employers of workingmen.

In all of the states the Utilities Indemnity Exchange is prepared to cover automobile liability insurance, and in all, except New York, it also covers public liability arising in construction work.

In Oregon, Washington and Wyoming state insurance is compulsory with respect to workmen's compensation liability.

In Maryland, Montana, Ohio and West Virginia there is so-called compulsory state insurance, but employers may obtain permission to carry their own risk, and after having done so may insure themselves in the Utilities Indemnity Exchange.

In a number of states the workmen's compensation laws are such that insurance in a stock company is preferable. In these states insurance may be obtained through the Employers' Indemnity Corporation, which has been organized for this purpose, with Mr. Block as vice-president, and the business is conducted in harmony with that of the Utilities Indemnity Exchange. The overhead expenses of the corporation are limited in the same manner, and savings are returnable to the policy holders in substantially the same way. The states referred to are California, Colorado, Connecticut, Indiana, Iowa, Maine, Massachusetts, Minnesota, Pennsylvania and Texas.

In the state of New York mutual insurance is provided for by law. The employers' liability, workmen's compensation liability and public liability are covered by the Exchange Mutual Indemnity Insurance Company, which has been incorporated for this purpose.

In all states, except those mentioned, the policies of the Utilities Indemnity Exchange cover all manner of liability risks.

Exceptionally Complete Electrical Equipment for a Residence.

The new residence under construction for John C. Karel, judge of the Milwaukee County Court, Milwaukee, Wis., is a model in complete electrical equipment. The building is not exceptionally large, comprising two stories, basement and attic. It has about 12 main rooms, including a large billiard room in the basement. Adjoining the residence is a private garage. In this building there are being provided 375 outlets for electric lighting, power, signaling and switch systems. In the large living room there is a multitude of wall receptacles, arranged at short distances apart, for the purpose of enabling the owner to provide individual lighting for any of the fine paintings which are to decorate the walls. These receptacles may also be used for portable lamps, fans, appliances, etc. The lighting fixtures are exceptionally elaborate, and are arranged for ready control from several points. In the basement will be provided special lighting equipment for the billiard and club room. There also is being installed in the basement a stationary motor-driven vacuum cleaner which includes remote control from nine different points in the house.

A private telephone system of the automatic reset Couch type, with 10 stations, is being installed. There is also a complete speaking-tube system and a special annunciator set connected with the front, rear and side doors. The garage, which is at the side of the house, has a special three-way switch installed so that the owner can drive his car up the private driveway and, without leaving the car, turn on the lights in and in front of the garage and at the side entrance to the residence.

The entire wiring in this residence, which is probably the most completely equipped electrically in the city of Milwaukee, is being put in in conduit. The electric work is being done by Henry Newgard & Company, 276 West Water Street, Milwaukee. Robert A. Messner & Brother, Majestic Building, Milwaukee, are the architects.

Boston Edison Company's Dealings With Contractors Explained.

The advantages of letting practically all the construction work to contractors rather than doing it by the central-station company's own force of employees were explained by L. L. Elden, electrical engineer for the Boston Edison Company, at a hearing recently on the Boston city lighting contract. It was pointed out that under present arrangements the Edison Company is able to call upon two contractors for their maximum force of men, one contractor employing 100 and the other 50 men, all the time on company construction, while about 500 are available in emergencies. If the central-station company were to do its own construction, it would have to employ at all times many more workmen than are required under normal conditions, as emergencies such as storms have to be provided for.

An instance of the advantages of contracting with large employing concerns was cited, in the case of the severe storm of the winter of 1914-15, when the Edison Company lost a pole line in Somerville by heavy snow. The availability of a large force of men to rebuild the line made for a minimum of interruption to service.

The usual repairs and maintenance to the system are carried on by the company's own regularly employed forces.

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The Reason Why—What Was It?

By George W. Hill

In this article, the eighth of the present series, Mr. Hill gives a striking example of the specious arguments which are not infrequently presented to the electrical contractor to secure his interest in a simple business proposition. The contractor in question was enabled in a few moments to analyze correctly the real defects of the proposition on a pure dollars-and-cents basis, which on its face seemed quite alluring. After giving our readers time to ponder on this problem, Mr. Hill will in a subsequent article answer the question.

This story originated in the private office of a prosperous electrical contractor and dealer, who lived in a city situated in the Middle West on the banks of the Father of Waters many, many miles from Manhattan Island. The proprietor of this business was one of those men who believed in making a business success of his profession. He had learned early in his business career that the difference between the price which he paid the jobber and that which he was able to sell an article for was not all profit, and did not believe that the amount which he paid annually for hats was his overhead, even though he wore them there; neither did he believe that because his bank account exhibited a greater balance this month than last, he was making money.

He was seated at his desk looking over the monthly financial statement of his business which had just been handed to him by the bookkeeper. The bell of the private telephone on his desk rang, and the young, stout, pleasant and obliging lady stenographer, who sits behind the railing, announced the arrival of Mr. A. S. Alesmannot, and in due course of time the latter was ushered into the presence of this business manager, announcing as he entered that he represented Putemover & Company, of Catchenskinnem, N. Y.

Without further ceremony, he handed the manager a Sand & Fleesum cigar and proceeded to tell him all about the article which he was to sell. After making the usual statement that "our company is buried in orders, and we are in no position to promise immediate delivery, and since the war broke out the price of raw material entering into the manufacture of this article has advanced 36 per cent, but the general manager of this concern is a close personal friend of the Kaiser, and during the year 1907 the Kaiser has confidentially tipped it off to him that there is going to be a big war, and that if they expected to continue in business and supply the heavy demands which would be made upon their factory, they would be acting wisely and in the direct interest of their customers if they would purchase several million dollars' worth of raw material, which they have done" (and which was evident from what stood before the manager and was being handed him), he said that they were going to give their customers the benefit of this tip from the Kaiser."

FINANCIAL STATEMENT FOR THE MONTH OF March 1916

PROFIT AND LOSS			BALANCE SHEET — ASSETS			BALANCE SHEET — LIABILITIES		
CASH SALES (TOTAL OF COLUMN 40)	1500	00	EQUIPMENT			NOTES PAYABLE	2000	00
CHARGE SALES (TOTAL OF COLUMN 39)	9672	00	MACHINERY	566	00			
GROSS SALES	11,172	00	OFFICE FURNITURE AND FIXTURES	450	00			
DEDUCT DISCOUNT AND ALLOWANCES (COL. 11 A)	150	00						
NET SALES	11,022	00						
DEDUCT COST OF LABOR AND MATERIAL (COL. 38)	7348	00	PROPERTY			OTHER CURRENT LIABILITIES		
GROSS PROFIT	3674	00				ACCOUNTS PAYABLE	7680	00
DEDUCT OVERHEAD EXPENSE (COL. 16 TO 27)								
OFFICE SALARIES $ 600.00			MERCHANDISE	30,582	00	Advances on Contracts	5000	00
NON-PRODUCTIVE LABOR $ 150.00								
SUNDRY EXPENSE $ 500.00								
Rent $ 200.00								
Interest & Tax $ 150.00			CURRENT ASSETS					
Insurance $ 50.00			CASH ON HAND	76	00			
Mgr. Salary $ 300.00			CASH IN BANK	1800	00			
Auto $ 100.00			ACCOUNTS RECEIVABLE	11,647	80			
L. & N. 150.00								
Incidentals 156.00								
TOTAL OVERHEAD EXPENSE	2356	00						
NET PROFIT ON SALES	1318	00						
ADD OTHER INCOME								
DISCOUNT AND ALLOWANCES (COL. 11 B)	20	00						
						NET WORTH PER LAST STATEMENT	29,102	80
NET PROFIT FOR PERIOD	1338	00				ADD NET PROFIT FOR PERIOD $ 1338.00		
						PRESENT NET WORTH	30,441	80
				45,121	80		45,121	80

Financial Statement Suggested for Electrical Contractors.

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He continued without a moment's pause and informed the contractor that they were selling this article at a ridiculously low price of $1.87 each, f. o. b. cars, New York City. He exclaimed immediately that for the further benefit of their customers they had established a resale price through the advertising columns of widely circulated periodicals, such as the *Saturday Evening Postem, The Wood and Fire Side, The Matrimonal Mishap,* and *The Reuben Herald,* of $2.50 each. It should be perfectly apparent upon the basis of these figures that if the contractor would place an order for 1,000 of these "Patent Adjustable Electric Profit Extinguishers," they would only cost him $1,870, and he wanted the contractor to understand thoroughly that his company would absolutely insist upon him maintaining the resale price of $2.50. This lot of 1,000 would sell for $2,500, producing the enormous profit of $630. Where on earth could a dealer make such a small investment and such wonderful profit, and so easily done. He stated that it was an absolute iron-clad rule of his company not to sell but one contractor (at a time) in the same city, and it would ship its customer a half carload of circulars and other printed matter which he could mail to his trade, and that on an initial order, even as small as this one, he would strain a point and see if he could not induce his company to place an "ad" in *The Evening Blatter* for one week.

Finally after the manager had long since smoked an eighth of an inch from the end of the Sand & Fleesum cigar and had laid it down in apparent interest in what was being said to him, but as a matter of fact in self-defense, and out of the pure kindness of his heart together with a mixed feeling of sympathy, courage, courtesy and curiosity, and his real appreciation for things which are really funny, he had permitted this fellow to talk rings around himself, and become so entangled in his efforts to take this man off his feet, that he resembled a pet kitten which had in its playful pranks become sadly mixed up in grandma's yarn; still he waited patiently for this representative to come to the point, if there was one, and to say to him: "Now, Mr. Contractor, when shall we ship the first thousand?" But this time it seemed would never come and while the possibilities of this representative finding the psychological moment in this transaction were as remote as that of Uncle Sam locating Villa, he was permitted to rave on. The manager eventually broke into the line of thought somewhere between a comma and a semicolon and said:

"Look here young man, I am going to be perfectly frank with you; in fact, I am going to be confidential with you and let you into some of the secrets of my business," and handing him the monthly financial statement remarked: "Are you able to determine from this statement why it is that I am not going to give you an order for 1,000 of your Profit Extinguishers at $1.87, f. o. b. New York City, and on which your company has been so thoughtful and considerate of its customers as to establish a resale price of $2.50 each?" After looking over the statement, which he knew as much about as the average citizen knows about the war, the salesman (?) replied that he did not. The contractor replied: "Well there is a reason. What is it?"

Electrical Contractors' Association of District of Columbia.

The Electrical Contractors' Association of the District of Columbia recently completed the first anniversary of its organization. Besides conducting routine business, the annual meeting included the election of officers for the ensuing year, which resulted as follows: President, E. C. Gramm; vice-president, Everett H. Henderson; treasurer, William B. Watzel; secretary, Joseph D. Campbell.

The association has accomplished much good in the city of Washington and is trying to secure the membership of every contractor. It holds bimonthly meetings at the Builders' Exchange, 711 Thirteenth Street, N. W., Washington, D. C.

Among the Contractors.

The Arcade Electrical Construction Company, Kansas City, Mo., was awarded the contract for wiring the six-story warehouse being erected for the Duff & Repp Furniture Company. There are elevators at each end of the building, and the wiring is so laid out that the lights can be controlled from either end of any floor.

The Chace Electric Company, Fall River, Mass., has relocated at 144-150 Pocasset Street, in that city.

Morril N. Farr, formerly in the electric service department of the Utah Power & Light Company, and P. J. Diebold, formerly in the manufacturing department of the Capitol Electric Company, have both resigned their positions and have incorporated the Farr-Diebold Electric Company, with offices at 24 Richards Street, Salt Lake City, Utah. The company will specialize on the sale, installation and repair of electrical motors and special electric equipment.

W. D. Lansing and E. Le Roy have purchased the business of the Johnston Electric Company, Appleton, Wis., and under the name of the Le Roy & Lansing Electric Company will handle electrical fixtures and appliances and do contracting work.

The Butte (Mont.) Electric Supply Company was awarded the contract for installing an ornamental lighting system in Roundup, Mont. There will be 41 posts, each bearing a cluster of five lights, the total cost to be in the neighborhood of $7,000.

The Kansas City Electrical Construction Company has been awarded the contract for wiring the six-story commercial building being erected for the Waggener Paint & Glass Company at Kansas City, Mo. The company will move about 20 motors from its present plant to the new structure. It is now using central-station energy, but will install a Fairbanks-Morse 50-horsepower oil engine and 35-kilowatt direct-current generator.

The Westchester Electrical Equipment Company has re-located at 73 Main Street, Yonkers, N. Y.

The Reeves Electric Company, of Montgomery, Ala., has established a branch office at Conti and St. Emanuel Streets, Mobile. A stock of electrical fixtures has been placed in the new store. Besides electrical contracting the company expects to make a specialty of installing isolated electric-lighting plants.

E. H. Helms, formerly of Kansas City and Marshall, Mo., has opened a shop for the care of storage batteries and automobile electrical equipment at 16 North Washington Street, Hutchinson, Kans.

Charles C. Moore & Company, of San Francisco, Cal., submitted the lowest bid to the State Department of Engineering for furnishing boiler-plant equipment for a power house for the Norwalk State Hospital in Los Angeles County. The bid is for $20,310.

Alexander Kailing, of Milwaukee, Wis., has secured the contract for the electrical work in the new Plankinton Hotel in that city. The electrical work will cost about $10,000.

The Rice & Walden Electric Company is a new firm of electrical contractors, located at 306 Pearl Street, Hartford, Conn. The firm is made up of Willard A. Rice, A. E. Walden and V. A. Sykes. Mr. Rice has been an electrical contractor for 26 years, Mr. Walden is an inventor and recently developed an electrical generating ozone plant for sterilizing water, and Mr. Sykes is a contractor of wide experience.

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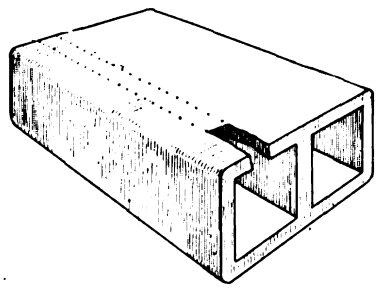
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Scheme for Channeling Hollow Tile.

To channel hollow tile walls for conduit it is better, instead of using chisels, to use a piece of tool steel, five-eighths inch by eight inches drawn to a point. With this make a series of holes on both sides of the intended channel; then knock out the pieces by gently tapping with a hammer. This method avoids breaking out the entire side of the hollow places, which is apt to occur if these border holes are not made. Try to line up the channel so that it does not run into one of the internal ribs.

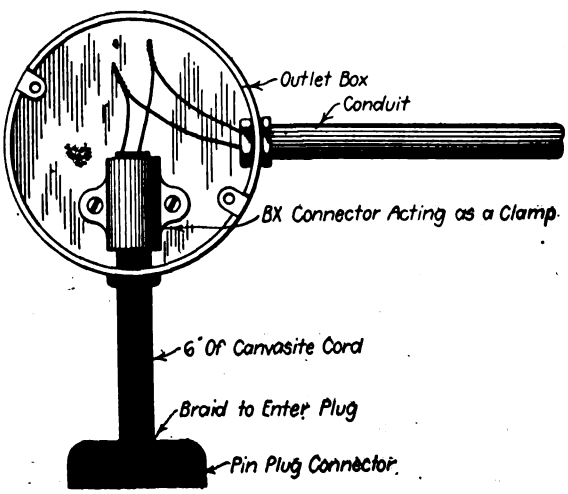


Method of Channeling Hollow Tile.

J. B. Story.

Clamping Charging Cable in Outlet Box.

In wiring garages all portable and charging-plug connections should be so arranged as to swing free from the outlet and be secured so that there will be no strain on splices. This can best be done in the manner shown in the accompanying sketch. Use a BX connector inside the outlet box to secure the cable and take all the strain there may be put on it.



Connector for Clamping Cable in Box.

M. Podell.

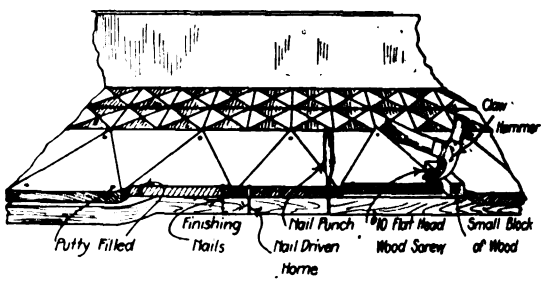
Making Outlets Without Cutting Lath.

In making holes in the walls and ceilings in old houses for lighting outlets and switches, I have found that by using an ordinary screw driver in place of a brace and bit it is possible to make a hole through the plaster between laths without cutting into the lath at all. This leaves a good solid lath on each side of the hole to screw the fitting to. I find that when a brace and bit are used the lath is very commonly cut into and this seriously weakens them.

L. F. Hiss.

Method of Taking Up Parquet Floors.

It is occasionally necessary for the wireman to take up a section of parquet flooring and unless this is done in the proper manner the floor is likely to be seriously marred, if not ruined. If the flooring is of the groove-and-tongue type, first hammer the metal blade of a try square in between the sections of the floor so as to cut off the tongue. Do not use a chisel for this purpose because it will mar the joint. The individual sections are usually held in place by means of finishing nails or brads, the holes made by which are filled with putty. To locate these holes, the floor must be thoroughly cleaned so as to expose these putty spots; these fillings and nails are removed by taking a nail punch directly over the putty spot and driving it home until the nail has been cleared of the floor. Next place a No. 10 flat-head screw in one of the holes left by sinking the nail at the edge. Place a small block of wood near the edge of the section to be lifted and by means of a claw hammer gently lift up a corner of the section, at the same time tapping the floor. The successive steps are clearly shown in the accompanying illustration. If this order is followed in the manner described, each section can be removed without breaking or marring the edge.



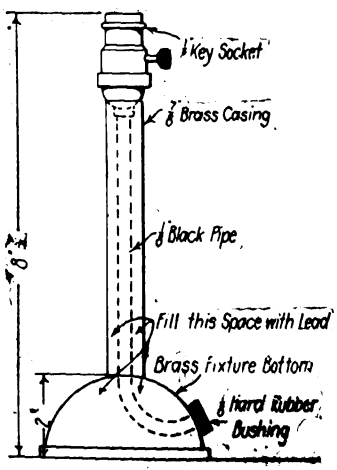
Successive Steps in Taking Up Parquet Floor.

John Domerhuizen.

Home-Made Portable Lamp.

The accompanying sketch shows a very easily and cheaply made portable lamp. Its construction is self-evident. The iron pipe is put into the bottom first and then all the space around it filled with hot lead. When this has cooled, it is turned up the other way and the space between the pipe and casing then filled. It is then ready for the buffing wheel. Wires are drawn in and the socket connected and fastened up.

Carl C. Kohn.



Simple Portable Lamp.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

HOW TO GUARD AGAINST LOSS OF SALES.

A Simple System for Recording Condition of Stock.

By J. S. Vogel.

Every dealer in electrical goods loses a certain number of sales every month. Some of these lost sales are unavoidable, while others are lost because of lax business methods.

Perhaps the most frequent reason for lost sales necessitates that time-worn excuse, "out of stock." A great many dealers do not fully realize a sale is being made for a competitor every time a customer is told that the article asked for is out of stock. The customer is forced to go to some other dealer for the article wanted. The loss of such sales means a reduction of business and of profits and these expensive lost-sale leaks should be stopped. It is the intent of this article to offer some suggestions for that purpose.

The first requirement to stop lost-sale leaks is the installation of some system that will at once tell the dealer when he is out of stock on certain articles, and tell him of the demand for new articles in the electrical line which are not carried in stock—a system that will keep dealer and salesmen on the alert for items that need ordering.

If the dealer does not keep proper records for ordering stock he is not in a position to know the magnitude of lost-sale leaks. The following method is suggested for putting the dealer face to face with the lost sales that occur in his store. A small blank form, such as the one reproduced here, should be prepared, and this will obtain from salesmen the necessary information regarding every lost sale.

The value of system is in filling out one of these slips every time a customer asks for an article and is unable to obtain it—or does not buy what the dealer has for sale. And there positively should be no exception to the rule of filling out one for each non-sale.

It is not absolutely necessary for the success of the system to have the customer's name, but if it can be secured the dealer is able to advise the customer, either by post card or by telephone, when the article asked for has been placed in stock. The dealer's willingness to serve is shown in this way and some lost sales can be recovered.

Many dealers to whom this suggestion is offered may at first consider the above system troublesome, and it will be if the number of lost sales is large. But more trouble will be made by the results of the system than by the system itself. There is no difficulty in getting 500 of these blanks printed and instructing the salespeople as to filling them out. And it will take but a very short time for them to make the entries.

The advantage to be gained is for the dealer, for it brings him face to face with the lost-sale situation, enabling him to estimate the losses and to prepare plans for reducing the number of lost sales.

There is no doubt that some of these blanks will be filled out every week and possibly every day. The very fact that a large number will be on hand at the end of every month will concern the dealer to keep them at a minimum and be an incentive for him to have his stock complete and his sales force energetic.

The installation of such a system will have a direct effect on the salespeople. It will make them better salesmen.

SALES LOST

Name of customer.....

Article asked for.....

Check reason for lost sale

Out of stock.....Out of size.....

Too costly..... .Too cheap.....

Not carried in stock.....

Other reasons, if any.....

Blank Form for Recording Lost Sales.

The method tends to stop losses of sales through carelessness, inattention and negligence in ordering stock at the proper time. Besides salesmen will redouble their efforts to make sales and to take advantage of opportunities presented. If a sale is lost on an article kept in stock the only reason is poor salesmanship. And salesmen do not want to confess themselves incompetent.

If the same salesman fails to make sales time and again, the fact should be known to the dealer. A system of lost-sales blanks will serve this purpose, and if there seems to be no legitimate excuse for the failures, he is in a better position to approach the salesman on the subject—and can remedy matters by securing better results from present salesmen or securing better salesmen. If the lost-sales records are conscientiously kept the dealer is brought closer to sales conditions and can attack his sales problems with much more surety.

House-To-House Canvass Results in Sale of 229 Appliances.

A complete report covering the seven-day appliance campaign in the Sandpoint, Idaho, division of the Northern Idaho & Montana Power Company shows sales of 229 household electric appliances with a total kilowatt demand of 120.4 kilowatts, including 89 flatirons, 91 utility grills, 19 electric percolators, 4 twin-glower radiators, 2 electric ranges and 28 other appliances. These results were secured by four house-to-house salesmen, whose calls were heralded by small newspaper advertisements and printed circulars. Prospects were secured for 15 electric ranges. Two new residence electric customers were obtained and the school board at Newport, Wash., was interested, in installing 12 electric disk stoves in the high school's domestic-science department. Approximately one-fourth of the residence customers in the territory canvassed purchased appliances.

A similar effort conducted in the Kalispell, Mont., division was responsible for the sale of 274 lamp-socket appliances and one electric range.

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WATCHFUL WORKING FOR INTENSIVE CULTIVATION IN MERCHANDISING.

By W. B. Parker.

This is the last of a series of three articles describing practical methods the electrical supply dealer can make use of in the work of business building. In the first two articles the subjects were the size of ground it was best to decide on for intensive cultivation and the kind of seed that produced the surest crops of sales and consequent profits. This will deal with aiding the growth that is sure to come and prevent the weeds that are the result of neglectful indolence from retarding this growth.

It is very important that some kind of record should be kept of the actual sales result of whatever advertising is done. Where a card system is installed to list the names of possible customers for easy reference in mail advertising, this same system can be used as a record of results. As it is in alphabetical order it will take very little time to note the amount of any important sale that is made to one on this list. Many customers will volunteer the information as to why they came to you, or what particular advertisement or letter attracted them. When they do not, it is good policy to ask the direct question, at least when the sale involved is large enough to make the information apparently worth while.

Your customers will give you a great deal of valuable information if you get in the habit of looking for it and following with questions all likely leads that you may receive in the conversation. For example, if a customer mentions the probability of his requiring a certain article in electrical line at some future time, a note should be made of the proximate time, where the value of the article is sufficiently large.

One method of taking up deferred buying is by telephone, and the telephone can also be used in other ways for sales promotion much more than it generally is. If care has been taken to keep up the card records they can be gone over on days when business is dull and different persons called up on the telephone where the card indicates that they might be interested in some special matter just at that time. Care should be taken not to make this method of selling a nuisance to the persons called. If good judgment is used it is possible to cause the customer to feel grateful for taking an interest in his requirements instead of annoyed at an attempt to sell him something.

In addition to securing all possible information as to the requirements of customers it is important to keep in touch with all that your competitors are doing, the condition of their stock, and the attitude of the public towards them. This, not for the purpose of obtaining material with which to "knock" them, but for the purpose of avoiding any mistake they are making and also to learn wherein they may be giving better satisfaction to the public along some lines than you are. You know the successful politician is always ready to trim his sails to the popular wind, and where this may show insincerity on his part, and therefore not be an admirable trait, yet it is necessary on the part of the merchant whose success depends on giving the buying public what they want.

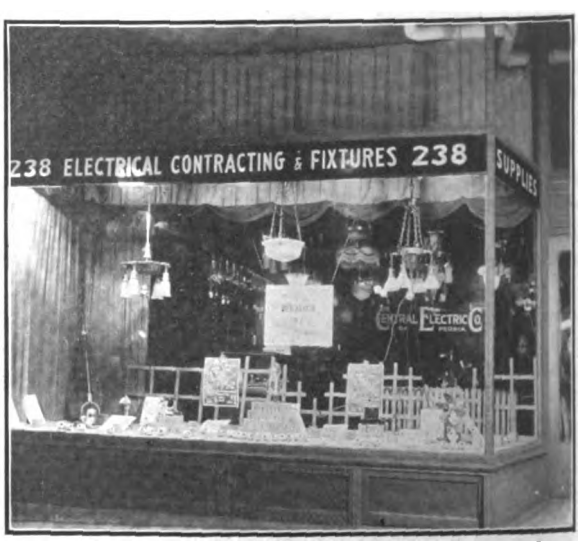
Intensive cultivation of a given territory means using every means possible to encourage business growth. The merchant is not altogether limited as to his possibilities of growth by the seasons as the farmer is in the growth of his crops. If the merchant's turnover is considered as equivalent to the harvest of the farmer it will be readily seen that the farmer is absolutely limited by the weather, while the merchant is only limited by his persistency in going after sales. It is true that many merchants have the idea that in certain seasons there is no use of going after business and therefore place themselves voluntarily under the same disadvantages as the farmer. It is true that sales are not likely to be as large in some seasons as in others, no matter what effort is made to boost them, but it is also equally true that well directed effort will increase sales at any time of the year, and that where such efforts are continuously made the totals for the year will show a satisfactory gain.

There is a type of merchant who never does any but very occasional advertising because he thinks that "when business is good there is no need of advertising and when it is bad there is no use." This is the kind of man who is not building for the future and who will always be struggling along with a small business if he is able to keep his head above water at all. It is a solid fact that occasional or seasonal advertising very seldom pays either directly or indirectly. There is only one way of business boosting that is sure to succeed—and that is "keeping everlastingly at it."

Window of Western Electric Company, Cincinnati, O.

Notable Window Displays in Campaign.

One of the appreciable helps in marketing electrical goods is the assistance given by the manufacturers to the various dealers. These helps take the form of suitable literature for local distribution, campaign suggestions, demonstrations and suggestions for window displays. The latter, particularly, are of value because dealers now quite generally recognize the importance of a good window dress in stimulating sales. In many instances manufacturers encourage attractive displays by offering prizes to the stores having the best dressed windows.



Window of Central Electric Company, Peoria, Ill.

In the accompanying illustration are shown two displays of Benjamin "92" cluster socket, which have attracted considerable attention and have, according to reports, greatly stimulated sales. One is the window of the Central Electric Company, of Peoria, Ill., and the other of the Western Electric Company, of Cincinnati.

Both displays are the result of a nation-wide campaign conducted by the Benjamin Electric Manufacturing Company, of Chicago.

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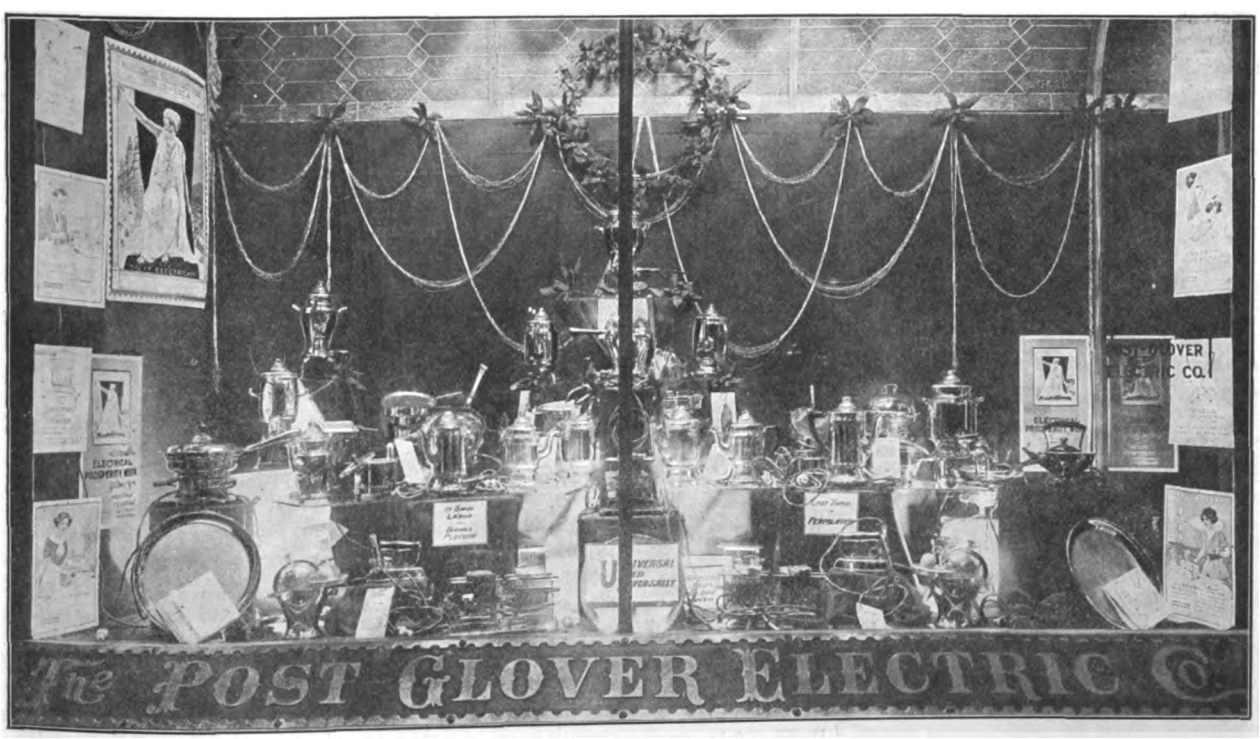
Window Display of an Electrical Dealer Featuring Universal Appliances in Campaign.

Campaign on Electrical Home Needs to Be Held During June.

Plans for an extensive campaign on the sale of electrical home needs have been prepared by Landers, Frary & Clark, of New Britain, Conn., manufacturers of Universal electrical appliances. The campaign will take place during the entire month of June.

The campaign will be instituted by advertising in the June issues of a number of the most prominent national home magazines. To supplement this advertising, dealers' helps in the form of ready-to-print newspaper advertisements will be furnished. The greatest feature of the campaign probably will be the window displays made in connection with it. The manufacturers have provided a special window trim, consisting of Miss Una Versal, life-sized and in colors, with two detachable right arms, and furnished ready to take her place in the window. Show cards, booklets and lantern slides on various Universal appliances will also be furnished. To promote interest among the dealers, cash prizes of $25, $15 and $10 will be given for the three best windows shown, in which the special trim is used. Three judges will make the awards, the selection to be based on originality of display, attention-compelling value and artistic arrangement. It will not be necessary to exhibit Universal appliances.

One of the accompanying illustrations shows Miss Una Versal, while the other is a recent prize-winning display.



Window Display of a Cincinnati Merchant in Appliance Campaign.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Book Review.

To the Editor:

A review of the book "Inventions and Patents" in your issue of April 8 has come to my attention. Inasmuch as many of the opinions and statements were obtained directly from the Patent Office, examiners, patent experts, attorneys, inventors and manufacturers, they do not necessarily express or govern the author's own opinions and actions. On questions upon which even courts do not agree, the statements are believed nevertheless to be for purposes of general information, correct.

The review says that the rules are mentioned in the text without stating that they are the rules of practice. The reviewer will kindly refer to page 83 and note the explicit footnote stating what rules are meant, as well as where to get them, and also note that they are described earlier in the book on page 14.

The Patent Office itself recommends that photo prints be filed with drawings (this costs but 15 cents per sheet) and notwithstanding the reviewer's comment, the practice is good, though perhaps not common, as it prevents loss or damage of the original and delay in case of amendment, in which latter case it is required anyhow.

The reviewer's comment on pages 117-122 is decidedly in need of correction, in view of the statements in the book and the express statement in the middle of page 119 that interference cases are relatively few in number. Surely the reviewer must be aware of the hardships some of the too numerous few inventors have been forced to endure because of interference proceedings, especially when false expert testimony mixes up the dates. The recent Steinberger-Hewlit case, decided one way first, then another, shows that so far from being exaggerated the statement of *possible* steps in an interference case is perhaps even understated. Note that the word "possible" occurs in the text. To emphasize the other relatively few cases in which a mere showing of dates in a preliminary statement suffices to afford justice would be to give the usual reader a notion that the interference system was already perfect and simple, when, as a matter of fact, leading attorneys and inventors have repeatedly pointed out the very facts gathered together in the book.

I refrain from mentioning the other few points analogous to these and do not wish to criticise the reviewer, but when he says that the situation regarding undivided rights is not mentioned and this point is explained on pages 139-140, when he says that a patent "reference" is not explained and there is in fact a full explanation early in the book on page 17, when he misquotes the footnote to page 61 about the indexing of patents as corrections, when "revising and indexing" in the book have an unmistakable meaning warranted by the dictionary definition of the partial term "revising," and when he includes employer's assignment forms, chapters on protecting an invention from a manufacturer's viewpoint, claims, etc., under the generalization of "speculative point of view," and further overlooks the whole chapter on Patentability and Practicability, pages 69-73, in saying that no guide is given as to determining commercial worth of proposed patents, I must conclude that the book, imperfect as it is and so admitted in the preface, merits his more thorough inspection.

P. E. Edelman.

St. Paul, Minn.

To the Editor:

My criticisms of Mr. Edelman's book were based on the assumption that this volume was intended for the average reader who judges from general impressions and who does not use a microscope for locating possible limiting terms or explanations. Telling such a man (p. 117) that an interference proceeding "is one of the most expensive parts of patent procedure," and that "to a rightful inventor it means a very expensive delay and may even mean the loss of his patent right," gives the impression that the rightful inventor always gets the worst of the situation. And advising him (p. 118) that "interference proceedings should be avoided whenever possible" certainly seems unfair to the applicant who is clearly the prior inventor.

Nor does it seem fair to assume that the lay reader would correctly guess certain omitted explanations. For example, when the author states that each holder of a part interest in a patent can dispose of his rights independently of others, how is the reader to know that this may also give him the right to operate independently under his rights, i. e., to manufacture and sell without accounting to the others? So also, the long chapter on "Patentability and Practicability," while containing much valuable information on the former topic, gives one the impression that any thing which can be patented, ought to be patented. Indeed, in addressing manufacturers, the author says (page 70): "All processes, machines, or blanks used in the manufacture should be examined to see if they are patentable or can be improved to make them patentable. . . . The manufacturer should not neglect to patent an invention. . . ." In other words, the oft-repeated implication is that every practical item, if patentable, should be patented, regardless of the manufacturer's purse or of the prospects of securing returns from the obtainable patents. To my mind, the advertising patent solicitors have already done enough harm in stimulating unremunerative patents without the assistance of so able and presumably disinterested a writer as the author of this volume. Hence my repeating my expression of regret (which obviously is not prompted by selfish motives, since it comes from a patent attorney who might profit by the increased demand for patents) that this volume urges an almost promiscuous patenting, instead of guiding inventors and manufacturers alike in the analyzing of the patent-worthiness of each invention and in the selection of those for which the expenses of patenting really imply a sound business expenditure.

Albert Scheible.

Chicago, Ill.

Largest Turbogenerator Unit Being Built—Capacity 45,000 Kilowatts.

The General Electric Company, Schenectady, N. Y., is building the largest single-unit steam turbogenerator ever constructed. It will have a continuous rating of 50,000 kilovolt-amperes, which at 90 per cent power-factor means a capacity of 45,000 kilowatts. This tremendously powerful unit will consist of a single Curtis turbine of single-flow design, direct-connected to a single 60-cycle generator. This construction is believed to secure the maximum of simplicity and the reduction to a minimum of joints, connections and possible air leaks, thereby assuring sustained economical operation. This machine will be installed by the Detroit Edison Company, Detroit, Mich.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to not over 300 words. Payment will be made for all answers published.

Questions.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent. —R. D., Washington, D. C.

No. 347.—Wiring for Polyphase Motors.—(1) There are to be 15 to 20 five-horsepower motors, (each 440 volts, three phase) in a manufacturing department supplied from one feeder in conduit. All of these motors are in a space 35 by 24 feet. It is difficult to find space to locate fuse cabinets directly at the point where the branch circuit for each motor is tapped onto the feeder. Would the Code permit locating the motor fuses near to the motors and the use of one or two steel cabinets for terminal boxes where all the branch circuits may be tapped onto the feeder? (2) Where several large motors from 20 to 75 horsepower are supplied from one feeder, can the starting fuses be located near the motor instead of where the branch circuit taps on?—R. B., Jackson, Mich.

No. 348.—Electric Japanning Oven.—In an electrically heated japanning oven what kind of heating units is it best to use? How much wattage should be supplied to an oven of small size? What kind of thermometer should be used to check the temperature?—J. S. C., Fort Wayne, Ind.

Answers.

No. 342.—Trouble Finders.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

In brief, this method consists of applying a current interrupted usually by motor-driven equipment to a circuit composed of the faulty conductor and ground or of two defective conductors, and applying a small exploring coil to the cable sheath or vicinity of the conductor at intervals along the route. A telephone receiver is connected to the exploring coil so that at each make and break when an induced current flows in the exploring coil, the difference in tone on either side of the fault enables the trouble to be located with great accuracy. The apparatus used by the Boston Edison Company for this work has undergone an extended development during the past six or more years, and it now has reached a state of perfection which permits of its use by even the ordinary lineman who has had no technical training. Credit for the company's present excellent practice in line trouble hunting is largely due to James A. Vahey. The new testing equipment is of 7.5 kilowatt rating, with pressures available from 115 to 6,900 volts, or one-half the maximum voltage of the Boston system. These pressures are obtained by different combinations of connections when using standard lighting transformers with appropriate switches permanently wired to a switchboard inside the station for the analysis of troubles on lines whose terminals may be temporarily connected to the test panel. Varying amounts of current can be obtained in the faulty circuit by connecting loading coils of certain constant values singly or in multiple, at this switchboard or on the portable apparatus. The signaling portion of the equipment can be adapted to any existing breakdown apparatus, and consists of a specially designed motor-driven interrupter impressing waves of a frequency of about 600 cycles maximum on the tested line, when used on a 60-cycle system.

The waves produced by the interrupter are adjusted to give a frequency to which the telephone and the ear are most responsive. An interrupter current of one ampere can be heard easily in a commercial circuit carrying 200 amperes at 60 cycles. Either alternating or direct current can be used in the interrupter, a distinctly different tone being obtained with each. The interrupter is of rugged construction, operates on the system voltage, and runs without attention—like any small motor-generator set. An ammeter is a useful addition to the testing outfit, and a pilot lamp serves to indicate the conditions on the line under test. A transformer generally is placed between the apparatus and the line being tested, to protect the supply circuit. To locate faults in cables leading from suburban stations, a portable testing set of about four kilowatts capacity is used. This is carried in an automobile to the substation from which the faulty line radiates, and works as well as the larger equipment. For secondary networks and faults of very low resistance in isolated wires and cables, a portable vibrating-interrupter set, operated with two dry cells, is used. This gives a good signal and produces an audible sound in the exploring coil through a fault of 1,000 ohms. It is employed in locating trouble on live circuits with pressures up to 250 volts, and the sound produced can be heard on a circuit carrying 50 amperes at 60 cycles. Horseshoe-shaped or transverse exploring coils are used to pick up the interrupter signal on signal-conductor or duplex cable and overhead line, the straight or longitudinal coil for multiple-conductor, three-phase cable; whilst a triangle coil is used in catching signals along the ground, leaking down trees, etc.

The theory of the method is based upon the well known principles of induction. The pulsations set up in the tested line by the interrupter induce corresponding pulses in the exploring coil, it being self-evident that this action will be stronger on the supply side of a ground or other fault than beyond such, whilst, for example, it can be seen readily that with one of the triangular coils placed vertically against a tree and at right angles to the line overhead, no sound will be heard unless current is leaking down the tree.—P. B. W., Verbena, Ala.

No. 346.—Electric Arc for Cutting Scrap Metal.—What voltage should be used in cutting up old boilers with an electric arc? Of what material and shape should the electrode be? What safety device is most practical for preventing overloading transformers used in such work?—L. G. C., Lincoln, Neb.

The voltage of an electric arc depends partly on whether direct or alternating current is applied. The voltage across a direct-current arc is approximately 38 to 42 volts, across an alternating-current arc about 30 to 35 volts, according to the strength of current applied. In the present case where simply cutting up in short time is required, about 30 to 50 amperes, or even more will be right, whereas if the cutting is to be made along certain definite lines a more pointed flame arc with lower current is advisable. The material of the electrode can be the ordinary arc lamp carbon of a thickness fit for the current selected; if direct current is applied, the negative pole is to be connected to the scrap material. It is unusual to use alternating current for this purpose. The best, however, would be to use a constant-current transformer, such as is used with arc lamps in series. To steady the arc a steady resistance ought to be connected in series with the arc, in this way a special safety device besides a normal circuit-breaker will not be necessary. The voltage of the transformer must be sufficient to give a minimum of about 40 to 45 volts to take care of the drop across the resistance. It is generally advisable to have the cutting done with direct current. A special dynamo of the Rosenberg (cross-field) type, as described fully in American, German and English papers in 1905 and 1906, will be the most appropriate, but a differentially compounded dynamo will also do when greater fluctuations do not matter much. A safety device with the Rosenberg type is not necessary, since at short-circuit the machine gives no voltage. A steady resistance can also be dispensed with, the dynamo being connected directly across the arc. The voltage of the dynamo should be about 50 volts for the normal circuit.—H. A., Pittsburgh, Pa.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

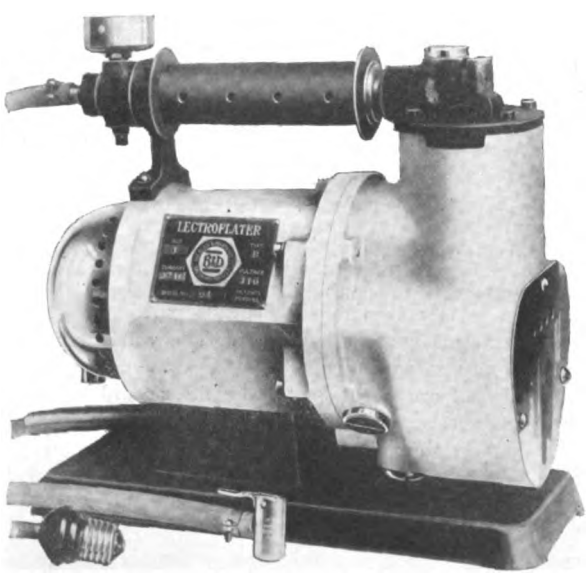
Electrical Tire Inflater.

An improved type of compact, electrically operated tire inflater has been put on the market by the Black & Decker Manufacturing Company, Baltimore, Md. It is known as type B Lectroflater and embodies a number of improvements on the tire-inflating machine brought out by this firm about a year ago.

The Lectroflater is an ingenious combination of a universal electric motor that will run on either alternating or direct current, a high-pressure air compressor, a gear box and a condensing chamber so arranged that all elements are inclosed in a single housing, and are automatically cooled by a patented cooling system that requires no liquid of any kind.

The piston, all bearings and gears are automatically lubricated from a central source by the capillary system, there being no liquid lubricant or oil level to maintain, consequently, there can be no flooding and it is impossible for any oily vapor to get into the tires and rot them out.

The outfit is very neat in appearance, light in weight and is fitted with a long electric cord, high-pressure gauge, hose and quick-acting coupling. It will run from any lamp socket and will pump any size tire to required pressure in a very short time. It eliminates the necessity for storage tanks, stationary compressors and heavy truck outfits around the garage.



Electrically Operated Tire Inflator.

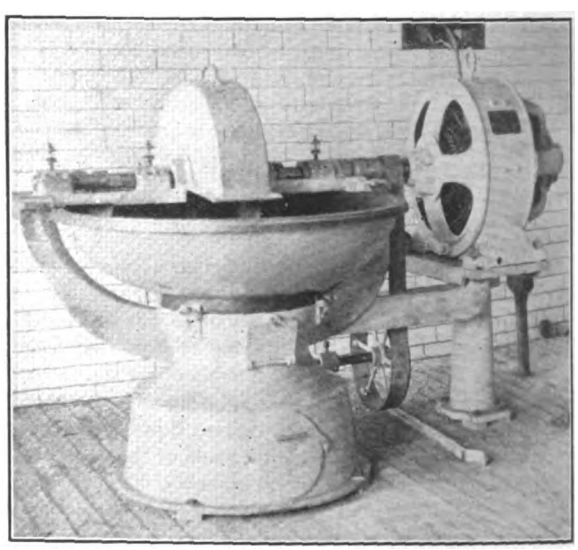
This set is made in two sizes. No. 1 size is particularly suited to private garages. No. 2 size has 2.5 times the capacity of the No. 1, and is intended for public garages, tire sales rooms, etc., as it will take care of the heaviest demands for air.

These machines are also furnished for mounting permanently on the wall, and in this case have short electrical connections and very long hose, that can be hung on a hook when not in use. The No. 2 Lectroflater is also furnished mounted on a light seamless steel tubular carriage, having large-diameter wheels and tool tray; this set is suitable for rolling around public garages and other public places.

Crescent Motor-Driven Silent Meat Cutter.

The meat cutter illustrated, the latest improved Crescent silent cutter made by the Brecht Company, St. Louis, Mo., has been developed to meet the demand for a smooth, silent-running machine suitable for cutting sausage meat, mince meat, pickles, cabbage, fruit and other products. The illustration shows the No. 1 machine, which has 6 knives, a capacity to 50 pounds, and a bowl 43 inches in diameter. It is operated by a 30-horsepower, 230-volt, constant-speed, commutating-pole, direct-current Westinghouse motor, which is direct-connected to the cutting shaft and this in turn is belted to a countershaft geared to a worm mechanism for turning the bowl. In operation the knives and the bowl revolve simultaneously.

A vertical shaft in the base of the machine turns the bowl. A collar near the bottom has a ball race and fits in a cup filled with oil in which the balls run. The cup rests in a heavy cross piece that carries the weight of the bowl. The bowl itself is held in place by four or more bronze side bearings that can be adjusted to fit and when once adjusted will hold the bowl in place in correct relation with the travel of the knives. The outer top edge of the bowl is flat and fits so close under the table that meat cannot escape when being chopped. The under edge of the bowl has a lip preventing any drip from running down on outside.



Motor-Driven Meat Cutter.

In the center of the bowl-shaft there is a dental clutch that turns the bowl by engaging a worm wheel. The ball race supports the vertical bowl-shaft and takes the thrust and combined weight of shaft, bowl, and contents. This feature, together with the perfect alignment obtained by the bronze side-adjustment bearings, renders the machine as nearly frictionless as it is possible to make it, and accounts for its steady motion, and smooth and silent running.

Besides the size illustrated, this make of cutter is made in two other sizes, with capacities of 50 and 100 pounds.

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Simple Rectifying Device for Charging Storage Batteries.

On account of the great increase in the use of storage batteries for starting, lighting and ignition purposes on automobiles, simple means are demanded for charging such batteries at periodic intervals in order to insure their maintenance under the best conditions. A device aiming to meet this demand by means of a simple and rugged equipment has been placed on the market by the Ohio Electric Works, Cleveland, O. It is designated as a "magnetic rectifier" and is said to overcome the disadvantages of the mercury-arc rectifier and other means of obtaining direct current from the ordinary alternating-current supply lines.

The device is very compactly made and is quite inexpensive. It includes a small step-down transformer, which reduces the voltage to the proper value for the charging circuit. The low-voltage current then passes through the rectifying element, which consists of a master spring armature carrying two opposite auxiliary springs, to each of which is attached a copper electrode that makes and breaks the circuit with a carbon electrode. The master armature is energized from the same flux in the transformer core that induces the secondary or charging current, and it is claimed that this produces not only simplicity in design, but eliminates lag between vibrations of the armature and current reversals. The device really has but one moving part and since a carbon electrode is used substantially no sparking is obtained. The carbon electrodes are easily adjusted for slight wear by means of a thumb screw. Both half waves of the alternating-current supply are utilized and a quite steady direct current suitable for charging small storage batteries and other direct-current apparatus is obtained.

Simple Rectifier.

To connect the outfit requires merely inserting the attachment plug to a lamp socket and turning on the current. The loose wire terminals shown in the lower left corner are then properly connected to the binding posts of the battery so as to secure correct polarity. An ammeter is included in the outfit to indicate the charging current. This device is made for use particularly with six-volt storage batteries. If it is desired to charge batteries of higher voltage, two or more of these rectifiers are connected in series. If several six-volt batteries are to be charged at the same time, two or more rectifiers are connected in parallel.

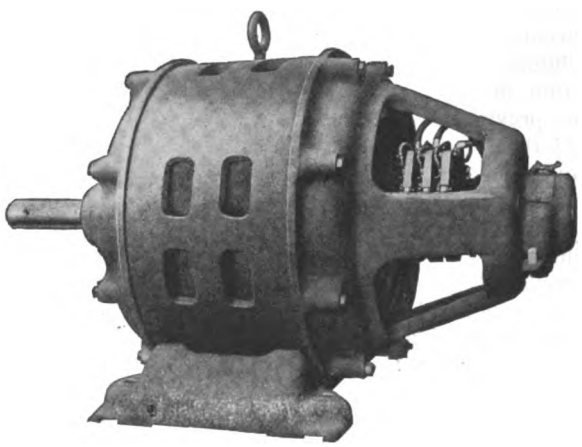
New Type of Westinghouse Slip-Ring Induction Motor.

A new line of slip-ring induction motors, known as type CI, for severe, intermittent, varying-speed service has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. These motors are especially designed for heavy duty on cranes, hoists, draw bridges, roller-lift bridges, railway turntables, transfer tables and similar applications. They can be furnished in sizes from 1.5 to 200 horsepower for operation on two or three-phase, 220 or 440-volt, 25 and 60-cycle circuits.

The frames of the smaller sizes are made up of steel laminations riveted between forged steel end shields; in the larger sizes the frames are made of rolled open-hearth steel. The brackets are of cast iron with reinforcing ribs to assure rigidity and perfect alinement of the bearings at all times. The bearings are self-oiling, of the oil-ring type, and are large in size. The steel brush-holders are supported by and insulated from the bracket, which is open to permit easy inspection and renewal of the brushes.

The rotor is small in diameter, thus reducing the flywheel effect. This feature, together with perfect balance and secure attachment of the windings, makes these motors especially adapted for frequent starting, stopping, and reversing. The shaft is of axle steel and can be removed from the rotor without disturbing the winding.

The running torque of these motors is the maximum obtainable and the starting and pull-out torques in all motors exceed twice the full-load torque. They are so constructed that in case of accident repairs can be quickly made, and maximum strength is obtained, while weight and overall dimensions have been reduced to a minimum.



Type C. I. Westinghouse Slip-Ring Motor, 75 Horsepower.

Slip-Ring Motor, 10 Horsepower.

The illustrations show a 75-horsepower motor, with rolled-steel frame and a 10-horsepower motor with built-up frame construction.

New Sangamo Ampere-Hour Meter for Submarine Use.

One of the exhibits that attracted a great deal of attention at the National Electric Light Association manufacturers' exhibition this week was the new ampere-hour meter specially designed for submarines by the Sangamo Electric Company, Springfield, Ill. This instrument represents an important development in the electric meter art. It consists really of two meters combined in one base and connected through differential gearing so that the total sum or difference of the quantities integrated by the two elements will be correctly shown on a single dial.

As used in submarine vessels, one meter element is

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operated from a large external shunt carrying the entire main charge and discharge of one of the two batteries on a boat. The other meter element is operated from a much smaller shunt, from 100 to 200 amperes, which measures only the current taken by lights, fan motors and other auxiliary services on the vessel; the current through this meter therefore is only in one direction—discharge. Having the two elements connected to the one train by means of suitable differential gearing, and taking proper account of the difference in capacities of the two meters, the dial will show at all times the true condition of a battery with respect to charge and discharge.

This new meter is equipped with the usual Sangamo variable-resistor feature on the main element to compensate for the necessary battery overcharge of 15 or 20 per cent, and in addition a special arrangement of external shunts is used, by which the main element of the meter is caused to speed up on very high discharge rates so as to further compensate for the reduction in useful capacity thus brought about.

Summing up, it may be said that this combination ampere-hour meter comes more nearly approximating an absolutely correct device for the indication of battery condition in this very severe service than any method that has previously been considered. It may be of interest to add that the single or ordinary type of Sangamo ampere-hour meter has already been used on the majority of submarines of the United States Navy and on a number of the submarines of Spain, Holland, England and Russia. This new combination type will undoubtedly supersede all previous types for this class of service and in any other service where a battery has to be operated under the extraordinary conditions approaching those which obtain on a submarine vessel.

Electrically Wound Contact-Making Clock.

For numerous purposes there is need of a reliable automatic mechanism for making and breaking an electric circuit at regular periodic intervals. To supply such a mechanism an electrically wound contact-making clock has been developed for special use with maximum-demand indicators, signal-bell systems, grain-sampling devices, or for any appliance where it is necessary automatically to make and break a small-capacity circuit at predetermined intervals. This clock differs from other

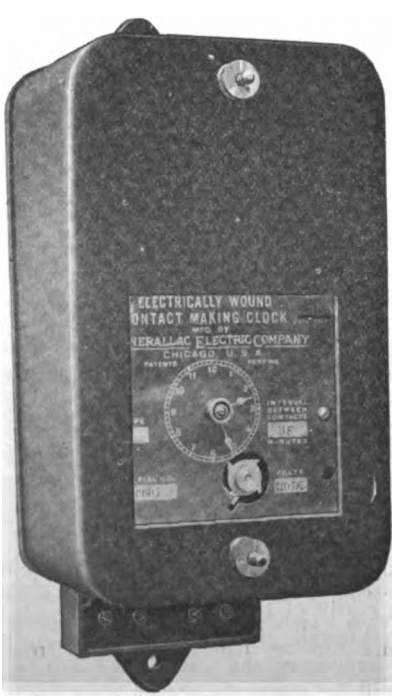

Fig. 1.—Electrically Wound Contact-Making Clock.

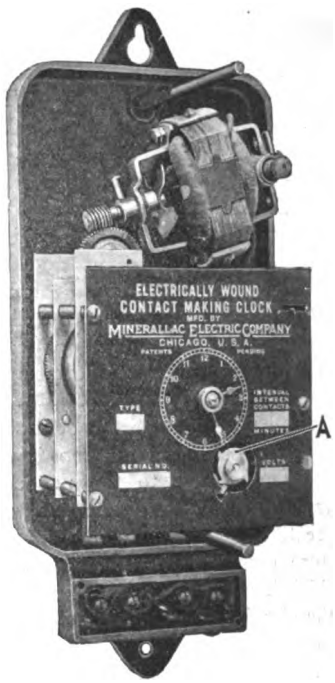

Fig. 2.—View Showing Interior of Contact-Making Clock.

electrically wound clocks in that it is operated from standard line voltages and does not require any batteries. An electric motor shown at the top of Fig. 2, is used to wind the springs and keep them at an even torque at all times. This insures accurate time and reliable service.

The motor-winding feature results in a great saving by eliminating the daily, semi-weekly, or weekly key winding. It also has the advantage of affording extreme reliability. Due to the fact that the springs are kept fully wound at all times, the clock will run through the most severe temperature changes without stopping. The average key-wound clock at the end of an eight-day period or when almost entirely unwound, does not have sufficient spring power to keep the clock running through a very sudden and extreme drop in temperature. The winding element, escapement and practically the entire clock element is the same strong and durable device that is used in the Minerallac motor-wound time switches, which have made for themselves an enviable reputation for continuous and reliable operation the year around.

Even though it be necessary for an operator to visit installations of these clocks with demand devices, samplers or similar installations at frequent periods, still the advantage, as above stated, of having a motor-wound clock is apparent, for at the times of these visits the operators have in many cases been known to forget to wind the clock or are unable to visit them at a time when they are almost run down and an extreme change in temperature at such a time occurs and stops them entirely.

The device for governing the time interval is made so that this interval may be changed at any time without taking the clock out of service. This change is made by replacing the cam *A*, Fig. 2, which is accomplished by merely removing a thumb nut and slipping the cam off, substituting the new one with the proper number of teeth, so that any of the following intervals can be obtained: 5, 10, 15, 20, 30 or 60 minutes.

The clock can be furnished with a motor wound for 110 or 220 volts direct current or alternating current, the alternating-current motors being obtainable in any commercial frequency from 25 to 60 cycles. These electrically wound contact-making clocks are made by the Minerallac Company, Chicago, Ill.

The Wright Electric Company is the incorporated name of what was formerly the O'Shea-Wright Company, electrical contractors, 212 South Main Street, Albany, N. Y. C. D. Wright is president and manager and F. W. Wright secretary and treasurer.

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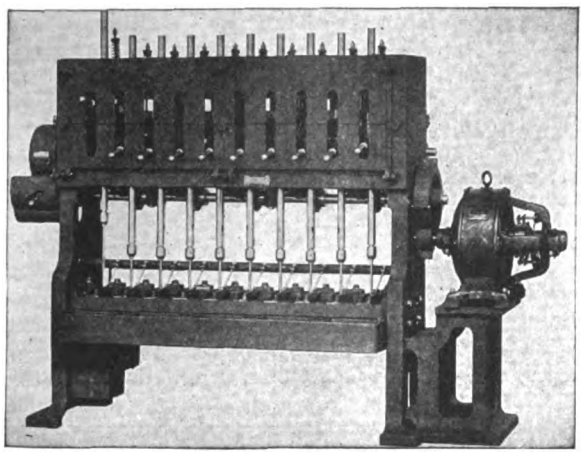
Electrically Driven Nut-Tapping Machine.

In the National ten-spindle automatic nut tapper the National Machinery Company, Tiffin, O., offers a machine that will handle hot-pressed nuts as readily as the cold-pressed ones. Furthermore, there is no chance of the nuts sticking as is usually the case with entirely automatic nut tappers. In this machine the spindles are raised and lowered automatically by cams, the sole duty of the operator being to feed the blank nuts into the machine and to empty the taps.

By operating the machine without treadling, tap breakage is greatly reduced, as the cam movement lowers the spindles gradually. This eliminates the sudden and violent tap strains incurred in the "foot lever" tapper, when from fatigue or through negligence, the operator allows the spindles to drop, causing the tap to jam and bind, and subjecting it to excessive torsional strains that result in breakage.



National Nut-Tapping Machine.

The tap spindles are close together, being within a space of 70 inches, thus enabling the operator to successfully feed ten spindles. The spindles can be adjusted vertically to suit various lengths of taps, and the taps can be removed or inserted in the sockets without stopping the machine.

Ten three-step cams are used to raise and lower the spindles and are so timed that the raising and lowering movements are in consecutive order. The cam shaft can be shifted laterally to engage the various cam steps. In this way the resting time of the spindles when raised can be changed to meet the needs of the operator for feeding and emptying the taps.

The illustration shows one of these machines geared to a Westinghouse adjustable-speed direct-current motor. By means of a drum control the speed of the motor operating the cam shaft may be adjusted from 550 to 1,200 revolutions per minute, making the machine suitable for tapping nuts from 0.75 to 1.5-inch size. This control allows the revolutions of the tapping spindle to be varied to suit the number of threads on the tap used, thus obtaining maximum production from the machine. These speed changes can be made while the machine is running.

Potentiometer System of Pyrometry.

The high accuracy attainable through use of the potentiometer in electrical measurements has led to its adaptation to pyrometry. As the development of several years, the Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has placed on the market a complete potentiometer system of pyrometry.

The potentiometer pyrometer is based upon the use of the thermocouple, but differs from the ordinary deflection galvanometer or millivoltmeter pyrometer in that the electromotive force resulting from the difference in temperature between the hot and cold ends of the thermocouple is measured by a novel balancing method, rather than by a deflecting galvanometer. That is, a variable but always known electromotive force is connected into the circuit with voltage opposing that of the couple. A galvanometer is also introduced into the circuit, being employed to show when the two voltages are equal, since at this time the pointer will stand motionless at zero.

This method produces a pyrometer independent of the immersion and resistance of the thermocouple and of the temperature and length of the connecting leads and also of the resistance and calibration of the galvanometer itself. By using leads of the same metals used in the thermocouple, the cold-end junction of the latter is brought back to the instrument, where it is compensated for either by hand adjustment or automatically, avoiding the necessity of ice boxes, steam boxes, or other means of holding the cold-end temperature constant.

The potentiometers employed are of two general types, hand adjusted indicators and automatically adjusted recorders. The recorders are of the single-point curve-drawing class and of the multiple-point printing class, the latter being supplied for keeping records of the temperature of as many as 16 different thermocouples. Selector switches and busbar boards render it possible to operate either indicators or recorders in connection with as many thermocouples as may be desired. As errors due to changes in resistance are eliminated by the potentiometer method, it is possible to obtain with base-metal thermocouples results equal to or superior to those secured by the use of precious-metal thermocouples in connection with millivoltmeters.

Because of the increased amount of attention being given to heat-treatment problems at the present time, this new system of pyrometry should prove of particular value to all users of special steels, alloys and other metals. The instruments are quite rugged. They may be placed where most advantageous, regardless of the distance to the furnace. The entire system is very flexible and adaptable to requirements.

New Hubbell Cap for Receptacles.

A new type of cap for use with wall and flush receptacles and separable attachment plugs has been placed on the market by Harvey Hubbell, Incorporated, Bridgeport, Conn. This cap is made of a durable heatproof composition and is provided with an elongated and knurled neck which affords a very convenient grip. This elongated neck has been purposely designed as a means of withdrawing the cap from the receptacle and it is expected that the ease with which this can be done properly will discourage a tendency to pull the cap by means of the cord. This new cap is interchangeable with the entire line of Hubbell wall and flush receptacles and separable plugs.

New Hubbel Cap.

Washington Garage Has 80-Volt and 105-Volt Battery-Charging Circuits.

In the Sterrett & Fleming Garage, Washington, D. C., two voltages—80 and 105—are available for charging and it is the practice here to charge a small number of cells, say from 24 to 36 from the 80-volt busbars, and in the case of 36 cells, when the voltage comes up to approximately the 80 volts, to throw over to the 105-volt busbars to finish the charge. With 40 cells and over the charging is entirely from the 105-volt circuit.

The battery-charging equipment in this garage consists of 40

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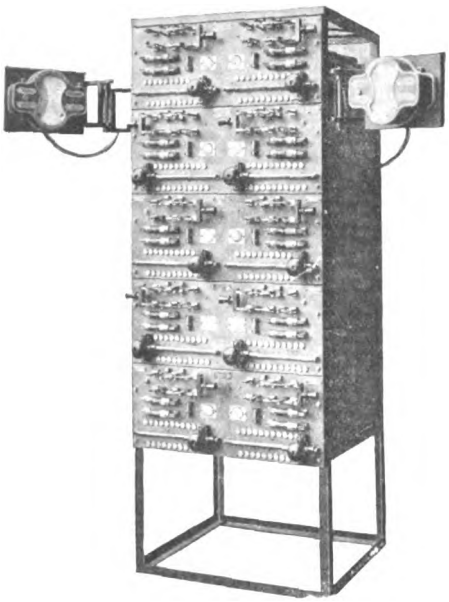

Fig. 1.—First Ten-Circuit Charging Equipment Installed in Washington Garage.

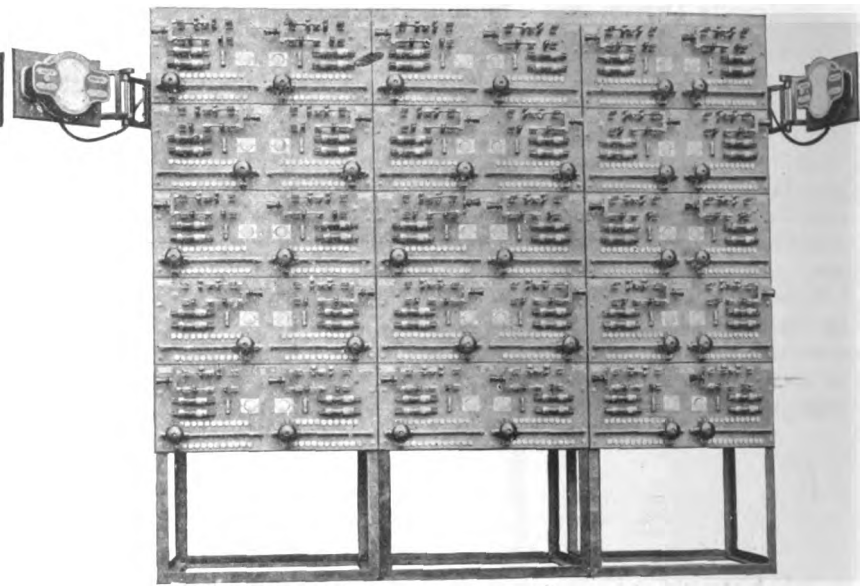

Fig. 2.—Second Installation of C-H Battery-Charging Equipment Installed in Sterrett & Fleming Garage, Washington, D. C. This Consists of Three Ten-Circuit Panels, Similar to the Original Equipment.

C-H units made by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis. The first installation consisted of the 10-unit rheostat panel shown in Fig. 1, while a 30-unit equipment to care for 30 additional charging circuits was installed later. This is the exact duplicate of the first installation except it is for 30 instead of 100 circuits. The duplex meter at one end is connected to the 80-volt supply and the other meter to the 105-volt busbars. The features of the unit type charging sections are standard (except for the throw-over switches) and have previously been described in these columns.

View in Assembling and Testing Departments of Roth Brothers & Company Factory.

This illustration shows at the left the assembling department in the factory of Roth Brothers & Company, Chicago, Ill. At the right is a portion of the testing floor, where every motor and generator built is given a running test. Adjoining the testing section is the switchboard controlling all power and lighting circuits in the building. To the right and back of the switchboard is part of the machine shop. On adjoining portions of this floor are the shipping department and the stock room for finished parts of all machines. The Roth Brothers firm is an old and well established manufacturer of all kinds of direct and alternating-current motors and motor-driven machines; generators, motor-generators, and other lines of dynamoelectric machinery are also made. The company is especially fitted to handle orders for special apparatus.

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INDUSTRY ACTIVITIES

Leeds & Northrup Company, Philadelphia, Pa., has issued a 16-page booklet which illustrates and prices its odd-stock list of electrical instruments.

Stow Manufacturing Company, Binghamton, N. Y., has issued a booklet on its portable electric tools, motor-shaft combinations and flexible shafts.

Westinghouse Lamp Company announces the removal of its executive offices to the City Investing Building, 165 Broadway, New York City, on June 1.

Metropolitan Engineering Company, manufacturer of electrical devices, has removed its offices from 30 East Forty-second Street to 35 Vestry Street, New York City.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued Bulletin No. 1098, on engine-type, alternating-current generators, and Bulletin No. 1099, on types "AB" and "AH" belted, alternating-current generators.

Roller-Smith Company, manufacturers of electrical instruments and circuit-breakers, announce that the location of its main office has been changed from 203 Broadway to 233 Broadway (Woolworth Building), New York City. The necessity for additional space occasioned the removal to the new quarters.

Jas. Clark, Jr., Electric Company, Louisville, Ky., announces the removal of its Chicago office from 201 Machinery Hall Building, to its new store and offices at 31 North Jefferson Street. In the new location the company carries a much larger stock of "Willey" electrically driven tools and has facilities for exhibiting samples of all of these tools in actual operation.

Harding Pole Concrete Company, Spokane, Wash., maintained an exhibit at the convention of the National Electric Light Association in Chicago which attracted considerable attention. The company has a process by which poles decayed at the butt are reinforced by steel embedded in concrete. The life of a pole is greatly lengthened in this manner at a cost considerably lower than would be occasioned by other means. The Kootenai Power Company, of Coeur d' Alene, Idaho, during the past year has reinforced over 500 transmission line poles with the Harding process, and the Washington Water Power Company and Inland Empire Railway System are considering its extensive use.

Delta Electric Company, Marion, Ind., has recently completed the erection of one of the most modern and complete factories for the manufacture of electrical lanterns, lamps and flashlights. This company has been planning and constructing this building for some time and they report having moved into the new quarters and that their entire equipment is in full operation. Extensive installations of new machinery and equipment have been made and the company is now having its raw material, made to their special orders at the mills, shipped direct to the factory in carload lots. The company's added manufacturing facilities have fortunately been completed just at the right time of year, when business is so prosperous. It is equipped to manufacture its products in immense quantities preparatory for use by ultimate consumers during the summer, fall and winter months. The Delta Electric Company announces one of the most extensive advertising campaigns it has ever made. This campaign will be launched in the course of a few days and will reach practically every consumer in the United States and Canada. It will be educative, teaching the advantages, safety, etc., of its line of electric lanterns, lamps and flashlights.

S. Robert Schwartz & Brother, manufacturers of commercial portable lamps, lamp shades, ground clamps and fittings, have removed their offices and factory to 729 Broadway, New York City. The concern is also representing the Phelps Manufacturing Company, Detroit, Mich.; Bourn Rubber Company, Providence, R. I.; American Insulated Wire & Cable Company, Chicago, Ill.; Bussman Manufacturing Company, St. Louis, Mo., and King Electric & Manufacturing Company, Cleveland, O.

The Richardson-Phenix Company, Milwaukee, Wis., has issued Bulletin No. 5, on oil filters. A complete line of filters for purifying lubricating oil, having capacities of 25 gallons per day to 50,000 gallons per hour, is described, together with large-size filters for purifying lubricating oil from water-wheel thrust bearings, large gas and steam engines in steel mills and also for purifying cutting lubricants. The large filters are made of heavy steel plate, the oil connections for some of them being for 10-inch pipe. The catalog services to indicate the remarkable advance made in recent years in the science of oil filtration. Copies may be obtained upon request to the company.

Christening of a Hughes Range.—On Wednesday noon in the booth of the Hughes Electric Heating Company at the National Electric Light Association Exhibition, Miss Charlotte Greenwood, of "So Long Letty" company, christened a new Hughes electric range "Princess Off-Peak." This event was one of many staged in the Hughes Exhibit and took place before a large crowd of convention delegates and their ladies; also newspaper photographers and a motion picture man from the Selig-Tribune weekly. Miss Greenwood played her part exceptionally well before the movie camera, "registering" the expression that it broke her heart to break the bottle and let the champagne go to waste. After the christening, Miss Greenwood was presented with a large bunch of American Beauty Roses with which she posed again for the motion camera man. Another feature at the Hughes booth was electric cooking on the Hughes Junior, the toy range, by two little motion-picture actresses. They toasted marshmallows for the delegates during the entire week.

Snyder Electric Furnaces in England.—W. K. Booth, vice-president of the Snyder Electric Furnace Company, of Chicago, Ill., has just returned from England, where he designed and built several furnaces for making ferrosilicon, in which silicon is made 97.25 per cent pure. Four of these furnaces are being built and installed at the present time, using a total of 1,800 kilowatts of power input. The plant is equipped with a very complete chemical laboratory, and considering the present labor conditions in England, the work was done in a very short time. In addition to the above illustration, Mr. Booth started and had well under way before his return, two furnaces each capable of melting 12 tons of steel every 24 hours, for Thwaite Bros., Bradford, Eng. These were lined basic and third basic furnace was sold to Thos. Summerson & Sons, Darlington, England. Another furnace was sold to the Daimler Motor Car Company, to be used for the making of automobile cylinders of grey iron. A special type of furnace, capable of turning out 5 tons of basic steel every 24 hours, was sold the National Steel Foundry Company at Leven, Fife, Scotland. Within the next few months the Snyder Electric Furnace Company will have in operation in England at least nine Electric Furnaces, a very good showing considering that this was done within one year.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

ARMORED CABLE. — American Metal Moulding Company, Newark, N. J.

Marking: Letter "D" stamped in armor at intervals of about 5 inches, or two parallel paper cords wound between inner and outer layers of armor.

Listed April 17, 1916.

ATTACHMENT PLUGS, Fuseless. — Harvey Hubbell, Incorporated, Bridgeport, Conn.

Separable attachment plugs, having porcelain or composition bases or caps.

Cord connector, 10 amperes, 250 volts, catalog No. 6406.

Cap with Knostrain bushing, catalog Nos. 6254-55, 6328-29.

Listed April 4, 1916.

ELECTRICALLY ILLUMINATED GRATE.—The Miller Grate Company, Center and Washington Streets, Cleveland, Ohio.

This device is a portable electric grate, in which are mounted two standard lamp receptables and a standard motor attachment plug. A wire mesh screen is provided over lamps on which broken glass is laid and light from red lamps shining through glass gives effect of coal fire.

Listed April 14, 1916.

FIXTURES, for Gas-Filled Lamps.—The Alexalite Company, 434 East Twenty-third Street, New York, N. Y.

Alexalite indirect.

Listed April 14, 1916.

FIXTURES.—Benjamin Electric & Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Show window and show case types.

Sectional unit with opal or mirror lining, catalog No. 4357; with detached stem, catalog No. 4360.

Single unit, mounted on stem, catalog No. 4282.

Continuous unit, catalog No. 4290.

Listed April 19, 1916.

FLEXIBLE CORD. — Kerite Insulated Wire & Cable Company, 30 Church Street, New York, N. Y.

Marking: Green and black threads parallel in braid, or in wires or cables without braid or having colored braids, green, white and black threads parallel with wire between insulation and outside finish.

Listed April 19, 1916.

HEATERS, Electric.—Chicago Surgical & Electrical Company, 314 West Superior Street, Chicago, Ill.

These devices are designed to warm microscope-specimen slides to a moderate degree, and are electrically heated and thermostatically controlled.

Microscope warm stage, for use in series with an 8-candlepower incandescent lamp, catalog No. 7.

Slide warmer, 1 ampere, 110 volts, catalog No. 26.

Listed April 11, 1916.

INCUBATORS AND BROODERS. —Chicago Surgical & Electrical Company, 314 West Superior Street, Chicago, Ill.

These devices comprise a line of electrically heated and thermostatically controlled bacteriological incubators and appliances.

Five amperes or less, 110 volts, catalog Nos. 1-3, 5, 6, 7, 8, 10-14, 17, 18, 21, 22, 24, 25.

Listed April 11, 1916.

Fixture for Gas-Filled Lamp.—The Alexalite Company.

MISCELLANEOUS.—Chicago Surgical & Electrical Company, 314 West Superior Street, Chicago, Ill.

This device is an adjustable speed motor-driven centrifuge for laboratory use. 1 ampere, 110 volts, catalog No. 19.

Listed April 11, 1916.

PICTURE MACHINES, Stereopticon Type.—Kineto Machine Company, 440 South Dearborn Street, Chicago, Ill.

Automatic stereopticon in which illumination is obtained from a gas-filled incandescent lamp connected to circuit by an attachment plug and length of flexible cord, for projecting image of a clock dial showing time and small amount of advertising matter on an auxiliary screen in picture theaters. "Kineto Ad Clock," 250 watts, 115 volts.

Listed April 4, 1916.

RHEOSTATS.—Diehl Manufacturing Company, Elizabethport, N. J.

Diehl sewing-machine-motor controller consisting of a starter and speed regulator for small motors, and comprising a resistance coil with taps connected to contact studs on a porcelain base inclosed in a cast-iron case and a contact shoe operated by a spring on a shaft connected to treadle of machine. In event of breakage of operating spring contact shoe is held in off position by gravity. Maximum rating, 0.25 horsepower, 125 volts.

Listed April 22, 1916.

RHEOSTATS.—Singer Sewing Machine Company, 149 Broadway, New York, N. Y.

Singer sewing-machine-motor controller, consisting of a starter and speed regulator for small motors and comprising a resistance coil with taps connected to contact studs on a porcelain base inclosed in a cast-iron case and a contact shoe operated by a spring on a shaft connected to a treadle of machine. In event of breakage of operating spring contact shoe is held in off position by gravity. Maximum rating, 0.25 horsepower, 125 volts.

Listed April 22, 1916.

RECEPTACLES, Standard.—E. H. Freeman Electric Company, Trenton, N. J.

Freeman porcelain shell receptacles.

Keyless, 660 watts, 250 volts. Fixture type, catalog Nos. 232-33, 294.

Listed April 7, 1916.

SIGNAL APPLIANCES. — The R. Haas Electric & Manufacturing Company, Springfield, Ill.

Electric signal bell, Ideal. 100-125 volts, alternating current.

Listed April 14, 1916.

WIRE, Rubber-Covered. — Bourn Rubber Company, Providence, R. I.

Marking: Three parallel green threads in braid, or one green thread and one soft uncolored thread running parallel with wire between insulation and braid.

Listed April 19, 1916.

WIRE, Rubber-Covered.—Kerite Insulated Wire & Cable Company, 30 Church Street, New York, N. Y.

Marking: Green and black threads parallel in braid, or in wires or cables without braid or having colored braids, green, white and black threads parallel with wire between insulation and outside finish.

Listed April 19, 1916.

WIRE, Rubber-Covered Fixture.—Kerite Insulated Wire & Cable Company, 30 Church Street, New York, N. Y.

Marking: Green and black threads parallel in braid, or in wires or cables without braid or having colored braids, green, white and black threads parallel with wire between insulation and outside finish.

Listed April 19, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. F. L. GILMAN, formerly assistant general superintendent of the Hawthorne Works of the Western Electric Company, has been transferred to the engineering department, New York City, with the title of the assistant chief engineer. Mr. Gilman has been identified with telephone interests for 21 years. He was graduated in Harvard in 1895, following which he entered the repair shops of the New England Telephone Company at South Boston, eventually becoming assistant electrical engineer of that company. In 1901 he took charge of switchboard engineering for the Western Electric Company in New York and remained in the New York engineering department for five years, at the expiration of which he was in full charge. In 1906 Mr. Gilman was transferred to the New York shops, and later became superintendent of the manufacturing branch. In 1909 he became associated with the staff of Vice-President Thayer and in 1911 became general manager of the Missouri & Kansas Telephone Company, later becoming general manager of the Bell Company, in charge of operating. In 1912, Mr. Gilman was appointed superintendent of the telephone apparatus shops of the Western Electric Company at Hawthorne and later was made assistant general superintendent, in charge of the technical, operating, inspection and installation branches, the position which he held until his recent transfer. Mr. Gilman is a fellow of the American Institute of Electrical Engineers, a member of the American Society of Mechanical Engineers and other organizations.

F. L. Gilman.

MR. A. F. GANZ, of New York City, has been engaged by the Northern Ohio Traction Company to conduct a detailed examination of the company's overhead feeder system, with a view of determining electrolysis losses.

MR. JAMES R. COE, well known to the electrical trade in New York City, and a former president of the National Association of Stationary Engineers, has joined the sales force of Deuth & Company, Inc., electric lamp manufacturer and importer, New York City.

MR. H. J. MEYER recently was elected president of the Milwaukee (Wis.) Electrical League.

MR. C. E. FAHRNEY, manager of the Ottumwa (Iowa) Railway & Light Company, has been elected vice-president of the Iowa Street & Interurban Railway Association.

MR. H. F. YOST has been appointed assistant manager of the San Francisco office of the Trumbull Electric Manufacturing Company. He was formerly in the sales department of the Electric Appliance Company, San Francisco.

MR. G. B. COLPAS, auditor of the Washington Water Power Company, of Spokane, for the past 10 years, has resigned. He is succeeded by MR. PARKINGTON HAYWARD, who has been in the employ of the company for eight years.

MR. F. S. PRATT, chairman of the Board of Directors of the Puget Sound Traction, Light & Power Company, of Seattle, a subsidiary of the Stone & Webster Corporation, recently made a tour of the Northwest on business connected with the extensive interests of the latter company.

MR. LUTHER A. LEACH has been appointed general superintendent of the Bar Harbor & Union River Power Company, Ellsworth, Me., with supervision of all the plants east of Bangor. He has been connected with the company since its organization, and prior to that was with the Bar Harbor Electric Light Company. MR. L. H. CUSHMAN, of Ellsworth, has been appointed superintendent of construction, with headquarters at Brooklin, where the lines are being extended.

MR. A. C. BABSON, formerly commercial engineer for the Wisconsin River Power Company, Madison, Wis., recently was appointed manager of the Watertown division of the Wisconsin Gas & Electric Company, which includes the gas and electric business at Watertown and the high-tension distribution system to Fort Atkinson, Jefferson, Lake Mills and Johnson's Creek. Mr. Babson has had an extended experience in California, Oregon and Washington in connection with electrical work.

MR. A. R. LOUGHBOROUGH, who for the past three years has been manager of the Salt Lake City office of the Western Electric Company, has been appointed sales manager of the Cincinnati office of the same company and has assumed his new duties. Mr. Loughborough entered the service of the Western Electric Company 13 years ago as stock clerk. In the comparatively short time which he spent in Salt Lake City he made a host of friends who were pleased to learn of his promotion. MR. D. J. BUTTS has been assigned to the managership of the Salt Lake City office. Mr. Butts has been in Salt Lake City for the past three months. Prior to that he was in the Boston office of the Western Electric Company for five years, and has been in the service of the company for 14 years.

MR. J. WHYTE has been appointed manager of the storage battery service department of the Prest-O-Lite Company, Inc., of Indianapolis, Ind. Prior to his coming with the Prest-O-Lite Company, Mr. Whyte served as electrical engineer for the Maxwell Motor Company, of Detroit, Mich., was at one time assistant chief engineer for the Scripps-Booth Company, of Detroit, and has been prominently connected with other companies in the automobile and electric-starter business. In his years of association with the automobile and electric industries in this country and abroad Mr. Whyte has gained a wide experience with storage batteries that make him eminently fitted for his new position. Before turning his attention to automobiles Mr. Whyte had much valuable experience with the battery industry in its application to central-station power plants and was closely connected with the electrical end of marine engineering.

J. Whyte.

OBITUARY.

SERGEANT CHARLES M. BEER, who was for a number of years electrical instructor at Fort Totten, died May 18 in Washington, D. C., aged 56 years. He was a native of Germany and served 30 years in the Coast Artillery Corps of the United States Army.

MR. F. E. SEAGRAVE, builder of the first street railway line in Toledo, O., died in that city May 19, aged 73 years. He was active in the construction of many electric railway systems, one of the most important being the Toledo & Indiana.

MR. ELMER E. CORTHELL, president of the American Society of Civil Engineers, died in Albany, N. Y., May 16. He was born in Whitman, Mass., in 1840, receiving his education at Phillips Exeter Academy and Brown University. He became one of the most prominent members of his profession, and was associated with many of the large engineering enterprises in North and South America. He was author of a number of technical papers.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

AUGUSTA, ME.—The Middle States Power Company has been incorporated here for the purpose of acquiring, owning and operating public utilities. The capitalization is $500,000 and the incorporators are R. S. Buzzell, L. J. Coleman and C. L. Andrews, of Augusta, and C. S. Rogers, of Duluth, Minn.

LISBON FALLS, ME.—This town has voted to contract for one year with the Lisbon Falls Gas & Electric Company for its street lighting. A committee had investigated the desirability of acquiring a municipal plant, but the town voted down the proposition. The new street lighting rate will be $15 instead of $20 per year for 32-candlepower lamps. The committee reported that a municipal plant could be constructed and equipped for $11,000 and the cost of lighting would be $17.12 a year for 32-candlepower units. The local company will reduce its commercial rates, the maximum lighting rate from 12.5 to 10 cents, and power in similar ratio. At the town meeting it was brought out that a reduction of the company's income through its discontinuance to supply street lighting might result in higher commercial rates.

ENOSBURG FALLS, VT.—This community is considering the erection of a generating plant on a water-power site near its present station, at a cost of $10,000.

CONCORD, MASS.—The city has voted to expend about $10,000 in improving its steam plant, especially in connection with the condenser system.

FALL RIVER, MASS.—The city council is planning to extend the white-way and arc-light systems at an estimated cost of $1,800.

NEEDHAM, MASS.—This town is planning a white way of nitrogen-filled lamps to connect the center of the town with Needham Heights.

CONCORD, MASS.—At a recent election it was decided to spend $10,000 for extensions to the municipal electric-lighting plant.

DERBY, CONN.—The Derby Gas Company is preparing to double the capacity of its electric power plant. A 5,000-kilowatt turbogenerator and auxiliaries will be installed. Additions to the boiler house will be made and a new 600-horsepower boiler added, together with automatic stoker and other equipment.

FAIR HAVEN, CONN.—The Connecticut Company will add a large generator, several boilers and other equipment to its power plant here. Additional power is required for street-railway operation.

HARTFORD, CONN.—The Hartford Electric Light Company will build a substation 44 by 71 feet and three stories high, at a cost of about $66,000. Construction will be done by the Stone & Webster Engineering Corporation.

BUFFALO, N. Y.—The Shoelkoe of Aniline & Chemical Works, Inc., will erect a power house in connection with other plant additions. Contracts for the work have been awarded.

COHOES, N. Y.—The Business Men's Association has under discussion plans for a new street-lighting system.

DELANSON, N. Y.—Plans are being considered here for an electric street-lighting system.

NIAGARA FALLS, N. Y.—The Public Service Commission has approved an issue of $500,000 of the International Railway Company's five-per-cent refunding and improvement mortgage bonds. The proceeds of this issue together with those of a previously authorized issue, making in all about $676,000, will be used to refund car-trust certificates to the amount of $55,000 due this year and to pay for the extension and improvement program for 1916.

NIAGARA FALLS, N. Y.—The Public Service Commission has authorized the Niagara Falls Power Company to receive $2,500,000 of the capital stock of the Canadian Niagara Power Company in payment for advances made and to be made to the latter company for the improvement and extension of its generating and transmission facilities. More than $1,500,000 has already been advanced the Canadian company by the Niagara Falls company and the plan for improvements calls for the expenditure of another $1,000,000.

BUTLER, N. J.—The lighting committee of the Common Council is considering an extension of the distributing system of the municipal lighting plant to Pompton Plains, and into Pequannock Township.

FREEHOLD, N. J.—The Public Utility Board has granted the Monmouth Light Company permission to issue $26,700 in bonds.

NEWARK, N. J.—The Seaboard Chemical Company will build a new boiler plant at its factory on Blanchard Street.

NEWARK, N. J.—The Central Dyestuff & Chemical Company will make alterations and extensions in its power plant on Plum Point Lane.

PRINCETON, N. J.—The Public Service Electric Company will install an underground conduit system along Nassau Street.

VINELAND, N. J.—The Borough Commissioners have voted to employ an engineer to plan extensions to the electric-lighting plant which will involve an expenditure of about $40,000.

WILDWOOD, N. J.—The West Wildwood Water & Power Company has been incorporated with a capital of $100,000 to operate electric power and water systems.

BLOOMSBURG, PA.—It is reported that the Columbia & Montour Electric Company of this city, has closed a contract with the American Car & Foundry Company to furnish auxiliary power for the latter company's Bloomsburg, Berwick and Milton plants. The contract is for nearly 4,000 horsepower.

ELIZABETHTOWN, PA.—J. L. Webster, formerly of Oxford, Pa., has purchased the electric-lighting plant and water-power site here and proposes to make improvements to give 24-hour service.

HARRISBURG, PA.—Approval has been given by the Public Service Commission to the applications for incorporation of the Connonquenssing and Lawrence Hydro-Electric Companies, two of the largest water corporations to come before it. The proceedings have been under way for months, numerous protests having been heard. The companies will operate in Lawrence County.

STAUNTON, VA.—The city is planning to operate its water-works pumping plant with electricity, abandoning the steam plant. It is planned to operate the present municipal electric-lighting plant 24 hours a day.

VIVIAN, W. VA.—The Sycamore Coal Company will install additional electrical equipment.

WHEELING, W. VA.—The service committee of the City Council has recommended a $5,000 bond issue, the proceeds to be used for improvements of the electric-lighting system.

SHULLS MILLS, N. C.—The Boones Fork Lumber Company will install a 600-horsepower hydroelectric plant and two miles of transmission line to furnish energy for operating band and planing mills and lighting system. The equipment will be purchased at once. W. S. Whiting, of Elizabethtown, Tenn., is president, and D. R. Shearer, of Boone, N. C., is consulting engineer for the company.

SUMMERVILLE, S. C.—The Summerville Light & Power Company is planning to install additional generating equipment and subsequently will enlarge its distribution system.

ARMUCHEE, GA.—The plant of the Armuchee Water Mills was completely destroyed by fire. The property destroyed includes an electric-lighting plant. The total loss was about $12,000.

KISSIMMEE, FLA.—An election will be held June 3 to vote on the question of granting a franchise to Tucker Brick Company to furnish electric service here.

NORTH CENTRAL STATES.

CHAUNCEY, O.—A considerable quantity of electrical equipment will be installed by the New York Coal Company in the mine which it has acquired here. Three electric mine locomotives will be used to haul cars in the mine, and all hoisting will also be done by electricity.

CINCINNATI, O.—A district covering all of the streets in the retail business section of the city has been agreed upon by the United Boulevard Lighting Committee, and recommended to the City Council for adoption in an ordinance. The arc lights at present used for street lighting will be replaced by ornamental lights of the boulevard type. E. M. Imbus is chairman of the committee.

DESHLER, O.—Municipal ownership of the electric light and waterworks plants of Deshler was recently approved by vote. The bond issue for the purchase of the two plants will amount to $55,000.

DOVER, O.—City Engineer Arnold has been directed to prepare estimates for improvements to the electric-lighting system.

SPRINGFIELD, O.—A municipal garage, to be equipped with a repair shop, and provided with electrical lighting and other equipment calling for similar material, is to be constructed by the city to care for the 30 motor-driven vehicles owned by it. The estimated cost of the building and its equipment is $14,000.

SPRINGFIELD, O.—The city is letting the various contracts involved in the installation of the ornamental street-lighting system, Crain & Desormoux, of Springfield, being awarded the contract to furnish the posts, on their bid of $19 each for 294, each to bear three 100-candlepower lamps. The Richmond Electrical Company, of Richmond, Ind., will install the posts and do the wiring.

YOUNGSTOWN, O.—Extensions of the present boulevard lighting system in the business section will be made by the city to cover a number of additional blocks. It is proposed to install 600-candlepower lamps, one to a post, instead of 1,000-candlepower lamps, such as are used on some of the streets.

GOLDSMITH, IND.—A company has been organized by E. H. Tete and others in the vicinity of Goldsmith to buy electrical energy and sell it to the stockholders and to towns. The company is capitalized at $25,000.

HUNTINGTON, IND.—The Public Service Commission has authorized the city to issue $16,900 in bonds to meet the expense of installing an ornamental lighting system.

NASHVILLE, IND.—The Public Service Commission has given authority for the town of Nashville to issue bonds in the sum of $2,000 for an electric-lighting plant.

WESTPORT, IND.—Charles Brossmann, consulting engineer, 1616 Merchants' Bank Building, Indianapolis, Ind., is preparing estimates for electric-lighting plant to cost about $5,000.

GRAND RAPIDS, MICH.—The Universal Power Company has completed its organization and is preparing to float $150,000 in stocks and bonds recently authorized by the State Railroad Commission. The company will immediately begin the erection of 80 miles of transmission line to connect towns in Mecosta and Montcalm Counties with the new power plant to be erected near Croton. A water-power plant will also be built near Howard City. The company plans to furnish power to 24 towns in these two counties within six

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months. James E. Tobin of Gladwin, Mich., is president and J. M. Donahue, of Grand Rapids, secretary of the company.

BIRCHWOOD, WIS.—A contract has been signed with the Wisconsin-Minnesota Light & Power Company, of Chippewa Falls, to furnish energy for street lighting and private consumption.

PALMYRA, WIS.—The Palmyra Electric Company has been incorporated with a capital of $10,000 by D. W. Cram and others to furnish electric service here.

HOUSTON, MINN.—Alvin Carlson has been granted a franchise to install an electric-lighting system here.

LONG PRAIRIE, MINN.—The Little Falls Water Power Company has been granted a franchise and will install a street-lighting system.

NORTHFIELD, MINN—The Northern States Power Company, Faribault division, will construct a high-tension line between its Waterford switching station and the substation at Northfield, so that the St. Paul and Cannon Falls lines may be controlled locally and prevent possibility of interruption to the service in the Northfield district.

ST. CLOUD, MINN.—The St. Cloud Public Service Company is planning to install a new steam turbine and boiler equipment in its steam plant, and a 400-horsepower generator in its hydroelectric plant. Other improvements are to be made at the latter plant.

LAMONT, IOWA.—The City Council has made a contract with the Turkey River Light & Power Company, of West Union, Iowa, for electrical energy for street lighting. A transmission line is now being erected.

MAPLETON, IOWA.—Albert Luzen, who was the owner of the local electric-lighting franchise, has sold his holdings to the Electrical Development Company, of Omaha, Neb. The latter company is preparing to furnish service here soon.

AURORA, MO.—The Lawrence County Light, Water & Cold Storage Company, which has been supplying energy from its steam plant here, to Aurora, Marionville and Verona, is now receiving energy from the Ozark Power & Water Company, of Branson, and will extend its service into the mining district.

PIERCE CITY, MO.—A franchise has been granted to the Ozark Power & Water Company of Branson, and the company given a contract for city lighting, involving the abandonment of the municipal plant.

REPUBLIC, MO.—A 20-year franchise to the Republic Electric Lighting Company, and a five-year contract for city lighting will be voted on June 1.

LANE, KANS.—Stephen Needham is supplying electrical energy for commercial purposes to the local business district from a small plant operated by an automobile engine. He plans to extend the system for street lighting.

OBERLIN, KANS.—Preparations are being made for bond issues at Norcatur, Jennings and Clayton, Kans., to provide for local work on electric-lighting systems, the energy to be secured from the Oberlin plant.

STERLING, KANS.—The city is considering plans for the purchase of the local electric-lighting and power plant owned by George Morris.

TOPEKA, KANS.—The United Water, Gas & Electric Company, of Hutchinson, Kans., has asked the Public Utilities Commission for permission to issue $5,000,000 of first and refunding mortgage bonds, $350,000 preferred stock to exchange for stock outstanding, $50,000 common stock. There would be retired $687,000 of bonds, and $335,614 would pay for improvements contemplated.

GENEVA, NEB.—The Continental Gas & Electric Corporation, of Cleveland, O., has purchased the holdings of the Geneva Electric Company.

WENTWORTH, S. D.—The Flandreau (S. D.) Light & Power Company is planning to erect an electric-lighting plant to furnish service here.

GACKLE, N. D.—An electric-lighting plant will be installed here soon by W. K. Bauhous.

SHERWOOD, N. D.—E. T. Clark, of the local electric-lighting plant, has purchased new generating equipment for enlarging the capacity of the plant.

SOUTH CENTRAL STATES.

ASHLAND, KY.—The Ashland Iron and Mining Company, which recently let a contract for a $1,500,000 open-hearth steel plant, and $750,000 finishing mill, has contracted with the Ohio Valley Electrical Company of Benwood, W. Va., for the power to operate the plant. This is the largest power contract ever signed in Eastern Kentucky and it is stated that the plant will rank as the first to rely exclusively on electricity for power.

LOUISVILLE, KY.—The Fiscal Court of Jefferson County at Louisville is considering three recommendations for reconstruction of the county's power plant in the county jail. One proposition provides for repair of present equipment at an estimated cost of $6,000, with complete reconstruction of a new plant next year at a cost estimated to be $40,000 or $50,000. B. Davis, C Inter-Southern Building, is architect for the court.

BARTLETT, TENN.—The city contemplates the construction of an electric street-lighting system.

DYERSBURG, TENN.—The Dyersburg Water & Light Company, S. R. Blakeman, superintendent, is asking for prices on 70 one-light ornamental street-lighting posts, steel, concrete or cast iron, 10 to 12 feet high, with holder, socket and 16-in. globes, for high-tension series street-lighting circuit; and 7,000 feet of single-conductor No. 8 parkway cable for working voltage of 3,000; samples of cable and prices f. o. b. Dyersburg wanted.

SHELBYVILLE, TENN.—The Sylvan Cotton Mills is asking for prices on electrical machinery and supplies, especially wiring for generators and motors.

DECATUR, ALA.—The question of issuing $50,000 in bonds for a municipal electric-lighting plant and water works will be submitted to vote June 1.

LITTLE ROCK, ARK.—The Arkansas Hydro-Electric Development Company has been incorporated with a capital of $50,000 by A. R. Amos, W. D. Dickinson, E. T. Stanfield and G. A. Watkins.

DALLAS, TEX.—Mayor Lindsey announces that the United Electric Securities Company, subsidiary of the General Electric Company, has arranged to take over the traction and electric lighting and power properties of the Stone & Webster Engineering Corporation, in this city. New companies will be organized under the laws of Texas to operate the properties. Extensions to cost about $2,000,000 will be made to the traction and lighting systems.

HOUSTON, TEX.—Plans are being made for a new street-lighting system on Main Street. It is proposed to install 205 new 250-watt lamps.

SNYDER, TEX.—The Snyder Chamber of Commerce is conducting a campaign for extending the municipal lighting system.

DATES AHEAD.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. E. Fowles, Pine Bluff, Ark.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 22-23. Secretary, F. E. Sanborn, Ohio State University, Columbus.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Rochester*, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

WESTERN STATES.

ANACONDA, MONT.—J. C. Currah, of Helena, on a bid of about $5,000 has been awarded the contract by the City Council for installing a lighting system on West Park Avenue.

AUGUSTA, MONT.—The residents of Augusta are planning to secure electric light and power from Helena. Commissioner Biggs is in favor of creating an improvement district for the lighting system, providing the Augusta residents can prevail upon the Montana Power Company to furnish the electricity. According to the plans submitted, the proposed district, including both the electric light and the water plants, would cost $24,000.

BAINVILLE, MONT.—Arrangements for the installation of a small plant to serve Bainville with energy for street lighting and domestic use have been made by S. J. Dorothy, of Williston.

BILLINGS, MONT.—Approximately $85,000 will be expended in rebuilding the local telephone system by the Mountain States Telephone & Telegraph Company.

BUTTE, MONT.—The installation of a system of street lighting on Main Street has been planned by City Engineer Armstrong and is being considered by the Council.

BUTTE, MONT.—A special election to grant a new franchise to the Montana Power Company will shortly be authorized by a city ordinance. The company's 30-year franchise has expired.

GREAT FALLS, MONT.—A petition has been presented to the City Council, asking for the creation of a special lighting district on First Avenue North.

HINSDALE, MONT.—The Valley County Commissioners have laid over for consideration the proposition of creating a water and electric-light improvement district in Hinsdale. A municipal lighting plant and water system may be installed.

MALTA, MONT.—The local electric-lighting plant, formerly operated as a private utility, has been taken over by the town of Malta. It is reported a system of street lighting will be installed this summer.

GUERNSEY, WYO.—Permission to construct a dam across the Platte River near Guernsey has been granted to C. A. Guernsey, of this city, by State Engineer James B. True. The dam is estimated to cost $250,000, and it is planned to generate 20,000 horsepower. It will be employed in the generating of power for numerous mines of the Colorado Fuel & Iron Company and to furnish light for the town of Guernsey. Work will start on it in a short time.

WHITE OAKS, N. M.—J. H. Fulmer, Jr., and associates have taken over the holdings of the Alto Light & Power Company.

FLORENCE, ARIZ.—The City Council has rejected all bids received for light and water bonds.

SALT LAKE CITY, UTAH.—Plans are under way for electrifying the road of the Saltair Beach Company and extending the line to Garfield.

VERNAL, UTAH.—John T. Pope and associates, of Ogden, are having plans prepared for the development of a large hydroelectric plant on the Green River, near Split Mountain and this city. It is proposed to use the power generated for driving irrigation pumps.

DUBOIS, IDAHO.—D. T. Murphy, of Idaho Falls, was here recently investigating local conditions with a view to installing electric-lighting and water systems.

KELLOGG, IDAHO.—Electric power to operate the machinery in the property of the Coeur d'Alene Antimony Mining Company is being installed by the Washington Water Power Company, of Spokane.

LEWISTON, IDAHO.—The Idaho-Washington Water, Light & Power Company, which recently filed articles of incorporation, has taken over the holdings of the Lewiston-Clarkston Improvement Company, operating in this city and Clarkston, Wash., Asotin, Lapwia and Lewiston Orchards, Idaho, for a price said to be in excess of $750,000. The incorporators are B. T. Stephenson, Brighton, Mass.; Lynden B. Hardwick, Weston, Mass., and Brooks C. Uhlman, Auburndale, Mass. The company is organized with capital stock of $1,200,000, of which $1,000,000 is preferred and $200,000 common, and will do a general electrical, water and power business in the states of Idaho and Washington. Boston, Mass., is given as the prin-

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cipal office, and Lewiston, Idaho, as the principal place of business.

ST. ANTHONY, IDAHO.—The question of heating public buildings has been proposed to the City Council by the St. Anthony Power Company, and the Council is giving the proposition serious consideration.

COLVILLE, WASH.—According to reports, H. H. Phipps, of Spokane, will construct a small lighting and power plant to serve a farming community of 2,000 acres which he is establishing near Colville.

NORTHPORT, WASH.—The City Council has under consideration the construction of municipal electric-lighting and water systems, which will cost about $25,000.

PROSSER, WASH.—The Grandview Irrigation District has applied for a franchise for the construction of an electric transmission line in certain portions of the county.

SEATTLE, WASH.—The installation of 26 lighting standards to replace seven cluster lights around Times Square has been authorized by the Board of Public Works.

OREGON CITY, ORE.—The City Council is considering the installation of a generating plant to supply the city with energy for lighting. A generating plant and distribution system probably can be installed for $4,000, providing the present waterwheels are utilized.

SALEM, ORE.—A survey of the municipal electric light and water plant in Eugene will be made in the immediate future by the Public Service Commission.

SILVERTON, ORE.—Plans are being considered for the erection of a municipal electric-light plant and distribution system.

CASTELLA, CAL.—The State Railroad Commission has authorized the California-Oregon Power Company to distribute and sell electricity in a portion of Trinity County under a franchise from the county dated Jan. 7, 1915. The company wants to serve the Yukon Gold Company, on Coffee Creek, three miles north of the town of Carrville, and to reach this plant it is necessary to build a transmission line fom Castella, a distance of about 25 miles. The cost is estimated between $40,000 to $56,000. The power company has a contract with the Yukon company to furnish it power for its gold dredgers. The gold company is to advance $25,000 toward the construction price of the line, this amount to apply on future power bills.

FRESNO, CAL.—A movement is on foot here for the installation of an electrolier lighting system in Courthouse Park, which, it is estimated, would cost about $8,000.

FLORISTON, CAL.—An electric plant has been installed by the Crown-Willamette Paper Company to convert the waste sulphide liquor from the Floriston mill into a commercial product.

LOS ANGELES, CAL.—A petition asking for the establishment of the Bonita Meadows lighting district will be heard by the Board of Supervisors June 5.

McKITTRICK, CAL.—A two-mile transmission line to connect with the Nacirema lease in the McKittrick field is being constructed by the San Joaquin Light & Power Company.

OAKLAND, CAL.—The Sierra Electric Power Company has applied to the Railroad Commission for a certificate of public convenience and necessity, authorizing it to construct and operate a hydroelectric plant and system under franchises granted to Albert C. Agnew by the counties of Butte, Colusa, Shasta and Tehama. The applicant proposes to construct two hydroelectric plants on Digger Creek in Tehama County and construct a high-tension line southerly through the above mentioned counties to a point approximately four miles northeast of the town of Maxwell, Colusa County. The applicant states that this transmission line will be of steel-pole construction for 66,000 volts, using No. 2 copper wire, with suspension-type insulators.

SAN FRANCISCO, CAL.—The Great Western Power Company intends to create a bond issue of sufficient size to take over the bonds now issued and to provide for the further development of its hydroelectric properties in the Feather River Canyon and for building additional distribution lines.

SANTA BARBARA, CAL.—The City Council has under consideration an offer for the installation of concrete lighting posts at $18 each.

Proposals

PUMPING EQUIPMENT.—Sealed bids will be received until June 3 at El Paso, Tex., for electrically operated pumping equipment by the Ft. Bliss Depot Quartermaster.

ELECTRIC FREIGHT ELEVATOR.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., June 12, for the installation of a new hoistway, electric freight elevator, etc., in the United States post office at Boone, Iowa. See proposal columns for details.

CABLE AND TOWERS.—Sealed bids will be received by the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., May 29, for furnishing and delivering approximately 500 feet of No. 0 and 540 feet of No. 2 B. & S.-gage three-conductor, armored cable and furnishing, delivering and erecting two steel towers at Clarendon Avenue Beach, according to plans on file in the office of said official.

VACUUM CLEANERS.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., June 20, for supplying to the various public buildings under the control of the Treasury Department hand, electric, portable vacuum cleaners during the fiscal years ending June 30, 1917, in accordance with the specifications, copies of which may be had at that office in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

POWER PUMPING PLANT.—Sealed proposals will be received at the office of the United States Reclamation Service, Denver, Colo., until June 15, 1916, for furnishing and erecting power and pumping equipment for the Grandview irrigation district, Yakima project, Washington, involving a generator, transformers, switchboard equipment, hydraulic turbine, pumps, steel pipes, head gates, etc. The work is located near Grandview, Wash. Further particulars may be had on application to the United States Reclamation Service, Washington, D. C., Denever, Colo., or North Yakima, Wash.

LIGHTING FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., June 21, for furnishing and installing lighting fixtures in the United States post-office and courthouse at Chillicothe, Mo., the United States post office and courthouse at Lawton, Okla., the United States post office at Mobile, Ala., the United States post office and courthouse at New Albany, Ind., the United States post office at North Attleboro, Mass., the United States post office at Reading, Pa., the United States post office at Salamanca, N. Y., the United States post office at Seymour, Ind., and the United States post office at Van Wert, O. See proposal columns for details.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9670, Brooklyn, N. Y., miscellaneous lighting and power wire, rubber-covered single wire and 80,000 feet of ship-lighting cable. Schedule 9671, Brooklyn, N. Y., 5,000 feet of telephone cable, 525,000 feet of double-conductor wire, 8,000 feet of ignition-circuit wire, miscellaneous magnet wire, single-conductor wire and twin-conductor wire. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

Financial Notes

The report of the Republic Railway & Light Company, of Youngstown, O., and its subsidiaries, covering the month of April, shows a pronounced increase over April of last year, gross earnings being $367,672.32 as against $237,746.74. The increase is said to be almost solely due to an improved demand for current for industrial purposes.

Northern Ohio Traction & Light Company has sold to N. W. Halsey & Company and Hayden, Miller & Company subject to approval of the Ohio Public Utilities Commission, $4,000,000 first-lien and refunding 40-year five-per-cent bonds. The proceeds of these bonds will care for all capital expenditures of the company and all maturities over the next three years and places the company in a strong financial position.

The California Railroad Commission will soon pass upon the reorganization plans of the Northern Electric properties. The delay in setting a date for the hearing has been occasioned by the prosecution of an exhaustive physical valuation of the constituent roads by the Commission's engineering force. Out of a total of $8,500,000 of bonds and other obligations, which have been guaranteed in one shape or another by members of the Sloss family, all save the holders of $500,000 have consented to the release of the Sloss indorsements.

The Sierra Electric Power Company, of Oakland, Cal., has applied to the State Railroad Commission for authority to pledge $3,000,000 of its six-per-cent 30-year bonds, and 140,000 shares of its capital stock of the par value of $10 per share as security for a note for $25,000, payable to William Bayley of Los Angeles. The company also asks permission to comply with the terms of an option, by which Bayley was given the right to purchase 60,000 shares of capital stock for $10,000. The company has a total authorized capital stock issue of $3,000,000 divided into 300,000 shares of the par value of $10 per share.

The Pacific Power & Light Company, of Portland, Ore., operating utilities in North Yakima, Walla Walla, Kennewick, Pasco, and a number of smaller places in Washington, has filed the following report for the Public Service Commission for 1915: Net income for the year, $849,817.88; dividends paid out, $301,750; operating revenues, 1,363,496.75; non-operating revenues, $56,344.05, making total revenues of $1,419,840.80. Discounts and adjustments totalled $76,588.98, leaving gross revenues of $1,343,251.82. Operating expenses were $549,427.09, segregated as follows: Electric, $358,732.46; gas, $115,804.14; water, $46,168.11; railway, $28,723.02. After dividends had been paid and other dispositions made, the surplus for the year totalled $26,067.88; with accumulated surplus, the surplus totalled $137,258.56.

Dividends.

	Term	Rate	Payable
Am. Pw. & Lt., com....	Q	1 %	June 1
Am. Rys., com.....	—	2 %	June 15
Blackstone Val. Gas & Elec., com.....	Q	$2	June 1
Blackstone Val. Gas & Elec., pf.....	S	$3	June 1
General Elec.	Q	2 %	July 15
Louis Gas & Elec.....	Q	1.5 %	June 1
No. Ohio Tr. & Lt.....	Q	1.25%	June 15
No. Texas Elec., com....	Q	$1	June 1
Rochester Ry. & Lt., pf..	Q	1.25%	June 1
West Penn Rys., pf.....	Q	1.25%	Aug. 1
West Penn. Trac., pf...	Q	1.5 %	July 15
West Penn Trac., pf. (extra)	—	2.5 %	July 15
Wisconsin Edison	—	$1.75	June 30

CLOSING BID PRICES FOR ELECTRIC SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 22	May 15
American Tel. & Tel. (New York)	128⅞	128⅛
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	235	234
Electric Storage Battery common (Philadelphia)	64½	60
Electric Storage Battery preferred (Philadelphia)	64½	60
General Electric (New York)	172¼	167½
Kings County Electric (New York)	129	129
Massachusetts Electric preferred (Boston)	37	32¾
Massachusetts Electric common (Boston)	7	6
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	—	—
New England Telephone (Boston)	132½	132½
Philadelphia Electric (Philadelphia)	27¾	27¾
Postal Telegraph & Cables common (New York)	85	83¾
Postal Telegraph & Cables preferred (New York)	68	67½
Western Union (New York)	94	95¼
Westinghouse common (New York)	62	62⅝
Westinghouse preferred (New York)	70	73

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Reports of Earnings.

AMERICAN GAS & ELECTRIC.

American Gas & Electric Company reported as follows for year ended March 31, 1916:

	1916	1915
Combined gross of subsidiaries	$6,251,905	$4,510,008
Balance subsidiary earnings applicable to American Gas & Electric	1,347,547	1,071,855
Other income	461,027	497,508
Total income	1,808,574	1,569,363
Expenses and interest	688,849	718,931
Surplus	1,119,725	850,432

REPUBLIC RAILWAY & LIGHT.

	1916	1915
April gross	$ 327,672	$237,747
Net after taxes	*128,392	86,188
Total income	128,392	86,182
Surplus after charges	60,053	30,970
Balance after preferred dividends	34,026	5,013
Four months' gross	1,286,494	962,584
Net after taxes	*531,456	351,677
Total income	532,620	351,937
Surplus after charges	262,694	130,837
Balance after preferred dividends	158,659	27,009

*Large increase in operating charges for April and four months of 1916 was due to inclusion of depreciation charges in operating costs, this charge not having been so made in preceding years.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 21,211. ELECTRICAL SUPPLIES.—A commercial agent of the Bureau reports that a representative of a British firm has opened offices in New York City for the purpose of establishing commercial relations with American manufacturers of electrical fittings and lighting supplies for domestic use, domestic appliances, and other merchandise.

NO. 21,232. ELECTRICAL SUPPLIES.—An American consular officer in Norway reports that an agent in his district wishes to represent American manufacturers of electrical insulated wires, tubing and fittings. References are given.

NO. 21,242. TUNGSTATE.—The technical director of a company engaged in the manufacture of electric lamps in Norway writes an American consular officer that it is in the market for 300 kilograms (661 pounds) of tungstate of sodium, or one-half ton of metallic tungsten with a tungstic acid content of from 50 to 75 per cent. Correspondence should be in German.

New Incorporations

CHICAGO, ILL.—Deane Electric Works. Capital, $10,000. Incorporators: G. F. Cyphert, E. E. Deane and B. Franklin.

CHICAGO, ILL.—Royal Electric Sign Company. Capital, $50,000. Incorporators: M. H. Gladstone, L. H. Gladstone and Johan Waage.

WATERTOWN, S. D.—Sours & Banks. Capital, $10,000. Deal in electric fixtures. Incorporators: W. E. Sours, C. K. Banks and S. N. Addison.

GLENS FALLS, N. Y.—Glens Falls Electric Installation Company. Capital, $5,000. Incorporators: W. H. Lamont, F. R. Twiss and C. M. Marsh.

LORAIN, O—Lorain Electric Service Company. Capital, $10,000. Electrical supplies and contracting. Incorporators: R. A. Wentz, W. H. Jurbach and others.

ST. LOUIS, MO.—Behr-Warner Electrical Contracting Company. Capital, $5,000. General electrical business. Incorporators: C. B. Behr, J. T. Soy, F. Warner and E. E. Kumpf.

MILWAUKEE, WIS.—Arrow Fuse & Manufacturing Company. Capital, $35,000. Manufacture renewable electric fuses. Incorporators: H. E. Uhlien, W. J. Kozick, E. M. Fohey and O. H. Jung.

Electrical Patents Issued May 16, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,182,894. Alternating-Current Rectifier and Rectifying System. J. Chesler, assignor to New Jersey Patent Co., West Orange, N. J. Arrangement of magnets and vibratory armatures.

1,182,896. Head Support for Operator's Instruments. F. G. Davidson, Boston, Mass. Has laterally adjustable telephone receivers.

1,182,897. Apparatus for Recording and Reproducing Motion and Sounds. T. A. Edison, assignor to New Jersey Patent Co. Motion-picture machine set in operation by contacts controlled by phonograph carriage.

1,182,900. Overload Circuit-Breaker. H. A. Everett, Haddon Heights, N. J. Snap switch actuated by series magnet has dashpot retarding initial but not latter portion of opening movement.

1,182,902. Insulated Joint for Railroad Rails. M. Griffin, Jersey City, N. J. Structure and insulation of rail chair.

1,182,914. Safety Appliance for Elevators. J. J. Kuntz, Brooklyn, N. Y. Details of switch operated by depressible leaf.

1,182,926. Telephone for Automobiles. J. F. O'Brien, New York, N. Y. For communicating between operator and passenger compartments.

1,182,932. Party Telephone Line. O. B. Schnerre, Galena, Ill. Selective and lockout system.

1,182,940. High-Voltage Insulator. L. Steinberger, Brooklyn, N. Y. Suspension-type unit.

1,182,946. Wireless-Telegraph Detector. R. J. Vosburgh, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Has electrodes of carborundum and ferro-silicon in good and stable contact.

1,182,952. Advertising Clock. A. H. Wilke, Chicago, Ill. Electrically driven curtain over face of clock has apertures disclosing clock face alternating with display faces and is controlled by clock.

1,182,962. Coin-Collector for Telephone Tolls. W. O. Beck and A. U. Hoefer, assignors to Western Electric Co., New York, N. Y. Details of collector attachment.

1,182,965. Flashlight. B. Benedict, assignor to Beacon Miniature Electric Co., New York, N. Y. Tubular structure has circuit controlled by clip for securing in pocket.

1,182,966. Telephone System. S. A. Beyland and H. L. Harris, assignors to Garford Mfg. Co., Elyria, O. Trunk between main and sub-centrals locked up by apparatus at sub-central.

1,182,974. Contact Device for Electric Cars. G. W. Carr, St. Louis, Mo. Details of shoe for contacting supply conductor.

1,182,997. Magnetic Core for Inductance Coils. W. Fondiller, assignor to Western Electric Co. Arrangement of laminations and windings of loading coil for telephone lines.

1,182,998. Storage Battery. B. Ford, Philadelphia, Pa. Ventilating stopper for battery jars.

1,183,000. Dynamoelectric Machine. V. A. Fynn, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Commutator machine has two coaxial field windings respectively connected between a main brush and auxiliary brushes under opposite poles.

1,183,006. Variable-Speed Generator. L. F. Hatz, Cedar Rapids, Ia. Interconnection of generator and exciter windings.

1,183,009. Electric Battery. H. H. Hirsch, Philadelphia, Pa. Has electrolyte congealable at temperature above freezing and foraminous diaphragm securing electrolyte when congealed and permitting its passage when liquid.

1,183,011. Spark Gap. J. Klilz, Providence, R. I., assignor of one-third each to R. J. Martin and D. Connor. Cylinder containing spark points having vents and glass inclosing tube.

1,183,018. Thermostatic Regulator. J. F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Co. For electric car-heater circuit.

1,183,026. Permutation Electric Switch. H. B. Murdock, assignor to Van Derbeck, Sayers, Murdock Co., New York, N. Y. Device has sets of contacts and switch arms back of face plate and index pointers for arms on front of plate.

1,183,031. Indicator for Air Brakes. J. E. Price, Wilmington, Del. Electric indicator circuit controlled by movement of brake piston rod.

1,183,051. Automatic Dry-Cell Hammer. W. G. Waitt, assignor to National Carbon Co., Cleveland, O. For packing contents in cell casing.

1,183,073. Section Insulator. W. H. Kempton, assignor to Ohio Brass Co., Mansfield, O. For trolley wires.

1,183,076. Push-Button for Electric Switches. C. J. Klein, assignor to Cutler-Hammer Co., Milwaukee, Wis. Push-button member of socket switch has telescoping extension.

1,183,079. Electric Switch. F. Kratz and G. Honold, assignor to Firm of Robert Bosch, Stuttgart, Germany. Key-locked push switch.

1,183,096. Ignition Device for Internal-Combustion Engines. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Armature structure of ignition dynamo and indicator for relative adjustment of armature and field.

1,183,101. Sign Receptacle. H. J. Morey, assignor to Pass & Seymour, Solvay, N. Y. Details of receptacle for use with sign plate.

1,183,119. Lamp-Shade Hanger. J. T. Robb, Brooklyn, N. Y. For suspending bowl for indirect or semi-indirect lighting.

1,183,135. Telephone Signaling Apparatus. S. S. Stoln, assignor to Western Electric Co. Circuit-interrupter for selective calling.

1,183,147. Mine Lamp. W. McK. White and E. C. Brommer, assignors to Electric

1,183,155. Gun-Fire-Control Signaling Apparatus. F. W. Wood, assignor to Chas. Cory & Sons, New York, N. Y. Step-by-step rotor at gun operated from central station, indicating apparatus, etc.

1,183,159. Electric Switch. T. E. Barnum, assignor to Cutler-Hammer Mfg. Co. Special arangement of magnets for operating vertical switch arms.

1,183,162. Automobile Tail Signal. F. Bollinger, Akron, O. Has separately lighted end and intermediate compartments.

1,183,170. Automobile Signal. G. A. Damron, Los Angeles, Cal. Electromagnetically operated indicator rotor having latch controlled by steering mechanism.

1,183,179. Mounting for Lamp Reflectors. J. W. Esterline, assignor to Electric Service Supplies Co., Philadelphia, Pa. In headlight.

1,183,182. Trolley-Wire Hanger. A. L. Fox, assignor to T. C. White Electrical Supply Co., St. Louis, Mo. Details of structure having porcelain body.

1,183,188. Electrolytic Apparatus. W. E. Greenawalt, Denver, Colo. For decomposition of metal solutions; arrangement of anode bell and cathode tank.

1,183,191. Turntable. H. K. Hardcastle, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Manner of establishing electrical connection to movable part of electrically operated turntable.

1,183,192. Switching Device. W. E. Harkness, East Orange, N. J., assignor to Hall Switch & Signal Co. Arrangement of jack panel.

1,183,193. Plural Selective Signaling Device. W. E. Harkness, assignor to Hall Switch & Signal Co. Electromagnetic step-by-step device.

1,183,195 and 1,183,196. Timing Apparatus for Electric Welders and the Like. J. A. Heany, Washington, D. C. First patent: Connecting arrangement for welders to regulate the duration of current flowing to them. Second patent: Current regulated and distributed to machines successively and non-concurrently.

1,183,205. Selective Signaling Device. H. E. Johnson, Lansdowne, and C. F. Bower, Philadelphia, Pa. Included in telephone standard and operated by receiver hook.

1,183,214. Telephone-Exchange System. A. E. Lundell, assignor to Western Electric Co. Automatic switching.

1,183,219. Electric Lighting and Power Windmill. G. Manikowske, Mooreton, N. D. Mounting and gearing of dynamo.

1,183,237. Electromagnet. S. G. Rhodes, assignor to T. E. Murray, New York, N. Y. Arrangement of windings in three-coil device.

1,183,244. Expression Control for Electrical Musical Instruments. M. L. Severy and G. B. Sinclair, assignors to Choralcelo Co., Boston, Mass. Sonorous bodies operated by electromagnets energized by pulsating current, the circuits of lower having greater resistance than those of higher pitch.

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1,183,245. Damping System for Musical Instruments. M. B. Severy and G. B. Sinclair, assignors to Choralcelo Co., Related to above.

1,183,253. Commutator. M. E. Thompson, Ridgeway, Pa. Insulation between bars thicker at interior than at brush surface to prevent connection of bars by burr formed by interior boring.

1,183,258. Permanent Magnet and Process of Making the Same. A. J. Weed, New York, N. Y., assignor of one-half to E. W. Caldwell. Annealed cast iron made more retentive by superficially adding small amount of cobalt.

1,183,264. Method of and Apparatus for Electric Welding. H. R. Woodrow, assignor to T. E. Murray, New York, N. Y. Storage cells charged in series discharge through weld in multiple.

1,183,268. Illuminating Device. M. S. Baldwin, New York, N. Y., and A. Sundh, Hastings-upon-Hudson, N. Y. Flashlight in bottom of hand bag throws light downward.

1,183,282. Weapon. J. H. Dingee, assignor of two-thirds to L. V. Aronson, Newark, N. J. Flashlight in handle of club.

1,183,286. Dynamoelectric Machine. J. L. Farny, Zurich, Switzerland. For producing periodic voltages of unequal positive and negative values.

1,183,287. Process of Making Slot Windings for Dynamoelectric Machines. A. Finckbein, assignor to Siemens-Schuckert Warke, Berlin, Germany. Coil made in form of triangle, base being end connection, and is then cut at apex and sides spread.

1,183,292. Selective Signaling System. E. R. Gill, Yonkers, N. Y., assignor to Hall Switch & Signal Co. Impulse-operated selector controls operation of signal member with answer-back.

1,183,310. Flashlight. A. S. Lyhne, Bridgeport, Conn. Contact arrangement in tubular structure.

1,183,311. Non-Short-Circuiting Fiber Case for Flashlights. A. S. Lyhne. Relates to reflector and lens mounting for above.

1,183,317. Electrode for Arc Lamps. R. Mylo, Charlottenburg, Germany. Has ports or openings for absorbing molten particles to prevent formation of slag at crater, making the arc more steady.

1,183,335. Insulated Rail Joint. V. C. Armstrong, assignor to Rail Joint Co., New York, N. Y. Insulation of special form of divided chair.

1,183,337 and 1,183,338. Static-Electricity Dissipator for Paper Webs or Sheets. H. M. Barber, assignor to C. B. Cotrell & Sons Co., New York, N. Y. First patent: Means controlled by speed of press moves moistener into and out of contact with web. Second patent: Modification.

1,183,348. Variable-Speed Generator System. J. Dalziel, Derby, England. Combination of variable-speed generator, exciter and motor-driven controlled generator, for voltage control.

1,183,376. Electric Switch. H. Hansen, assignor to F. Keil & Son, New York, N. Y. Contact structure for oscillating snap switch.

1,183,377. Electric Snap Switch. H. Hansen, assignor to F. Keil & Son. Two-push-button mechanism for operating movable contact of above.

1,183,386. Electrically Operated Dial Mechanism. R. C. Lanphier and O. White, assignors to Sangamo Electric Co., Springfield, Ill. Reversible indicating meter for storage-battery circuit has dial movable at different rates on charge and discharge.

1,183,404. Method and Apparatus for Reproducing Sounds. R. Rummler, Dayton, O. Telephone diaphragm vibrated by molecular stresses induced therein by flat spiral coils on each side of it.

1,183,405. Relay. F. Schoenwolf, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Composite relay structure for telephone switchboard.

1,183,407. Electric Controlling Device for Railway Trains. E. L. Sharpneck, Winthrop, and C. F. Atherton, Boston, Mass. Block system.

1,183,411. Automatic Electric Regulator. W. A. Turbayne, assignor to U. S. Light & Heat Corporation, Niagara Falls, N. Y. Generator in battery system has voltage regulated by electromagnetic device effecting vibratory-contact field control.

1,183,418. Sign Flasher. O. D. Ziegler, Chicago, Ill. Structure of rotary contactor.

1,183,476. Electric Signaling System. U. E. Maille, assignor to A. I. Russell, Providence, R. I. Controlling circuits and switches for signal light with telltale.

1,183,516. Electric Connector. A. E. Anderson, assignor to A. & J. M. Anderson Mfg. Co., Boston, Mass. Casing contains connectors mounted on insulators having limited relative movement.

1,183,548. Induction Motor. A. W. Forbes, assignor to Crocker-Wheeler Co., Ampere, N. J. End connectors of rotor bars.

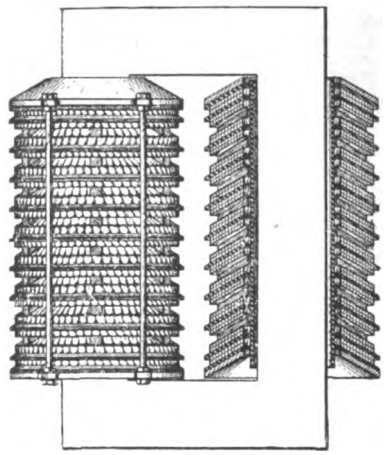
1,183,576. Automobile or Motorcycle Horn. R. H. Mauson, assignor to Garford Mfg. Co., Elyria, O. Details of mechanism for electromagnetically vibrating diaphragm.

1,183,588. Polyphase Transformer. A. H. Pikler, assignor to Crocker Wheeler Co. Arrangement of windings on a single-core structure.

1,183,590. Electrical Flasher. W. Reed-Lethbridge, Wellington, New Zealand. One set of lamps controlled by flasher and second set has circuit made through magnetic vibrator when circuit of first set is broken.

1,183,597. Automatic Moving-Vehicle Control. P. J. Simmen, Buffalo, N. Y. Operating sleeve about threaded rod engages therewith on energizing of magnet carried by it and is returned by spring on release.

1,183,616. Electrical Winding. W. J. Wooldridge, assignor to General Electric



No. 1,183,616.—Electrical Winding.

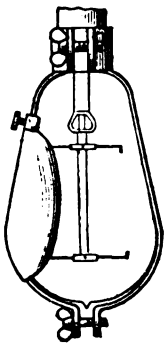
Co., Schenectady, N. Y. Arrangement of solid, dished disk coils to provide central ventilating spaces along transformer core. (See cut.)

1,183,625. Pipe Clamp and Ground Connection for Outlet Boxes. W. A. Bonnell, Brooklyn, N. Y. Details of device for securing pipe in box opening.

1,183,640. Plastic Insulating Composition. H. Grossmann, Ober-Urdorf, Switzerland. Colophonium, glass and wax, all powdered.

1,183,648. Direction Indicator. F. E. Justus, El Paso, Tex. For automobiles; has electromagnetically operated pointer.

1,183,664. Registering Device for Telephone Systems. E. M. Northum, assignor



No. 1,183,743.—Adjustable Lamp Shade.

to Northum Telephone Toll Register Co., Stephens, Ark. Structure of coin chutes, etc., and bell.

1,183,676. Audible Electric Signaling Device. T. S. Rogers, assignor to Thos. Crosbee & Sons, Birmingham, England. Automobile horn with electromagnetically vibrated diaphragm.

1,183,677. Speed-Control and Signal Device. A. P. Sanborn and R. C. Wilson, Ossining, N. Y. Brake-controlling and signal circuits on train controlled by track magnet and speedometer.

1,183,685. Damping System for Musical Instruments. G. B. Sinclair and M. L. Severy, assignors to Choralcelo Co. Related to device of patent No. 1,183,244.

1,183,709. Trolley-Wire Guard. A. Zanella, Ray, Ariz. Structure of insulating hood.

1,183,722. Direction Indicator for Motor Vehicles. L. M. Bowman, Tulsa, Okla., assignor of one-half to W. A. Smith. Details of electromagnetically operated pointer.

1,183,743. Adjustable Lamp Shade. C. G. Landers, Cement, Tex. Clamp securing opaque shield to side of incandescent bulb. (See cut.)

1,183,753. Water Purifier. D. W. Moody, Chicago, Ill., assignor of three-tenths each to W. E. Fuller and C. E. Olson. Unitary electrode structure for immersion.

1,183,771. Perforator for Master Sheets. L. R. Roberts, assignor to Underwood Typewriter Co., Uew York, N. Y. Electromagnetically controlled.

1,183,780. Combined Display and Lighting Fixture. F. H. Trimble, Los Angeles, Cal. Opaque, hollow base member contains lamp and is open at bottom to light rays, and supports stand for goods displayed.

1,183,787. Oil-Burner Safety Device. G. A. Welch and F. A. Ardron, Seattle, Wash. Circuit of motor driving oil lamp and alarm circuit controlled by overflow from burner.

1,183,802. Range Teller. L. De Forest, New York, N. Y., assignor to Radio Telephone & Telegraph Co., New York, N. Y. Wireless system.

1,183,807. Storage Battery Grid. E. E. Everett, assignor to Philadelphia Storage Battery Co., Philadelphia, Pa. Details of double lattice grid.

1,183,809. Steel Hardening and Tempering Machine. F. S. Frisbee and M. H. Baker, assignors to American Electric Process Steel Co., Boston, Mass. Steel is manipulated and held by magnetic attraction.

1,183,810. Battery Construction. W. Gardiner, Chicago, Ill. Ventilating provisions for storage cells.

1,183,811. Electric Switch. F. P. Gates, assignor to Arrow Electric Co., Hartford, Conn. Push-button flush switch.

1,183,814. Heat-Regulating System. E. Haagn, assignor to Firm of W. C. Heraeus, Hanan-on-the-Main, Germany. Electric system for regulating the temperature of furnaces and the like.

1,183,821. Telephone-Call-Locating System. T. G. Martin and J. Erickson, assignors to First Trust & Savings Bank, Chicago, Ill. For automatic system.

1,183,832. Automatic Telephone Release. J. Erickson, assignor to First Trust & Savings Bank. Relates to relays, etc., for releasing selectors.

Reissue 14,132. X-Ray Tube. R. H. Machlett, New York, N. Y. Original No. 1,150,530, dated Aug. 17, 1915. Arrangement of anode and cathode in their respective necks.

Reissue 14,133. Phase Balancer. E. F. W. Alexanderson, assignor to General Electric Co. Original No. 1,093,594, dated April 21, 1914. For balancing the voltage of polyphase mains.

Reissue 14,134. Igniter Mechanism for Internal-Combustion Engines. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Original No. 1,176,502, dated March 21, 1916. Mounting and gearing of magneto and igniter.

PATENTS EXPIRED.

The following United States electrical patents expired on May 23, 1916:

625,321. Socket for Incandescent Lamp. A. A. Chaillet, Shelby, O.

625,364. Electric Signal. J. M. Smith, New Orleans, La.

625,408. Electromechanical Apparatus. A. D. Neal, Boston, and H. F. Eaton, Quincy, Mass.

625,410. Apparatus for Producing Igniting Sparks. M. Osterberg and A. Fischer, New York, N. Y.

625,431 and 625,432. Electric Arc Lamp. S. Bergmann, New York, N. Y.

625,454. Regulator for Electric-Car Motors. H. S. Maxim, London, England.

625,462. Electrode for Dry Storage Batteries. L. Paget, New York, N. Y.

625,473. Electrical Attachment Plug. A. P. Seymour, Syracuse, N. Y.

625,489. Holder for Electroplating. W. Y. Buck, Bristol, Conn.

625,512. Electric Railway. R. Lundell, New York, N. Y.

625,554. Trolley Controller. L. M. Halsey, New York, N. Y.

625,566. Manufacture of Elements for Secondary Batteries. F. King, London, England.

625,597. Means for Ascertaining the Potential at Any Point Upon Systems of Distribution. S. L. Phillips and G. G. Tilden, Washington, D. C.

625,599. Electric-Lighting Apparatus. A. Plecher, Savannah, Ga.

625,609. Incandescent Electric-Lamp Fixture. B. F. Rout, Stanford, Ky.

625,632. Electric Controller. W. A. Adams and H. McGeorge, Cleveland, O.

625,639. Electrical Switch. N. L. Burchell, Washington, D. C.

625,647. Alternating-Current Range and Position Finder. A. C. Crehore, Hanover, N. H., and G. O. Squier, Fortress Monroe, Va.

625,683. Electrode for Secondary Batteries. J. Julien, Brussels, Belgium.

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ELECTRICAL REVIEW

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EDITORIALS

REFINEMENTS IN ILLUMINATION.

Nothing better illustrates the flexibility of electric lighting than special applications in which the central-station engineer or the fixture designer solves a problem on a plane above ordinary practice. It is no exaggeration to say that the industry has only begun to appreciate its opportunities in this field. Some of these problems may be stated to advantage. There is a demand now, limited to be sure, but considerable when the possibilities are studied, in the way of providing efficient illumination for the pulpit in chapels serving the deaf, so that lip-reading can be done by the congregation, which cannot get the preacher's meaning by the ordinary methods of communication. Temporary installations have been made which are much better than many of those where no special study has been given to the problem, but in the provision of suitable apparatus to gain the above result without disturbing glare the illuminating engineer can find an interesting and promising test. The need of an installation of this kind was expressed in a recent article in a church periodical by a clergyman experienced in ministering to the deaf, and without question the refinements of modern illumination are equal to the problem.

There is a possibility that the not distant future may witness a demand for a new type of art-museum illumination; that is, for an installation in which artificial light will completely supersede daylight. It is a question whether efforts to maintain a double standard of lighting in such places are worth while in view of the difficulties of securing equally good results with both. It is also worth investigating whether the use of electric lighting with suitable reflection and diffusion may not be better adapted to the maintenance of life in delicate exhibits like certain entomological specimens, animal skins and even tapestries to which a prolonged daylight exposure may be detrimental. Certainly the day has come when the use of museums at night is a consideration of some importance in the large centers, and there is no doubt that conference between the illuminating engineer and the curator might work out plans of lasting benefit to both. A museum load on the daylight schedule makes pretty satisfactory long-hour business from the central-station standpoint.

Other opportunities lie ahead of the lighting expert in the fields of hospital ward and private-room illumination, in the more artistic and better-diffused lighting of hallways in old apartment houses, in the concentration of luminous flux on street corner signs, and in the adaptation of the principles of short-range flood lighting to the requirements of fine residences. The variety of such problems in matters of detail is amazing, and every time one of these is well solved, the whole art of illumination is advanced, with a correspondingly improved outlook for the commercial side of such work, even down to the greater sale of supplies and the increase of central-station outputs.

AMERICAN MANUFACTURERS MAY COMBINE TO SECURE ADVANTAGES IN INTERNATIONAL TRADE.

The Federal Trade Commission has recently sent to the United States Senate a report embodying a unanimous recommendation that the Sherman Act be so amended as to permit business men to use the same weapons which foreign manufacturers have so long employed and utilized very successfully to accomplish results in the development of international trade. The Commission is fully convinced that it is not fair to subject American manufacturers to the competition of European syndicates and then deny to them the right of self defense.

Upon other pages of this issue there is published an abstract of the report submitted to the Senate by the Federal Trade Commission. Copies of the complete report may be secured by applying to the Commission at Washington, D. C. Manufacturers of electrical apparatus of every description have some opportunities for participating in international trade if in the development of their enterprise it becomes expedient for them to reach out in this direction. Therefore it is imperatively necessary that this measure recommended by the Federal Trade Commission after careful study of conditions be given the serious consideration of American manufacturers. Furthermore, foreign trade extension is not a partisan matter. The fruits of an increase in our overseas commerce will be reaped not only by the manufacturers, but by the jobbing and retail merchant interests of the whole country. The Senate bill is particularly in the interest of smaller concerns, since the largest manufacturers have expert export organizations of their own. Business men should promptly write to their senators and representatives, asking them to make the Federal Trade Commission's recommendations a law. There need be no hesitation nor diffidence in approaching these representatives. They are keenly alive to the situation and it is due to them, and will be appreciated by them, if they have the word of their constituents that their action in making the Commission's recommendation a law will meet with approval.

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THE NATIONAL ELECTRICAL SAFETY CODE.

The large number of accidents and, more specifically, the number resulting fatally, each year in the United States from electrical causes, coupled with the existing lack of uniformity in the construction and operation of electrical equipment, and the disregard, in many places, of precautions which should be universal, point to the desirability of a set of rules in this field which shall limit electrical hazards to persons and, so far as may be, safeguard human life. Realizing the need of such a set of rules, the officials of the United States Bureau of Standards have for about three years been working upon a compilation of rules which has been designated as a National Electrical Safety Code. These rules were first put forward in tentative form and have since been very greatly modified in accord with the criticisms and suggestions of those who are acquainted with the details of electrical practice. The electrical utilities have taken a prominent part in conferences to this end, and their suggestions have been of great value in modifying the original provisions and drafting a code which will be more possible of complete application, and which will appeal to various local authorities as being suitable for application, or, at least, suitable for a basis upon which to build rules which will be applicable to local conditions.

The Code is divided into four parts, dealing respectively with central stations and their equipment, electrical supply and signal lines, utilization equipment, and operating rules. The fourth section, comprising the operating rules, seems to be entirely acceptable to central-station companies, and was finally drafted with the complete assent of the Accident Prevention Committee of the National Electric Light Association. The sections dealing with utilization equipment and with the installation and maintenance of supply lines have not proved equally acceptable. The few available statistics indicate that about half of the accidents of electrical origin occur among the employees of utility companies, and of these about 15 per cent are due to defective equipment or defective construction, and 85 per cent to carelessness, ignorance or other fault upon the part of employees. It is thus evident that a large number of accidents can be obviated by proper instruction of employees, by the application of appropriate operating rules and proper attention to existing hazards. An approved set of operating rules is consequently a valuable asset to the industry.

Rules designating details of construction are not so welcome for a number of reasons. Most engineers and managers believe that mandatory rules should deal only with results to be achieved, and should leave them free to arrive at these results in whatever way they may deem best. Too great standardization in any line is likely to retard development. Any general set of rules, moreover, is not likely to take proper account of local variations in conditions, and is apt to receive different and unintelligent interpretations in different jurisdictions. It may be applied retroactively, which would involve great hardship upon companies whose existing construction does not conform to the proposed rules. The Bureau of Standards does not claim that the set of rules which it has formulated is perfect, or that it will meet all local conditions. It realizes that field experience is necessary to test the suitability of these rules, that exceptions and local modifications will be needed in them, that they should not be applied to present construction unless a definite and manifest hazard is involved, and that they should be applied with discretion by administrative authorities. When such a code is promulgated, however, there is danger that public service commissions will adopt the rules bodily without adjusting the details of their provisions to local conditions, and without providing for the exceptions which are admittedly demanded in their specific application. The rules may, moreover, be administered by local inspectors without sufficient experience or knowledge to apply them intelligently It is obvious, therefore, that it would not be politic for utility companies or associations of them to indorse the rules without knowing how they are going to be applied. In the State of Washington, for instance, a law which is now upon the statute books would probably have the effect of making such rules retroactive in their effect, and would impose a serious penalty for every departure from exact compliance with the rules.

It is evident, therefore, that state commissions, and others having jurisdiction, should not make such rules mandatory at once and should examine them very carefully with respect to local conditions before attempting to apply them at all. In the meantime it would be well for operating companies to attempt compliance with the Code as soon as the final draft is available, and see to what extent it will inflict hardships upon them in case it were made mandatory. It is claimed that compliance with the rules in small urban communities will involve an expense that will seriously limit the extension of electric service in the future, both by limiting its area and by preventing the reductions in rates which might otherwise become effective. On the other hand, the officials of the Bureau claim that most urban construction already meets the proposed requirements, that no restrictions are placed upon rural lines, except at crossings with railways and with other lines, and that the specifications in such cases are not as severe as are required by some state laws, or as are in use by most operating companies at the present time. It is evident that experience will be needed with the rules before final judgment can be passed upon their merit, and that legal requirements should not be applied to the operating companies until the effect of applying the rules can be determined.

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One objection to the rules is that as they stand they would exclude the possibility of making use of bare concentric wiring. If the rules are enacted into law, such a system or any other experimental system could be tried out only under special sanction. Since exceptions of this kind must be frequently made, it is evident that the success of the Code will depend upon its intelligent application and administration, and upon the possibility of frequent revision for the purpose of overcoming its defects and adapting it to the progress of the art.

THE NATIONAL ELECTRICAL CODE.

The fire hazards in electrical construction were early looked into by representatives of fire-insurance companies, with the result that the underwriters formulated a set of rules which has developed into the present National Electrical Code. This Code was originally prepared by the National Board of Fire Underwriters and was revised by them. More recently it has been taken under the jurisdiction of the National Fire Protection Association and is handled by the Electrical Committee of that body, which conducts a biennial revision. The Electrical Committee includes representatives not only of the fire underwriters, but of inspection bureaus and of the national associations of contractors, engineers, inspectors and of the electrical utilities, but has not up to the present time included any representative of the manufacturers of electrical fittings or supplies.

When revisions of the Code have taken place, the final action has been taken in an open meeting of the Committee, and such open meeting has afforded opportunity to the general public, to manufacturers and to any other interests, to present reasons for or against the adoption of any change in the Code. The open meeting of the 1915 revision of the Code demonstrated that this method is not satisfactory and that some better means should be adopted for the presentation of the various points of view of the different manufacturing interests involved. It has been the general idea that the action taken in this open meeting was the final step in deciding what should go into the Code, but this idea probably involves a certain misconception, for it is not likely that the Electrical Committee would shirk the responsibility of overruling the vote of such an assemblage if it believed that the situation and the conditions warranted it in doing so. The Electrical Committee is the responsible body in formulating new editions of the Code, and it must necessarily assume the final responsibility of what goes into that document. Unlike other committees of the National Fire Protection Association, its work does not go before the meeting of the entire association for approval, and responsibility consequently lodges not with the Association as a whole, but with the Electrical Committee.

Now that the electrical manufacturers have organized the Associated Manufacturers of Electrical Supplies, and their respective interests can be fully considered in the deliberations of this body, it will be in order for the delegates of this organization to represent the manufacturers as a whole before the Electrical Committee, and it would be exceedingly appropriate for the Electrical Committee to include one or more representatives of the organization in its own number. In that way the point of view of the manufacturers and their interests could be more fully and properly presented in the councils of the Electrical Committee and their claims would receive more mature consideration and more deliberate action.

The Electrical Committee is called upon not only to exercise legislative functions in formulating the Code, but is frequently called upon to exercise the judicial function of interpreting its revisions. Here, again, it is desirable that points of view of all elements in the industry should be fully represented, in order that a just and wise attitude should be assumed by the Committee.

RATE OF RETURN UNDER REGULATION.

The prospect of increased dividends through economy of operation is a stimulation to every privately owned utility to make improvements in its equipment and its methods which will permit service to be rendered at a decreased cost. Such a stimulus is lacking in publicly owned plants, as is too often flagrantly obvious. There is danger under state regulation that this incentive to economy and efficiency may be removed by restricting the earnings to definite percentages of the investment, regardless of merit in the management and operation. Some of the state commissioners have seen this danger and are holding up the ideal of a policy which will reward good management by more liberal allowances of returns to investors.

The Wisconsin Railroad Commission, which has been a pioneer in the inauguration of many progressive policies in connection with utility regulation, has disclosed a proper attitude upon this question in its eighth annual report. After calling attention to the fact that the electric central station is the only class of utility in the state whose operating expenses decrease from year to year, the Commission says: "These facts tend to show that the burden upon the Commission is to constantly promote efficiency in the way of granting a return to utilities which will induce them to place in operation modern appliances as they are put upon the market. Not only is this the case, but every effort must be made to show to the utilities the advantages and disadvantages of certain methods used in the production of the particular services which they sell. If this is not done, then the hope of future reductions in the price of these services will be by that much diminished."

This shows a realization by the commissioners that both knowledge and motive are necessary to achieve a desired result, which in this case is the reduction in the cost of electric service. An intelligent application of the principles here involved, not only in Wisconsin but in other states, will mean much for the future development of the electrical industry.

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Happenings in the Industry

Important Conference on Safety Code Held in Chicago—Meeting Electric Power Club—Kansas Contractors Elect Officers—Fixture Design Discussed in New York —Illuminating Engineering Lectures—Combinations in Behalf of Foreign Trade — Southwestern Electrical and Gas Association — Miscellaneous News Notes

FINAL CONFERENCE ON NATIONAL ELECTRICAL SAFETY CODE.

Bureau of Standards Holds Two-Day Hearing in Chicago.

On May 29 and 30 the Bureau of Standards held a conference on the National Electrical Safety Code in the La Salle Hotel, Chicago. This was the last of about 30 conferences which have been held at various times in different parts of the country to discuss the provisions of this code with the representatives of state commissions, municipalities, utilities and other interested parties. The final draft of the code will now be formulated and it is expected that it will be published some time during the summer.

The conference was attended by nearly 100 representatives of engineering associations, electric light and power companies, telephone companies, railroad companies, fire insurance underwriters, municipal inspectors, public utility and industrial commissions, electrical workers, electric traction companies, electrical manufacturers and others. The Code received the hearty indorsement of the municipal and insurance representatives. Most of the engineers of public service commissions who were present expressed their appreciation of the work done and expected the Code to be of great assistance in formulating local rules. Most of the railroad and telephone representatives welcomed the Code and, while not entirely satisfied with all of its provisions, considered it to be on the whole acceptable. The principal opposition expressed was from the representatives of electric light and power companies, and these objections were very numerous and forceful.

In addition to opposing a number of the individual rules the central-station men pointed out that the construction requirements were in general too severe; that while one code for the entire country was an ambitious and laudable idea, it is not feasible unless written in general terms, since specific details must differ widely in accordance with local conditions. Such a code should specify the results to be obtained, rather than the means for obtaining them; the rules would probably be made retroactive in certain jurisdictions and consequently work great hardship; the interpretation of the rules requires expert knowledge and ability which would not usually be available; and the effect of having such rules enacted into law would place the utility companies in an unfortunate position in case of litigation. For these reasons approval of the Code could not be given either by the central-station representatives as such, nor by the various associations of which they are members.

The Bureau of Standards was represented at the conference by E. B. Rosa, W. J. Canada, E. R. Shepard and W. C. Wagner. Dr. Rosa presided at the five sessions which were held and ably upheld the Bureau and its work. In opening the conference he reported upon the work which has already been done, involving the origin and development of the National Electrical Safety Code, and explained the legality and desirability of the Bureau of Standards undertaking this work. He pointed out the desirability of having a uniform code in the various jurisdictions and explained that the rules are not a detailed construction specification. They are not expected to be made mandatory until they have been given a field trial of a year or more.

At the session on Monday afternoon, W. H. Merrill, director of the Underwriters' Laboratories, spoke in favor of the Electrical Safety Code. W. H. Blood, Jr., representing the National Electrical Light Association; Farley Osgood, representing the American Institute of Electrical Engineers; and R. J. McClelland presented the objections of the central-station companies to the promulgation of the proposed rules. They claimed that the rules would require large expenditures of money without improving safety; that different local conditions are not recognized by the rules; that if the rules are once legally adopted, they would be no longer under control of the Bureau of Standards for interpretation or revision; that the future growth of the industry would be imperiled; that much of the best of present construction does not comply with the rules and the practice of many years in regard to sags would be upset; that concentric wiring would be prohibited. Dr. Rosa pointed out the difficulty of reconciling the conflicting interests in such matters as overhead crossings, where the central-station men claimed the rules were too stringent, while the telephone and railroad men claimed they were not stringent enough. He pointed out that there were no requirements whatever for rural lines except at such crossings and that the requirements within cities were considered by many as not being severe enough. He said that most of the detailed suggestions of central-station men had been adopted and that the specifications for railroad crossings were not as severe as those already adopted in the states of Nebraska, Iowa and Idaho, or as required by specifications which have been agreed upon by the engineering societies. Regarding minuteness of detail, he stated that the first draft of the rules had left a great deal to the judgment of inspectors and had been strongly objected to on this account. As a consequence details had been inserted.

The rules applying to electric power supply stations were then taken up in detail and changes in the provisions and wording were noted. This was followed by a consideration of the rules governing utilization equipment and grounding. The above comprise parts I and III of the Code. It was decided that the introductory paragraphs referring to the scope and application of the rules should be made a part of the latter and suitably numbered. A committee consisting of Henry Nixon, O. L. Cadle and E. J. Blair was asked to report upon Rule 384 concerning the illumination in subways, and decided that subways should be equipped with duplicate lighting systems and recommended that cars also should be equipped with an alternative system for emergency lighting.

C. E. Skinner, of the Westinghouse Electric & Manufacturing Company, raised a number of questions regarding Rule 300, having to do with the examination and approval of material and current-consuming devices. A committee was appointed to consider this matter, consisting of Mr. Skinner, A. H. Moore, V. H. Tousley, H. S. Wynkoop, W. S. Boyd, J. C. Forsyth, Ernest McCleary and R. A. Smith. This committee reported in favor of deleting the note in Rule 300 (*c*), referring to examination as to the suitability of devices. Objections to certain of the grounding rules were made by R. S. Hale and W. H. Blood, Jr., largely owing to their exclusion of concentric wiring. Dr. Rosa stated that a paragraph would be added permitting the trial of experimental methods under proper conditions.

Part II of the rules, referring to the installation and maintenance of electrical supply and signal lines, was considered on Tuesday. Different grades of construction are specified for different conditions. The country is divided into zones

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with respect to weather conditions and three conditions of loading are specified for the three zones and construction is required which will withstand such loading. The loading assumed for the worst zone is a radial thickness of one-half inch of ice on the wire, temperature of zero degrees Fahrenheit and a wind pressure of eight pounds per square foot normally. In the second zone, a temperature of 15 degrees is assumed with a loading two-thirds as great. In the third zone a temperature of 30 degrees and a loading of four-ninths of the maximum is assumed. The rules include tables of minimum sags for soft, hard-drawn and medium-hard-drawn copper wires and these sags were considered in detail, with the corresponding tensile stresses resulting.

L. C. Hurtz, representing the United States Independent Telephone Association, asked that No. 12 galvanized steel wire be permitted for use in railroad crossings in arid territory where corrosion is not serious. This precipitated quite a discussion. W. C. Polk, representing the same association, stated that No. 14 wire of this type had been in use for years in Kansas without deterioration. Representatives of steam railroads claimed that such construction would not be safe, that the iron wire formerly used resisted corrosion better than the steel wire which is now supplied and that the railroad had discarded the use of such wire. It would undoubtedly be corroded by the fumes from locomotives where it crosses railroads.

Dr. Rosa advocated the use of medium-hard-drawn wire by power companies in place of the soft wire so frequently used, as it is 50 per cent stronger than the latter and its elastic limit is about double. Mr. Shepard exhibited specimens of splices where such wire was used, showing that no difficulties were introduced.

C. L. LeMaistre, of the British Engineering Standards Committee, was called upon for an address, in which he explained the work of that committee and its relations with the National Physical Laboratory in England. Opinions were also called for as to the application and interpretation of the safety rules, if adopted, from representatives of the state utility commissions, including J. K. Anderson of West Virginia, J. N. Cadby, of Wisconsin, T. J. Strickler, of Kansas, Bert H. Peck, of Illinois, F. J. Rankin, of Colorado, R. N. Bradshaw, of Connecticut, William Nixon, New York (First District), E. S. Cheney, New York (Second District). Comment was also made by H. S. Wynkoop, electrical inspector of New York City, V. H. Tousley, electrical inspector of Chicago; W. S. Boyd and J. C. Forsyth, representing the fire underwriters; Wills Maclachlin and A. C. Davison, representing Canadian interests; R. A. Smith, representing the International Association of Municipal Electricians; P. Junkersfeld, representing the Association of Edison Illuminating Companies; T. L. Rhodes, representing the American Telephone & Telegraph Company; G. A. Cellar, representing the Association of Railway Telegraph Superintendents; and W. S. Vivian, representing the United States Independent Telephone Association.

W. J. Canada told of the results of some investigations of electrical accidents and the economic values which they represent.

The conference closed with a vote of thanks offered by Farley Osgood to Dr. Rosa, Mr. Canada and their associates.

Among others who were present and participated in the discussion were John B. Fisken and G. E. Quinan, representing the Northwest Electric Light & Power Association; O. L. Cadle, representing the American Electric Railway Association; C. W. Stone, of the General Electric Company; J. E. Moore, of the Electric Bond & Share Company; Cecil F. Elmes, of the Federal Light & Traction Company; B. H. Glover, of the Underwriters' Laboratories; William Bennett, of the Chicago & Northwestern Railway Company; S. M. Viele, of the Pennsylvania Railroad; John Leisenring, S. T. Rhodes, A. Schlesinger and W. E. Nolston.

Electric Power Club Discusses Motor Ratings and Standardization Work.

The Electric Power Club held its annual meeting at Hot Springs, Va., May 1-4, with 64 members present, representing companies manufacturing electrical machinery, transformers and control apparatus. The meeting was very successful and a large number of recommendations were adopted tending towards the standardization of all classes of electrical apparatus.

Charles Robbins, of the Westinghouse Electric & Manufacturing Company, read a paper on temperature ratings for open-type motors carrying continuous-time ratings. This question has been before the Electric Power Club for some time, and a recommendation was adopted approving two ratings for open-type continuous-duty motors. The present Electric Power Club rating of 40 degrees centigrade rise at rated load and a 25-per-cent, two-hour overload guarantee at 55 degrees centigrade is retained, this rating to be known and designated as the 40-degree rating, and a new Electric Power Club rating was adopted based on a temperature rise of 50 degrees centigrade without overload guarantee, to be known and designated as the 50-degree rating.

In order to properly distinguish between the two ratings, nameplates are to be marked with temperature and overload guarantees. The following descriptive statement of the two ratings was approved: "Motors having the 40-degree rating are designed for all classes of service including those in which an overload capacity of 25 per cent for two hours is desired." "Motors having the 50-degree rating are designed for conditions in which the load requirements are accurately known and under which the motor will not be subjected to load in excess of the motor rating."

Considerable constructive work was done at this meeting towards the standardization of transformers and industrial control apparatus. These two new sections were added to the Electric Power Club at the last general meeting.

Standard sizes were adopted for mining locomotives, as also electrical performance guarantees, draw-bar pull and the basis of motor rating. Standard voltages for mining locomotive motors were adopted as 125, 250 and 500 volts.

Specifications covering the capacity and voltage regulation of three-wire direct-current generators were revised so as to make 10 per cent unbalancing in the neutral standard. Standard terminal markings for motors, generators and transformers were adopted, the transformer terminal markings to be subject to further conference with the National Electric Light Association. Standard general-purpose alternators shall be designed so as to permit of operation at power-factors at least as low as 0.80.

It is recommended that for geared service outboard bearings be used on motors in frame sizes above and including 75 horsepower at 900 revolutions per minute, and for belted service in frame sizes 250 horsepower at 600 revolusions per minute, and larger. Squirrel-cage elevator motors are to be rated primarily on the basis of guaranteed starting torque and may also be given a horsepower rating based on the brake horsepower which they will develop for the standard time rating selected without exceeding the standard temperature rise. Direct-current motors under normal operating conditions may vary not to exceed 7.5 per cent above or below rated speed in sizes from 1 to 7.5 horsepower at 1,150 revolutions per minute, and 5 per cent in larger frame sizes.

Fractional-horsepower motors must be designed to operate successfully with voltage 10 per cent above or below the rated voltage, but not necessarily within other limits established for normal operation. The allowable variation from rated speed under normal operating conditions for all sizes of fractional-horsepower motors is fixed as not to

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exceed 7.5 per cent. It is recognized as standard practice to furnish starting rheostats with shunt and compound-wound direct-current motors 0.5 horsepower and larger.

E. R. Harding, vice-president of the Holtzer, Cabot Manufacturing Company, was re-elected president of the Electric Power Club for the coming year. C. L. Collens, president of the Reliance Electric & Engineering Company, was elected vice-president. C. H. Roth, president of Roth Brothers & Company, was re-elected secretary and treasurer.

Kansas Contractors Elect Officers.

Sixty electrical contractors, including Kansans and visitors from Missouri, participated in the annual convention of the Electrical Contractors' Association of Kansas, at Wichita, May 19. The chief speaker at the morning session was W. B. LaBar, of Utica, N. Y., traveling representative of the national association, who told of the advantages gained by membership in the Electrical Contractors' Association of America. In the afternoon W. L. Hutchison, of Kansas City, Mo., told of the work of the Missouri and of the Kansas City Contractors' Associations, of the co-operation with the national organization and of the work of the local Jovian League.

The contractors were entertained by the Jovian League, of Wichita, at luncheon at noon, dinner in the evening, and with a parade after dinner. Fifteen candidates for Jovianism from among the contractors were imprisoned in an animal cage borrowed from a traveling show, and this spectacle was the feature of a parade, which included also a steam calliope, and electrically illuminated trucks. The rejuvenation was held after the parade.

Officers elected by the Electrical Contractors' Association of Kansas were:

President, J. A. Mercer, Topeka.
Vice-president, William Cates, Hutchinson.
Secretary, R. M. Sutton, Wichita.
Mr. Sutton is also national director for Kansas.

Fixture Design and Glassware Problems Discussed at May Meeting of New York Section, I. E. S.

A new attendance record was again made at the meeting of the New York Section of the Illuminating Engineering Society, held on May 11, at the Engineering Societies Building.

Chairman D. M. Moore addressed over 200 members and guests when he opened the meeting, introducing Stephen de Kosenko of the Sterling Bronze Company, New York, who handled his subject, "Fixture Design," in a unique and absorbing manner. He traced the history of lighting fixtures from the dark ages up to the present, and delighted his hearers by his sketches, in charcoal, made to illustrate the points. Beginning with the holders in metal and clay for slivers of wood and then on through the oil and candle periods, the reasons for many of the designs of today were apparent. His remarks on the more recent efforts were of the critical order, but justifiable, to judge from the attitude of the audience. The heavy metal chains, the buttressed glass bowls and other anachronisms kept up a keen interest. The major faults in public structures are too much light, badly directed light and too much glare. Church lighting suffers from being too spectacular. Picture galleries are not constructed so that they can be well lighted. The qualifications of a fixture designer, as he outlined them, were so exacting that even an artist-architect could not be better equipped.

The second paper of the evening covered "Lighting Glassware" and was presented by A. D. Nash of the Tiffany Furnaces. He outlined the field of the manufacturer and made a plea for a better general understanding as to the character of the product. While glassware represents only 20 per cent of the cost of a fixture installation it is the most important feature of the whole installation. The production of daylight illumination is a function of the lamp manufacturer and not that of the glass man.

The discussion by Messrs. Basset Jones, Norman Macbeth and A. A. Wohlayer had principally to do with the daylight effects and paints for wall surfaces. The possibilities in the latter case are greater than generally understood, as two surfaces of apparently the same whiteness showed a difference of 25 per cent in illumination values.

A number of pieces of glassware were exhibited and also a number of unusual slides of fixture designs.

P. S. Millar outlined the course of lectures to be given in Philadelphia September 21 to 28 and stated that the price of the ticket, $25, would include bound volumes of the forthcoming lectures and also those delivered at the Johns Hopkins course in 1910.

W. F. Little, chairman of the papers committee, announced that at the June meeting, Mr. Dempsey of the New York Edison Company would exhibit moving pictures of street lighting construction and maintenance. Following the paper there will be an auto-inspection covering the types of lighting described.

"Get-Together" Dinner Given By the Lighting Sales Bureau of N. E. L. A.

An opportunity afforded to every one interested in the lighting branch of the electrical industry to meet the prominent men of the lighting sales bureau of the Commercial Section of the National Electric Light Association was given at a "get-together" dinner given by the Bureau on May 25 at the Morrison Hotel, Chicago. The dinner was featured by the appointments, which included a number of illumination features. A wide diversity of entertainment was provided and greatly enjoyed by those in attendance.

J. G. Learned, chairman of the Lighting Sales Bureau, presided at the dinner. The speaker of the evening was John F. Gilchrist, vice-president of the Commonwealth Edison Company, who spoke at some length of his 30 years of experience during the development of the electric-lighting industry. He gave a large number of examples of the progress already made and outlined in a large way the development to be expected in this line of activity.

The dinner was very successful and the attendance, which was well over 200, proved the great popularity of the Lighting Sales Bureau.

The Illuminating Engineering Lecture Course.

The preliminary list of subjects for the course of 21 lectures to be given at the University of Pennsylvania, following the convention of the Illuminating Engineering Society, is as follows: The Principles of Interior Illumination (2); the Principles of Exterior Illumination; Color in Lighting; Architectural and Decorative Aspects of Lighting; Recent Developments in Electric Lighting Appliances; Recent Developments in Gas Lighting Appliances; Modern Lighting Accessories; The Lighting of Factories, Mills and Workshops; The Lighting of Offices, Stores and Show Windows; The Lighting of Schools, Auditoriums and Libraries; The Lighting of Churches; Theater Lighting (including Stage Lighting) and the Lighting of Art Museums; The Lighting of the Home; Train Lighting; Street Lighting (2); The Lighting of Yards, Docks and Other Outside Works; Headlights, Search-lights and Projectors; Sign Lighting; Building Exterior, Exposition and Pageant Lighting.

The course is directed specially toward the practical application of the principles to the work of illuminating engineering as carried on today by the latest methods and with the most recent equipment. It ought to appeal with particular force not only to the engineer, but to those whose contact with illuminat-

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ing engineering is chiefly commercial. It should impress upon those, who in their daily task have to deal with the applications of artificial light, a firmer grasp of advantageous methods and a closer understanding of the things which are necessary to make electricity of the maximum usefulness to the consumer.

COMBINATIONS IN BEHALF OF FOREIGN TRADE.

Federal Commission Emphasizes the Obstacles Which Confront Our Producers When Seeking Foreign Markets —Urges Modification of Our Anti-Trust Laws.

Acting under authority of the statute under which it was established and is maintained, the Federal Trade Commission has made a careful investigation of the competitive conditions affecting American concerns in international trade. The commission finds:

(1) That other nations enjoy marked advantages in foreign trade, from superior facilities and more effective organizations;

(2) That doubt and fear as to legal restrictions prevent Americans from developing equally effective organizations for overseas business and that the foreign trade of our manufacturers and producers—particularly the smaller concerns —suffers in consequence.

Appreciating the importance of fostering foreign trade and realizing the urgent need of enabling our citizens to meet foreigners on equal terms in international commerce, the commission recommends the immediate clarification of the law, so as to permit co-operation among Americans for export trade.

Foreign Exporters' Advantages.

The commission finds that foreign nations have built up their ocean shipping, have granted low export railway rates and have combined their land and ocean transportation facilities to give their shippers ready entrance into their overseas markets. The United States, on the contrary, has neglected its merchant marine, until we are dependent upon our commercial rivals to deliver our goods. In consequence, the transportation of our products is now largely controlled by powerful international combinations of foreign shipowners, who discriminate against American shippers.

Foreign nations, moreover, have not only established connections with banking houses in every land, but have dotted the map of the world with foreign trade banks of their own. They give the foreign exporters information, extend credit, finance his transactions and constantly strive to increase the foreign business of the mother country. The few foreign branches of American banks have but recently been established, and in most markets our exporters must still depend on alien bankers.

British, French, German and other foreign traders enjoy a peculiar advantage from the investments made by their fellow nationals in foreign lands, frequently on the express condition that supplies and equipment be purchased in the country furnishing the funds. British and German investments in South American railways and public utilities, French investments in Turkey, and Japanese investments in China and Manchuria are typical examples. Time and again American manufacturers have found it impossible to sell their products abroad because the prospective customer was forced to purchase from, or through, interested investors.

In seeking business abroad American manufacturers and producers must meet aggressive competition from powerful foreign combinations, often international in character. In Europe, in Japan and elsewhere, business men, often aided by their governments, have developed comprehensive combinations which effectually unite their activities.

German Combinations.

In Germany, prior to the war, there were 600 important cartels—i. e., combinations to control the market—embracing practically every industry in the Empire. Many dominated the export trade of their industries and carried on vigorous campaigns to extend their foreign business, to prevent competition among German producers in foreign markets and to secure profitable prices.

Thus the German dye-color industry operated as a unit in foreign trade, under the leadership of two great groups of allied producers, the Badische group and the Höchst-Casella, which were working under agreement to avoid competition between themselves for fifty years. The manufacture and exportation of electrical equipment has been made one of the bulwarks of German foreign trade by two great companies, the Allgemeine Electricitäts Gesellschaft and the Siemens-Schuckert, with numerous subsidiaries at home and abroad working in harmony with each other.

Similar syndicates obtain in France and Belgium, Italy, Russia, Austria Hungary, Australia, Sweden, Greece, Argentina, Chile, Equador and in Japan and China.

The commission urges the pressing need of immediate action. It does not believe that Congress intended by the anti-trust laws to prevent Americans from co-operating in export trade for the purpose of competing effectively with foreigners where such co-operation does not restrict trade within the United States and where no attempt is made to hinder American competitors from securing their due share of the trade. If American business men are to make the most of the great opportunities now before them, they must build securely in foreign trade to avoid disaster in the shock of the stern and determined competition that will doubtless follow the war and must at once perfect the organization which the conditions of international trade demand.

Convention of Ontario Electrical Dealers' and Contractors' Association.

The second annual convention of the Electrical Dealers' and Contractors' Association of Ontario is to be held at Toronto, Canada, on June 6 to 8. The meetings will be held at Massey Hall. The following is the condensed program for the convention:

Tuesday morning session: Opening address by President G. D. Earle; address on "Organization," by E. A. Drury. Tuesday afternoon session: Report of Committee on Licensing, by William Henry Lodge, chairman; address on "Inspection," by H. F. Strickland, chief electrical inspector of Ontario.

Wednesday morning session: Paper on "Advertising," by J. C. Kirkwood; three papers on "Resale," by R. Grant, C. A. McLean and Edward J. Wied; paper on "How to Keep the Electrical Business in the Family," by Gordon C. Keith. Wednesday afternoon session: Papen on "Cost of House Wiring," by C. D. Henderson; four addresses on "Co-operation," by Walter Carr, F. M. Dusenbury, A. H. W. Joyner and A. C. Lyons.

Thursday morning session: Paper on "Bookkeeping and Accounting," by Ernest Griffith; reports of the following committees: Architects, by Martin Nealon; Compensation, by G. T. Dale; Electrical Development, by H. M. Kewman; election of officers. Thursday afternoon session: Paper on "Illumination," by T. M. Deblois; a practical talk on "Incandescent Lamps," by W. B. Burnett.

Throughout the meeting there will be an electrical show at which a considerable number of American and Canadian manufacturers will have interesting exhibits. A number of entertainment features are included, one of which is a moonlight excursion on Lake Ontario on Wednesday evening. The acting secretary of the association is Marshall S. Soules, Oshawa, Ont. The chairman of the Electrical Show Committee is E. A. Drury, 45 Moutray Street, Toronto.

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SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION CONVENTION.

Twelfth Annual Meeting at Galveston Considers Electric Cooking and Other Kindred Topics of General Interest.

For the fourth time in as many years the Southwestern Electrical and Gas Association held its annual convention in the city of Galveston. This, its twelfth annual convention, was presided over by David Daly, manager of the Houston Electric Company, Houston, Tex. True southern hospitality pervaded the entire convention but was personally extended on behalf of the citizens of Galveston by Mart H. Royston, city attorney. W. B. Head, vice-president of the Texas Power & Light Company, of Dallas, responded very appropriately on behalf of the Association.

The opening session on Wednesday, May 17, was occupied principally by the reading of reports. Secretary H. S. Cooper, of Dallas, stated in his report on the affairs of the Association that the membership had been maintained at its high mark for the past year. This is a compliment to the work of the Association, in view of the unfavorable business conditions.

President Daly in his address, while speaking particularly of the street railway, stated a principle that is more or less involved in the development of any utility when he said: "Nothing costs the community less to give, nothing is so conducive to its solid and substantial upbuilding as security to the capital that is devoted to its needs and services. And yet what do we constantly see? Every safeguard that can be taken away from this capital is considered a victory for the public; every burden that can be placed upon it, a political asset for the man that placed the burden. The temporary advantage of the individual, the glittering expedient of the present make an effective appeal—and, as always, made with the most righteous attitude, with seeming solicitude for the common people.

"Those who attack do not use a bludgeon and batter us into a shapeless mass. That would arouse the sense of decency and fair dealing that all the public have at bottom and would defeat the effort. The attacks are subtle. They promise great relief to the public, but instead of frankly taking away from use a great part of our property they urge the clipping off at the two ends of our income, leaving a residue that in value is equivalent to only a portion of the property we formerly possessed. The value of a public service is in the income that it produces."

The Wednesday afternoon and Thursday morning sessions were devoted to papers and discussions on subjects directly interesting to street-railway men, and coincident with the Thursday afternoon session on the general subject of rates for light and power there was held a special session of claim agents for street-railway companies. The matter of rates was introduced by the report of a Committee on Rates. The subject was treated under the subheads of "Standardization and Simplification of Rates," "The Equity of Dissimilar Rates for Different Uses of Public Utility Commodities or Services," "Discriminatory Rates," "Publicity of Rates," "Relation with and Education of the Public with Reference to Rates," "Forms of Customer's Contracts" and "The Combining of Lighting Franchises with City Lighting Contracts." The object of this discussion was to arrive, if possible, at a basic principle of rate-making rather than the naming of any particular rate for any definite class of service. Those participating principally in the discussion were J. C. Kennedy, manager of the Brenham Compress, Oil & Manufacturing Company; B. F. Cherry, City of Weatherford Water, Light & Ice Company; Prof. F. C. Bolton, A. & M. College of Texas; D. A. Hegarty, of Houston; R. J. Irvine, of San Angelo Water, Light & Power Company; D. R. Locher, general manager of the Corpus Christi Railway & Light Company, and L. L. Stephenson, of Dallas.

Friday Morning Session.

The first paper to be presented at this session was by A. E. Warner, illuminating engineer of the Dallas Electric Light & Power Company, on the subject of "The Practical Side of Modern Illumination."

The discussion of this paper was opened by Walter G. Ross, commercial agent of the Dallas Electric Light & Power Company, who said that the illuminating field is advancing so rapidly that those in close contact with the business must exert every effort to keep pace with it. Mr. Ross also spoke of the help received by central-station managers from the manufacturers of appliances.

"Commercial Exploitation of Electric Current for Cooking and Heating," by J. A. Dupree, manager of the electric appliance department, Corpus Christi Railway & Light Company, received more consideration than almost any other paper presented at the convention. The discussion was spirited and reluctantly discontinued when it came time for adjournment. A number of ladies were present to hear this paper and invited to take part in the discussion. R. J. Irvine, of San Angelo, asked whether material changes in the distribution system were found necessary. Mr. Dupree in reply stated that owing to the fact that they had not installed very many ranges so far that question had not received very great consideration, but that they employed a wire of sufficient carrying capacity to also take care of their ranges. In reply to a further question by Mr. Irvine as to how he prevented the abuse of cooking installation by people who would be disposed to do so, Mr. Dupree said: "Most of our wiring is what you might call ironclad service. The wires are installed in conduit which would make it difficult for anybody to connect the current for lighting. All of our lighting and cooking circuits are run with 110-volt service, with which we have not experienced any trouble." J. C. Kennedy, manager of the Brenham Compress, Oil & Manufacturing Company, referred to the high price of electric ranges and stated that although they had adopted the 30-day trial method they had found it expensive and not altogether satisfactory. D. R. Locher, general manager of the Corpus Christi Railway & Light Company, said his company was really forced to adopt the 30-day trial plan so that the customers might be shown that the electric range can do what is claimed for it.

H. H. Russell, heating specialist of the General Electric Company, Schnectady, gave some very useful information concerning the installation and operation of electric ranges. The points of his discussion might be summarized as follows: "I find that adequate instruction in the handling of a range is practically as necessary as adequate instruction in handling an automobile. I have found that where the meter was installed directly over or behind the range in such a place where the person using the range could see it, and where such a person was taught how to read the meter and thus check up the amount of current used every day, we have not yet lost the sale of a range. There are really two methods that may be employed in the sale of ranges. One might be called campaigning and the other exploitation. It is the same thing which has popularized the vacuum cleaner, the electric flatiron and practically every other accessory that has been put out. The percentage of sales during the past eight months covering something over 250 ranges has been about 90 per cent. In other words, that percentage of ranges has given satisfaction. The idea has been, or perhaps it has been taken for granted without thought on the part of most people, that it is the rich

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people who will take the electric range first. Our experience has proven that that is absolutely untrue; that the people who are going to create the electric range industry will be the people of the middle class, people who are intelligent but who do not have servants. We employ a demonstrator in chief and a secondary set of demonstrators known as local instructresses. In other words, when we have sold a range we make arrangements with some lady in town to whom possibly the remuneration might be an advantage, and she is known as the local instructress. We have found that the system of having a local demonstrator is an absolute necessity and where we have not had a local instructress our results have not been as good. It is not advertised in any way, but whenever a range is sold this lady is notified and gets in touch with the customer by telephone or otherwise and in a series of three lessons instructs her in the use of the range. For this service the local instructress receives two dollars. Also for every range that she can arrange to put in on trial with the intention of purchase we give her an additional two dollars, and so that she won't lose interest if any such sale is completed we allow her a further commission of five dollars. It is possible for her to make nine dollars in this way on each sale."

A. L. Chase, manager of the Texas Southern Electric Company, Clarendon, said that the equipping of domestic-science departments in high schools with electric-cooking devices as well as sewing-machine motors and appliances of that kind was a means of introducing these devices and educating the younger people in their use and creating a demand for them. J. C. Kennedy further stated that in connection with their uptown store they advertised that their lady demonstrator was in attendance to demonstrate the use of electric appliances. "This lady on her own account serves the business men and ladies that work in the department stores downtown with a lunch electrically cooked which brings the matter very forcibly to the attention of the public," said Mr. Kennedy.

In concluding the discussion on this subject H. H. Russell supplemented his former discussion by saying: "At the present time we have just finished the period of experimentation. There is one company now that has an electric range which contains an element which is incased in a steel sheathing which makes it not only proof against physical damage but also prevents any oxidation, the two essential features for the long life of any heating element."

"How to Increase the Power Load with Profit to Both Company and Customer," by Walter G. Ross, commercial agent, Dallas Electric Light & Power Company, was the next paper to be presented at the Friday morning session, but owing to the great length of the program there was no time for its discussion.

Final Session.

At the Friday afternoon session reports of the various committees were made. The report of the Committee on the Affairs of the Association made by a special committee included the recommendation that $5,500 be appropriated for the conduct of the Association's affairs for the coming year. In all probability the next meeting place will be in Galveston, although its selection is a matter for the Executive Committee.

The following officers were elected for the ensuing year:
President, F. R. Slater.
First vice-president, H. C. Morris.
Second vice-president, D. A. Hegarty.
Third vice-president, W. A. Sullivan.
Treasurer, J. B. Walker.

H. S. Cooper of Dallas, who has been secretary for several years, will no doubt be continued in that office, though the selection is made by the Executive Committee.

OHIO NEW-BUSINESS MEETING.

Timely Discussion of Commercial Problem Held Under Auspices of Ohio Electric Light Association.

A very interesting meeting of the New-Business Co-operation Committee of the Ohio Electric Light Association was held in Newark, O., on May 12.

H. B. Craft, of the Columbus Railway, Power & Light Company, in a paper on "Motor Drive as Against Gas Engine Drive," pointed out that the electric motor in the matter of initial cost, flexibility, maintenance, fire hazard, cleanliness and other features is easily the superior of the gas engine, and asserted that these facts far more than outweigh the slight difference between fuel and power bills.

The discussion brought out the fact that the small single-cylinder engine uses 35 to 40 cubic feet of gas per kilowatt-hour, while the multi-cylinder type uses 20 cubic feet per kilowatt-hour with gas of about 1,020 British thermal units. In a case cited it was found that the actual gas bills amounted to only $450 per year, but a close examination of the books showed a total fuel and maintenance cost of $1,450; moreover, the gas engine gave a speed variation of the line shaft of 6.5 per cent either way. This was replaced by an electric motor which cut this variation down to 0.5 per cent and operated for $1,500 a year.

A paper by C. M. Gilbert, sales manager of the Huetteman-Kramer Company, Detroit, Mich., dealt with the advantages that will accrue to both the central station and the compression-ice-making manufacturer by co-operative effort on the part of both in the installation of electrically driven ice plants. In the discussion it was pointed out that many ice-machine manufacturers show no enthusiasm in this regard and that in some instances are actually antagonistic toward the central station.

In a paper on "Industrial Electrical Heating Appliances" Mr. McKinney, of the General Electric Company, dealt with the advances in different applications of electric heating, with special emphasis on the present status of electric baking of enamel and japan on automobile parts and similar work. In a given case the time of baking on this kind of work was cut from six hours necessary with gas to one and a half hours with electricity, and the resultant finish was of a higher grade.

Dexter Rollins, of the Simplex Electric Company, presented a paper reviewing the merits of the different appliances of his company and asserted that a first-class appliance, even at the necessary higher price, is a much better proposition for the central station than a cheaper device which quickly fails. The question of water heating in connection with domestic electric ranges caused considerable discussion. It was brought out that some companies are giving on water heaters a rate of $1 per month per kilowatt.

J. E. Swan, of the Hotpoint Electric Heating Company, explained the work being done by the co-operative bureau of his company to aid central stations in every possible way to sell electric heating devices. H. G. Hopkins, of the Westinghouse Electric & Manufacturing Company, reviewed the new heating appliances being placed on the market by this company and described the methods and results of several successful appliance sales campaigns.

R. E. Woolley, of the Standard Electric Stove Company, made a point of the fact that every use of electricity can be supplanted by gas at a lower cost for fuel, but in no other field than cooking is this fact a predominant argument against electricity; therefore, why should an attempt be made to sell electric cooking on a basis of price competition with gas. He also stated emphatically that for the present electric ranges will not be bought, but must be sold.

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Miscellaneous NEWS NOTES

White-Way Celebration.—The Hudson City Board of Trade, Jersey City, N. J., is arranging for a three-day celebration, June 13-15, in connection with the inauguration of a new white-way lighting system on Central Avenue.

Utility Company Brings Suit Against City.—The Central Indiana Lighting Company has brought suit against the city of Columbus, Ind., and the Sanborn Electric Company, of Indianapolis, asking that the defendants be perpetually enjoined from executing a contract to build an electric-lighting plant at Columbus at a cost of $16,000, and from engaging in commercial lighting. The plaintiff contends that the contract is illegal. The city has been engaged in municipal lighting for years.

Indiana Lighting Company Moves.—The office of the Indiana Lighting Company which has been located in the Merchants Bank Building, Indianapolis, will have been moved to Hammond, Ind., by June 1, as a result of the consolidation of the company, together with other interests, with the Northern Indiana Gas & Electric Company since February 1.

Kansas City Jovian League and Advertising Club Meet.—The Jovian League of Kansas City, Mo., met with the Kansas City Advertising Club at luncheon May 12 during the latter club's annual exhibit of advertising. P. L. Lewis addressed the gathering on behalf of the electrical industry represented by over 50 Jovians, and mentioned the activities of the electrical interests in national advertising and opportunities for co-operation with advertising clubs.

Wireless Patent Trial Postponed.—Attorneys for the Marconi Company, in its case against Kilbourne & Clark Manufacturing Company, have secured a continuance of the trial until July 18, on the ground that the Marconi Company had been in error as to the characteristics of the "Simpson" mercury-valve transmitter of the Kilbourne & Clark Manufacturing Company when complaints were originally filed in Brooklyn and Buffalo, N. Y. The Marconi engineers will be enabled to make additional tests upon which to base claims of infringement of the patent.

To Illuminate Lincoln Highway Into Oakland.—Plans are under way to electrically illuminate the Lincoln Highway into Oakland, Cal., and a resolution has been passed in the City Council instructing the superintendent of the city electrical department to draw up plans for this lighting. A test of the various methods of illumination best suited for motoring will be made. The plan includes the lighting of about four miles of the road. This will be the third section of the Lincoln Highway to be electrically illuminated by the cities through which it passes, the other sections being at Aurora, Ill., and Salt Lake City, Utah.

New York Edison Company School Holds Graduation Exercises.—Commencement exercises for the graduating class of the New York Edison company's commercial school, were held on May 10 at the Company's Auditorium, 44 West 27th Street. Dr. Charles P. Steinmetz addressed the 60 members of the graduating class on "Educational Requirements in Modern Industry." F. C. Henderschott, manager of the Bureau of Education, also addressed the graduates. The prescribed course of lectures and studies of the school extend over a period of two years and embrace a broad variety of subjects. Of the 60 graduates, 45 are employees of the New York Edison Company, 6 of the New York & Queens Electric Light & Power Company, 4 of the Westchester Lighting Company, 2 of the United Electric Light & Power Company, and 3 from the Yonkers Electric Light & Power Company. This is the fifth annual graduating class of the New York Edison Company's commercial school and the total number of graduates including members of this year's class is approximately 300.

The Power Barge for River Traffic.—The Engineers' and Architects' Club, of Louisville, Ky., recently heard an address by Roscoe Kent, of the Howard Shipyards, Jeffersonville, Ind., on "The Power Barge for River Traffic." The shipyards has recently launched the first of a fleet of 36 large power barges which it will build for the Inland Navigation Company, operating on gas-engine-generated energy.

Telephone Societies Hold Joint Meeting.—The annual meeting of the Telephone Society of New York, was held in New York City May 19, the meeting being in conjunction with meetings in Philadelphia, Baltimore and San Francisco, communication being established by means of the Bell Telephone System, of which a demonstration was given. At New York, officers and executive committee members were elected, I. J. Thorp, of the New York Telephone Society, being elected president for the ensuing year.

Electric Street Lighting in New York City.—On June 8, the New York Section of the Illuminating Engineering Society will be addressed by W. T. Dempsey on "Electric Street Lighting in New York." The meeting will be held at the United Electric Light & Power Company's 187th Street station. Moving pictures showing methods of installation, construction, maintenance and standardization of equipment will be shown. An inspection tour will be made through Manhattan to note the street-lighting installations.

To Appraise Central Station at Seymour, Ind.—Engineers representing the Indiana Public Service Company will shortly be sent to Seymour, Ind., where they will appraise the local property of the Interstate Public Service Company, with the purpose of arriving at the proper service charge which may be made by the company. Six months ago the city offered the company a schedule providing for material reductions in street-lighting and domestic service, which was refused, afterward the matter being referred to the commission. The city contends that the value of the local plant does not exceed $100,000, while it is stated that dividends are being paid on a $450,000 valuation.

Ontario Hydro-Electric Commission Acquires Extensive Properties.—The act passed by the Ontario Legislature, affecting the Electric Power Company, Limited, marks another step in the history of public ownership in that province. The Electric Power Company is comparable in size and scope of its operations with the Hydro-Electric Power Company of Ontario, controlling at the time of sale, March of the present year, 22 electrical companies operating in and around the Trent Valley district. These companies are as follows: Auburn Power Company, Limited; Central Ontario Power Company, Limited; City Gas Company of Oshawa, Limited; Cobourg Utilities Corporation, Limited; Cobourg Water & Electric Company; Cobourg Gas, Light & Water Company; Eastern Power Company, Limited; Light, Heat & Power Company of Lindsay; Napanee Gas Company, Limited; Napanee Water & Electric Company; Nipissing Power Company, Limited; Northumberland Pulp Company, Limited; Oshawa Electric Light Company; Otonabee Power Company, Limited; North Bay Light, Heat & Power Company; Peterborough Light & Power Company, Limited; Peterborough Radial Railway Company; Port Hope Electric Light & Power Company; Seymour Power & Electric Company, Limited; Sidney Electric Power Company, Limited; Trenton Electric & Water Company, Limited, and Tweed Electric Light & Power Company, Limited. The act states that the treasurer of the Province of Ontario is authorized to issue debentures of the Province of Ontario, to the amount of $8,350,000, in payment for this property, the debentures to bear interest at the rate of four per cent. The operation of the newly acquired property has been handed over to the Hydro-Electric Commission of Ontario.

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Use of Electric Power for Public Works

Advantages of Electrical Construction Methods in the Execution of Important Projects as Exemplified in the Wilson Avenue Water Tunnel in Chicago

Industrial Power Series—Article No. 165

ELECTRICITY is playing an increasingly important part in construction work and particularly in carrying out public projects of considerable magnitude. The first use of electricity in such service was for lighting by means of arc lamps many works whose urgent completion required carrying on construction both day and night. As the adaptability of the electric motor became recognized, its use for hoisting, driving concrete mixers, drainage pumps, etc., gradually increased until now there are under way numerous important public projects in which electric power is used almost exclusively. In many undertakings the use of electricity for power purposes exceeds its use for lighting.

Probably the most common use of electric power in construction work is for hoisting, for which motors arranged for speed control are generally backgeared to the drum. For driving concrete mixers, air compressors, blowers, rock crushers or screens, either leather or chain belt drive is commonly employed, although in some cases direct connection is advisable where the driven machine operates at fairly high speed. Pumps of the centrifugal type directly connected to the motor are best for construction work. In all such work the most rugged types of machinery are preferred for self-evident reasons. Therefore the polyphase squirrel-cage induction motor is the best suited for all purposes where practically constant speed can be used. For variable speed the polyphase induction motor with secondary resistance is reliably providing all the speed control that is needed. Because of the desire to avoid commutation troubles, direct-current motors are not so generally used in this service as formerly; in fact, they are now employed chiefly where direct-current power alone is available.

For lighting an extensive work at night the use of arc lamps is no longer common, unless the contractor doing the work wishes to make use of old equipment on hand. For illuminating foundation work and the structural part at least in many buildings and for illuminating canal, sewer or open-cut subway work, etc., the use of flood lamps has in the last year or so been found to be exceptionally advantageous. These employ tungsten incandescent lamps of the gas-filled type mounted in projectors which permit throwing the light to the zone where the work is carried on. This type of lighting requires relatively few lamps and places them out of the way of derricks, excavating shovels and other construction machinery and allows the

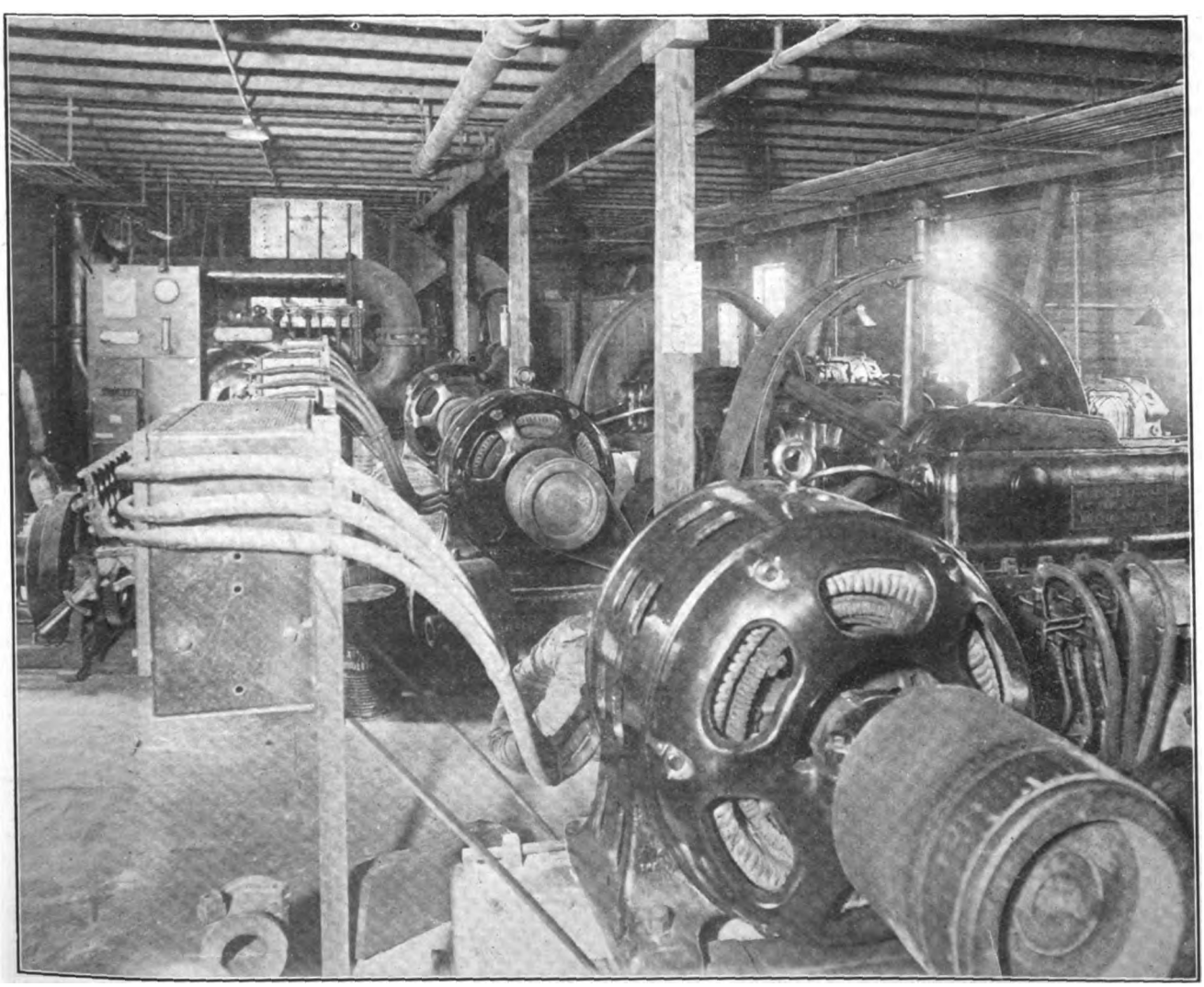

Fig. 1.—A Battery of Motor-Driven Air Compressors at Lawndale Shaft of Wilson Avenue Tunnel, Chicago.

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work to proceed unhampered by the numerous wires that formerly were needed for use with arc lamps, which had to be mounted directly above or close to the work that was to be illuminated. For lighting up the interior floors of a large building under construction, as well as for

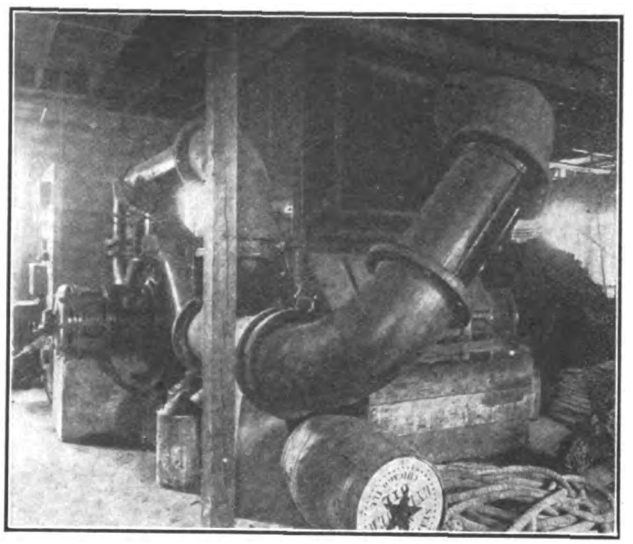

Fig. 2.—Motor-Driven Centrifugal Blower for Supplying Air to Tunnel Workmen.

illuminating a tunnel or other inclosed space, flood lamps of course are not suited and in this case either tungsten or carbon lamps are made use of, usually being well protected by means of wire guards.

Advantages of Electric Power.

The advantages to be gained by using electricity instead of steam or other kind of energy are numerous and include economy in first cost of construction equipment, as well as more economical and less troublesome operation thereof, also its greater safety from fire, explosion and other dangers, its convenience, readiness and portability, its adaptability to a variety of purposes, its ability to furnish power where needed without long lines of belting, rope drive or steam piping, and its elimination of objectionable smoke and noise attendant on the use of steam. The relative importance and order of these advantages depends largely upon local conditions and requirements. In many cases special advantages accrue from the conditions prevailing.

The opinion may be held that the use of electricity in construction work is most advantageous where electric power lines are at hand or can be easily extended. While this is true in general, many cases have arisen where electric plants have been especially installed for the purpose of carrying on the construction work. This has noticeably been the case in several irrigation projects in the West, where the cost of bringing fuel to the point where power was needed would have been prohibitive. In such cases either a temporary or a preliminary portion of a hydro-electric plant has been construced to provide the power during the work. A noteworthy case of this kind was the building of the Roosevelt dam for the Salt River Valley irrigation project in Arizona.

Among other important public projects in which the use of electric power has been or is being extensively made are the Los Angeles Aqueduct and the Catskill Aqueduct which latter is now under way to bring a new water supply to New York City. In the later stages of the construction of the Panama Canal considerable electric power was made use of and throughout the construction electric lighting was generally employed. In the building of the new subways in New York City electric power is being used on a large scale, both for driving motors and for night illumination. In this case the particular advantages it possesses over other sources of power for city use are especially prominent. If steam were used in such an extensive undertaking, a very large number of small donkey engines producing much smoke and noise would have to be employed. The cleanliness and ready portability of the motor drive is in this case particularly conspicuous. Another project of considerable magnitude is that involved in the construction of the Wilson Avenue water tunnel in Chicago. In this case not only is electric power used on a very large scale and for a great variety of purposes, but the construction work on this project has brought about the development of several new construction methods, a description of which is timely as their adoption on other tunneling projects may be the means for effecting important economies both in cost and time of construction.

Wilson Avenue Tunnel.

The Wilson Avenue tunnel is to supply water from Lake Michigan to a new pumping station to be installed in the northwestern portion of Chicago. The rapid growth of the population in this section has necessitated urgent provision on a liberal scale for an abundant supply of water. The main tunnel will have a total length of about 8.5 miles, of which over three miles extends under the lake to a new intake crib and something over five miles lies directly under Wilson Avenue. The eastern 5,800 feet of tunnel will have a finished bore equivalent to a circle of 13 feet in diameter, although the section is not to be exactly circular. At this point a short tunnel running south will connect with the present Lake View intake crib and this latter intake will be dismantled because it is not sufficiently far from shore to insure constant purity of water. The remaining portion of the tunnel to its present terminus, where the new Mayfair pumping station is being erected, will have a finished section equivalent to a 12-foot circle. At the shore line a short eight-foot branch tunnel con-

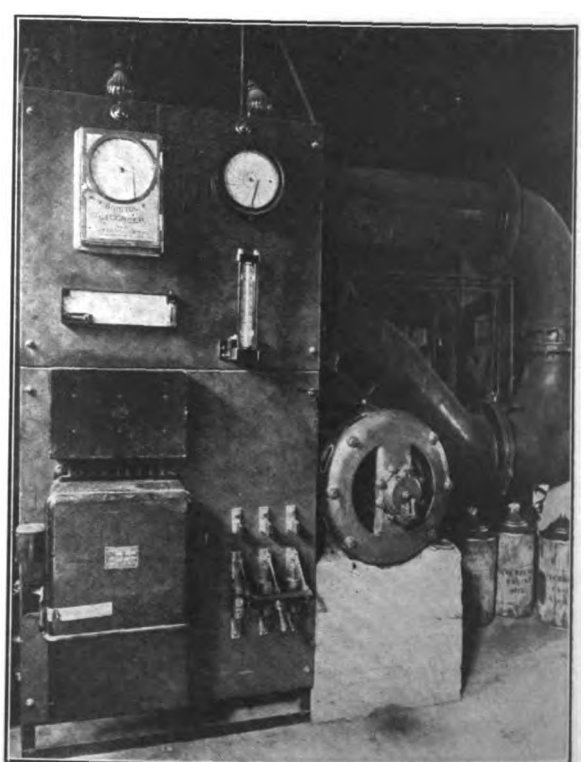

Fig. 3.—One of the Control Boards for Blower Motors.

nects with the present Lake View pumping station so that this station will be able to receive its supply of water from the new Wilson Avenue crib through either of two tunnels connecting with the Wilson Avenue tunnel.

As the engineering work on this tunnel was begun a number of borings were made along the line and it was found

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that at a depth of about 160 feet below street surface an apparently unbroken bed of solid limestone rock would be met with. Since tunnel excavation in clay or sand is very much more expensive and troublesome than that in the easily worked rock underlying the city, it was decided to excavate the tunnel through this solid rock. Numerous advantages have resulted from this decision, among which is the ability to use a considerable portion of the rock blasted out of the bore in making the concrete lining for the entire tunnel, and for this purpose a novel method of carrying on simultaneously both mining of the rock and concrete lining, without bringing any of the rock to the surface, has been developed.

In previous similar tunneling work the city had met with considerable delays, heavy charges for extras, and other difficulties when the work had been done by contract. The city had gained some experience in tunnel work done by its own forces on the day-labor plan. This led to the opinion that the latter plan would result in more economical and rapid construction. Consequently when bids that were not entirely satisfactory were received for part of the Wilson Avenue tunnel work, it was decided that the city should carry on the bulk of this work itself by day labor and fully 95 per cent of the entire work is being done in this way.

The only work being done by contract is the construction of the new intake crib and shaft in the lake and about 2,000 feet of the eastern end of the tunnel. If the city had undertaken this part of the work also, an expensive plant for working in the lake would have been required for which the city would have had relatively little subsequent use. It was decided to tunnel the lake portion without an intermediate crib, although previous practice had always included such a temporary shaft. About seven-eighths of the lake portion, or about 14,000 feet, is being built eastward from the short shaft. Over 9,000 feet of this has already been mined.

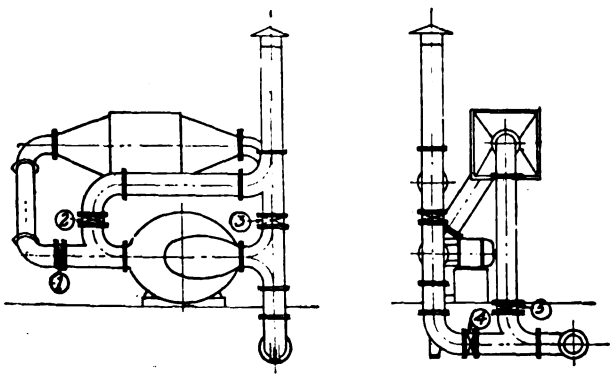

Fig. 4.—Diagram of Ventilation Equipment.

Between the shore shaft and that at the Mayfair station, or western end of the tunnel, there are two intermediate shafts, from each of which work was pushed in both directions. Thus the land section of the tunnel has been excavated in six drifts; over three-fourths of this section has already been mined. The preliminary work on the tunnel construction was done in 19'3 and late that year the shore shaft was sunk. Active work on the tunneling began in 1914 when the three other shafts were sunk.

At each of the four shafts a machinery or "power" house was built, also shops, storehouses and locker and dressing rooms for the men, and a small boiler house for a low-pressure boiler furnishing steam for heating in cold weather. Each of the four machinery houses contains three or four air compressors for furnishing compressed air for the rock-drilling and concrete-lining operations, also one or two blowers for ventilating the tunnel, and a hoist. In the tunnel at the foot of the shaft are one or more pumps for dewatering each drift. All of this machinery is motor-driven.

Electric Power Supply.

Before deciding to use electric power for the operation of this machinery, as well as other machinery that was added subsequently, the relative merits of installing a steam plant and of purchasing electric power were carefully considered.

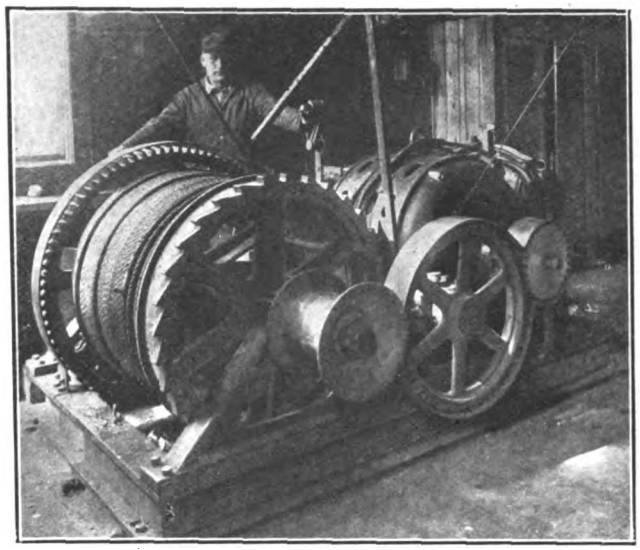

Fig. 5.—Motor-Driven Hoist Used in Tunnel Work.

To have utilized steam power would have necessitated a much larger initial investment in the construction plant, also more room than was available at three of the shafts; it also would have involved probable complaints from nearby residents due to smoke from these plants. The decision to use electric power eliminated these objections and permitted placing the shafts where they were most logically required for proper construction of the tunnel. Three of the shafts are located in high-class residence districts. Use of electric power has made the plants practically unobjectionable to the residents. The use of electric power has also proven much more economical than the use of steam power would have been. It has also resulted in a more flexible arrangement, since it has been possible to add motors as new operations were taken up and to dispense with others or put them into other use as the requirements demanded. The supply of power, which is purchased from the Commonwealth Edison Company, has been found very reliable and altogether satisfactory.

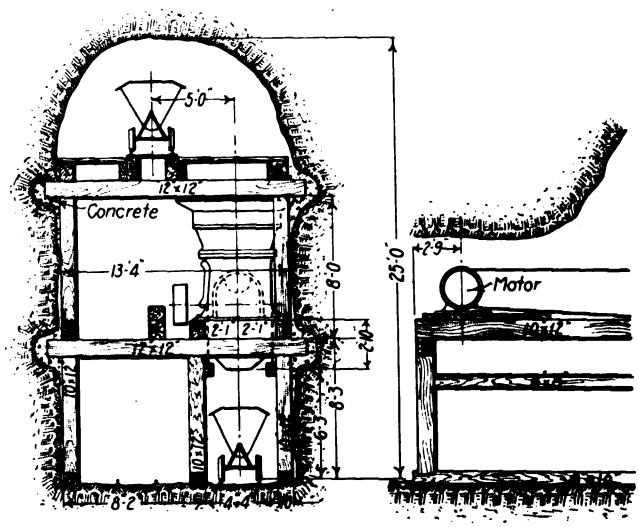

Fig. 6.—Diagram of Rock Crusher Near Foot of Tunnel Shaft.

Special supply cables bringing three-phase, 60-cycle, 4,000-volt current, are run to a bank of transformers mounted on poles close to each machinery house. These transformers are 75-kilovolt-ampere single-phase units which have been found by the central station to be best adapted for this power service.

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At first a single one of these units was placed in each phase at each shaft and at the Mayfair shaft this has sufficed to carry the load. As the load increased at the other shafts another transformer unit was placed in parallel with the one installed in each phase. At the shore shaft, which has the largest load, a third transformer has been put in parallel into each phase, thus making a bank of nine units. The primaries of the transformers are connected in star and the secondaries are delta-connected with the middle point of one phase grounded. All motors used are 220-volt, three-phase machines connected through a distribution panel to the low-voltage line. The lamps in use in the tunnel and the head works at each shaft are connected through an autotransformer between the outer wires and a relatively small neutral so as to give a practically balanced load on each phase.

Motor-Driven Machinery.

The detailed power equipment at each of the four shafts is as follows:

Shore shaft.—Four 100-horsepower air compressors; two 50-horsepower blowers; one 50-horsepower hoist; two 75-horsepower and one 100-horsepower pumps; this makes a total of 800 horsepower connected motor load.

Lincoln Avenue shaft.—Three 100-horsepower air compressors; two 50-horsepower blowers; one 50-horsepower hoist; one 75-horsepower pump; the total connected load is 525 horsepower.

Lawndale Avenue shaft.—Three 100-horsepower air compressors; two 50-horsepower blowers; one 50-horsepower hoist; one 20-horsepower pump; one 50-horsepower crusher; total connected motor load 520 horsepower.

Mayfair shaft.—Three 100-horsepower air compressors; one 20-horsepower pump; total connected load 320 horsepower.

Mayfair pumping station.—One 90-horsepower hoist; two 50-horsepower hoists; connected load 190 horsepower.

On each of the four concreting machines there are two motors aggregating 13 horsepower. The total connected power load at the four shafts, in the tunnel, and at the pumping-station site amounts to 2,407 horsepower.

At the Mayfair shaft there was formerly in use a 50-horsepower blower, which has been taken out since the tunnel mining work carried on from this shaft has been completed. While this work was still under way, a 50-horsepower hoist was used in the shaft; this has been removed to the adjoining pumping-station site and is used in connection with the concrete tower.

Aside from the foregoing summary of the power load, there is a total connected load of something like 150 horsepower for lighting the tunnel, head works and pumping-station foundation work.

Tunneling Method.

The actual work of tunneling is divided into two main operations, the first being the mining of the rock and the second the lining of the rough bore with concrete so as to make a smooth and clean finished tunnel. For the mining it was decided to use compressed-air drills exclusively. The mining work is carried out on a two-shift basis, each shift working nominally eight hours. Each shift consists principally of two gangs, one of miners who set up and operate the drills which make the holes for the blasting and fire the blast, and the other of muckers who remove the rock thrown down by the preceding blast. Just before the end of the work of each shift the holes are filled with dynamite, and after every one has been taken up from the tunnel, the blast is fired. Several hours are then left for the smoke to clear, when another shift comes in to carry on the work. The mining has been carried on chiefly by what is known as the top heading and bench method, in which numerous holes are drilled in the upper portion of the tunnel and this blasted out before the lower portion or bench is mined. The tunneling carried on from the Mayfair shaft was on the three-shift basis, but no greater progress was made than on the two-shift plan.

Compressed-Air Supply.

The compressed air used for operating the drills is furnished by Ingersoll-Rand compressors installed in the machinery house at the top of each shaft. Each of these compressors has an automatic unloader. Each unit has a capacity of 600 cubic feet of free air per minute and compresses this to a normal pressure of 110 pounds per square inch. Each compressor is belted to a 100-horsepower slip-ring induction motor which drives the compressor through a short belt with belt tightener at a speed of 190 revolutions per minute. A general view of a battery of these compressors at the Lawndale shaft is shown in Fig. 1. These motors run at practically constant speed. They are provided with secondary resistances and a multiple-switch starter by means of which the unit is gradually brought up to speed.

The air is carried in a seven-inch steel pipe to a receiver 4 feet in diameter and 12 feet high. A six-inch steel pipe runs down from this through the shaft and branches in each direction in the tunnel to four-inch pipes. At first single units of each compressor group were operated for supplying air for drilling only, but since the concreting began, which requires a very large amount of compressed air, practically the entire battery is used at each shaft.

Since no troublesome amount of water is encountered while mining the tunnel, there has been no need of air locks and none of the work has been carried on under compressed air. This is another valuable feature resulting from building the tunnel through rock. Still another is the elimination of timbering before the concrete lining of the tunnel is put in.

Ventilation of Tunnel.

Special attention is being given throughout the tunneling work to adequate ventilation of the tunnel, which is being done on an exceptionally liberal scale. This is accomplished by means of the motor-driven blowers already referred to. There is one of these for each drift. Each of these units is a low-pressure General Electric centrifugal air compressor directly connected to a 50-horsepower squirrel-cage motor. It furnishes 5,000 cubic feet of air per

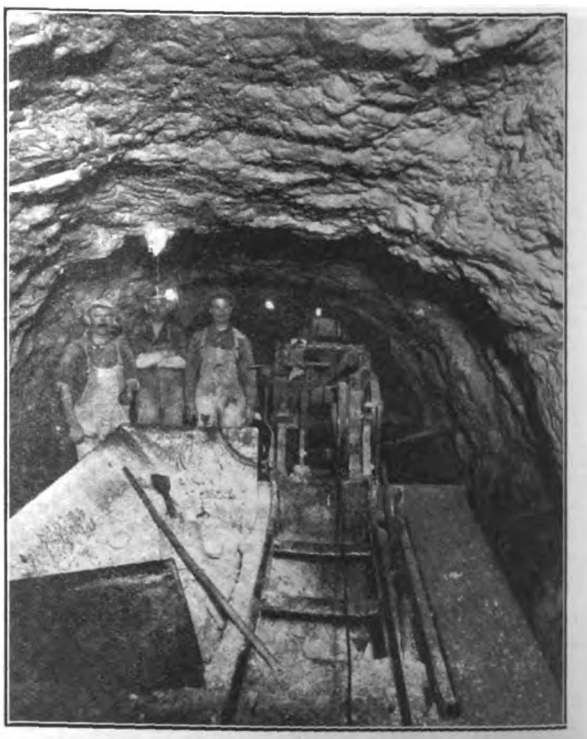

Fig. 7.—Portable Screening Machine, Motor-Driven.

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minute at a pressure of 1.5 pounds per square inch. For the long drift under the lake two of these sets are operated in series to supply the air at 3 pounds pressure. A general view of one of the single sets is shown in Fig. 2. The control and instrument board, shown in Fig. 3, includes the starting compensator as well as recording and indicating instruments.

The air from these blower sets is passed over steam heating coils in winter so as to prevent chilling the men in the tunnel. The piping used to bring the air down the shaft and to the heading where the mining is going on is of No. 14 steel and 18 inches in diameter. It is in 20-foot lengths with special rubber-gasketed joints. Although light enough for two men to carry a length easily, it is strong and tight. This piping is strung at the side of the tunnel and steadily extended to bring it within about 100 feet of the heading. By means of an ingenious bypass and valve arrangement shown in the diagrams of Fig. 4, reversible operation of the ventilation is secured without reversing the blower or driving motor. Normally fresh air is supplied to the men at the heading as already described. For this purpose valves 1, 3 and 5 are opened and valves 2 and 4 closed. After a blast has been fired, the set is operated as an exhaust ventilator by closing valves 1, 3 and 5 and opening 2 and 4. This serves to withdraw from the tunnel rapidly the smoke and gases resulting from the blast. Before the next shift of workmen appears, the tunnel is quite well cleared and normal ventilation is restored.

Where the concreting is being carried on, additional ventilation is provided for the men on the screening and mixing machines by locally bleeding the high-pressure compressed-air system.

Haulage in Tunnel and Hoisting at Shafts.

The muck blasted at each heading is loaded into steel side-dump cars of one-cubic-yard capacity and hauled on a double-track tramway to either the concreting machine or shaft. This haulage was at first done by mules, but after the drifts increased in length several improved gasoline types of Baldwin mining locomotives were purchased and are being successfully used. It was not practicable to use storage-battery locomotives because of their requirement of direct-current charging equipment, and three-phase trolley locomotives would have required special trolley wires and track bonding.

The surplus rock not required for concreting is taken up the shaft by means of a Thomas electric hoist with single drum 32 by 24 inches. These hoists are operated by 50-horsepower slip-ring induction motors. One of these sets is shown in Fig. 5. They were designed for hoisting a load of 5,000 pounds at a speed of 200 feet per minute, but in actual service have exceeded this capacity. The trip of about 160 to 185 feet is easily made in less than a minute, including starting and stopping. The hoisting performance could have been even bettered by using the double-skip method, one load going up while the other goes down. Simplicity dictated use of the single skip, however, and it has given entirely satisfactory service. Hoisting is done on two parts of line over 30-inch sheaves in the head house, a three-quarter-inch steel cable being used. These hoists serve for all of the hoisting done in each shaft.

Drainage Pumps.

Each drift of the tunnel has a gentle slope toward the shaft from which it was driven and at one side there is a ditch which drains water to a sump at the foot of the shaft. Under and near the lake section of the tunnel there is some seepage before the tunnel is lined. Some of the rock drills use water to keep the hole clear of dust. To remove the water from the sumps motor-driven multistage centrifugal pumps are used. These pumps are of various sizes from the 300-gallon size up. They operate against a head of 150 to 160 feet and discharge into the street sewers.

Fig. 8.—Flood Lighting Permitting Outside Work to be Done at Night.

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Each pump is directly connected to a squirrel-cage induction motor with specially impregnated windings for waterproofing. The pumps operate at constant speed. The driving motors are of three sizes, 20, 75 and 100 horsepower.

Ingenious Concreting Process and Equipment.

Former practice in building rock tunnels was to do all of the mining before the work of concrete lining was done. This meant that all rock had to be brought to the surface and stored or disposed of. When concreting began the concrete had to be mixed at the surface, using either purchased stone or that which had been stored, and the mixed concrete was then taken down the shaft and brought to the lining forms, behind which it was put by hand. All this involved a great deal of duplicate haulage and hoisting of material and therefore heavy expense, besides consuming so much time that completion of the entire work was seriously delayed.

In order to hasten the work and also effect large economies in the cost of construction, the city's engineers conceived the idea of carrying on concreting while mining was still going on, direct use being made of the stone brought from the heading without hoisting it to the surface. After careful study showed that this plan was feasible, special equipment for carrying it out was devised.

This equipment consists of a portable plant compactly designed to be moved along one side of the tunnel without obstructing the other track which is left free for haulage of rock, supplies, etc. The plant consists of two parts, the first a screening machine and the second the mixing outfit. The screening unit has an incline upon which the cars are drawn up by means of a hoist driven by a 10-horsepower slip-ring induction motor. On reaching the top, the cars are dumped into the hopper shown in Fig 7, which also shows the hoist and the forward upper part of this machine. The stone drops onto a steel screen which has in it holes 4 inches in diameter. All of the stone below this size passes through this screen and falls on a conveyor belt which brings it up to the hopper on top of the mixing outfit. This belt is driven by a three-horsepower induction motor at a speed of about 150 feet per minute. The stone which is larger than 4 inches drops to the lower portion of the screen and is there placed into empty cars to be hauled up the shaft. From this brief description it is evident that the stone is not crushed or sorted in an elaborate manner, since the mine-of-run material brought from the heading contains a considerable quantity of fine stone which has been found to serve very effectively in place of sand in mixing the concrete.

The mixed fine and coarse stone brought by the conveyor to the top of the mixing unit is fed into a hopper of definite size, mixed with one-fourth of cement and then by opening a gate or valve is dropped into the mixer body. This mixer is not one of the revolving type which ordinarily is used for concrete mixing, but may more properly be described as a sort of churning machine. It is operated by the compressed air which is piped to it from the 110-pound pressure line along the tunnel. The air is introduced on top of the charge and churns it about in the body of the mixer which has a number of deflecting vanes. By opening the discharge gate this air pressure then forces the mixed concrete through an eight-inch steel pipe which carries it to the steel forms. This process has been found to work with entire satisfaction. The air pressure is sufficient to move a charge of mixed concrete through this pipe a distance as much as 700 feet, although a considerable amount of air is required for the purpose. In order to prevent too great a drop in pressure when a charge of concrete is driven through the pipe there are two air reservoirs, each of 14 cubic feet capacity, mounted on the same framework adjoining the mixing unit.

The mixed concrete is brought by means of the pipe referred to directly back of the movable steel forms, which are 30 feet in length and arranged with wheels to rest on a track and so that they can be moved ahead after the concrete has set. The work of placing the concrete behind the forms is done entirely by the air pressure referred to and the only manual work connected with it is the directing of the stream from the discharge end of the pipe. Two independent steel forms are used in each drift. One of these starts 700 feet from the concrete screening and mixing machine and is advanced 30 feet each 24 hours. The other form is about 350 feet ahead of this and likewise is advanced each day. Concreting is carried on in two shifts at the same time that the mining is done. One steel form is lined during each shift. At the end of 12 working days a stretch of about 700 feet is completed and then this concreting plant is moved forward 700 feet, being then anchored in place and connected with the compressed-air system. As soon as another 700 feet is lined in two weeks the outfit is again moved forward. All of this work goes on without interrupting haulage of muck or surplus rock and supplies through the tunnel, the steel forms being arranged to permit passing a track through the middle. These forms are made of structural steel and plates and also permit carrying the compressed-air pipe, the ventilating pipe, water pipe and electrical supply wires through the form.

When the concreting began, there was just about enough rock left unmined in the tunnel to furnish the stone needed for all the concrete lining. In the western portion of the tunnel the mine-of-run rock brought from the heading is about one-half made up of lumps over four inches in size. Since it was necessary to use this rock, a gyratory crusher was installed close to the foot of the Lawndale Avenue shaft. This is belt driven by means of a 50-horsepower induction motor, the arrangement being as shown in Fig. 6. The lumps screened out at the concreting plant operating east of Lawndale Avenue are dumped into the crusher and the crushed stone fed directly into the concrete mixer that is lining the completely mined drift between the Mayfair and Lawndale shafts.

There are four concreting plants in service, one operating eastward from each shaft. Mining is going on in three drifts, from 20 to 22 feet being mined in each drift per day. This is several times as rapid progress as has ever been made in similar work before. While the mining is going on, about 60 feet is lined in each drift per day. On previous tunneling work of similar character only 30 to 35 feet was lined per day. This rapid progress on the Wilson Avenue tunnel will insure its completion fully a year before the estimated time. Its cost will also be materially lower than that estimated.

Wiring System in Tunnel.

As already referred to, the wiring in the tunnel is a four-wire three-phase system, using as a rule a No. 8 wire for the neutral wire and heavier phase wires depending on the load. Rubber-covered cable is used and mounted on insulating cleats supported on wooden blocks secured to the rough or finished walls. No trouble at all has arisen from this wiring, which has been found amply well insulated. Lamps are connected between the outer wires and neutral to balance the load between the phases. Voltage regulation for lighting has been found, on the whole, quite satisfactory.

Excavation and Foundation Work for Pumping Station.

Before work on the foundations for the new Mayfair pumping station could begin, it was necessary to dig the auxiliary tunnels connecting it with the present terminus of the Wilson Avenue tunnel. These tunnels form a loop connecting with the Mayfair shaft about 60 feet below street level. They were tunneled through clay. The northern portion of these tunnels, known as the suction tunnel, lies directly below the massive foundations of the pump room; it was therefore provided with steel lining

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plates within which are heavy circular steel reinforcements, the concrete lining being put in after these were all in place. There are also two concrete-lined screen shafts. All this auxiliary work has been completed.

Work on the foundations proper began last September and has been carried on uninterruptedly throughout since that time, something over one-half of this work being now finished. There will be seven steam-driven pumps, four of 25,000,000 gallons per day capacity and three of 15,000,000 gallons. All these pumps will set on the floor of the pump room which will be some 40 feet below street level. The total excavation therefore required involved digging a pit about 120 by 240 feet and at first about 20 feet deep, this corresponding to the boiler-room subbasement. At the edges of this the foundations for the outer walls, stack and coal-receiving room have been carried to a much greater depth and include a considerable number of caissons reaching hard pan. A large part of the outer foundation walls are already concreted. When these walls are brought up to ground level the prism or core now left below the pump room will be dug out to a depth of about 45 feet.

In order to carry on this excavation throughout the winter, work was done both day and night. Excavating was done by a steam shovel which dug directly down to the present general level of 18 or 20 feet below ground surface. By keeping continually at work and breaking up the ground from below no serious difficulty was met from frost. The excavated material was hauled away in wagons that were pushed up the incline by means of a 50-horsepower electric hoisting gear. At the end of the hoisting cable was connected a rugged car with a heavy protruding bar that was placed against the rear axle of the wagon. The hoist was started and pulled up the car, which pushed the wagon ahead of it. This rig worked very satisfactorily, as it eliminated delays due to hitching on and unhitching the cable.

A 90-horsepower electric hoist is also used for operating a steel derrick that hoists timbering, reinforcing rods, sheeting, concrete chutes, etc., about the work. Nothing but very small and light material is moved or lifted by hand. For lifting concrete to the top of the tower from which it is spouted to the various concreting forms there is used the 50-horsepower electric hoist that formerly was employed in the shaft.

One secret of the rapid and uninterrupted work done at the station site during the last eight months is the flood lighting provided for the night work by means of two "Sunlight" projectors, each with a 1,000-watt type C Mazda lamp. These are mounted on top of the adjoining machinery house for the shaft and are arranged so that their light can be projected to flood light any portion of the entire site. If night work is carried on in a restricted space the illumination can be made very intense over that area, having a lower intensity about it. The light can also be so spread as to flood a very large area to a quite uniform intensity. By means of these two lamps work has been carried on freely at any portion of the grounds.

Electric Load and Cost.

The electrical energy is purchased at each shaft on what is called a Class C power contract for supply of low-tension alternating current. Each shaft has a maximum-demand meter and a kilowatt-hour meter, the monthly bill including a demand charge and a consumption charge. Naturally, on this basis the best net rate per kilowatt-hour is obtained by maintaining as nearly constant a load as possible so as to keep down the maximum demand and raise the load-factor to as near 100 per cent. as possible. All of the work on the Wilson Avenue tunnel and Mayfair station has been planned to secure the highest load-factor practicable with the best and most economical construction methods.

At times the work has been unavoidably delayed at some of the shafts. At the shore shaft the load is greatest and most continuous. In recent months the maximum demand here has been about 545 kilowatts and the monthly consumption about 250,000 kilowatt-hours. The highest load-factors have run from 60 to 70 per cent. The average cost of energy for the short shaft has been a little over one cent per kilowatt-hour. At the other shafts it has averaged nearer to one and one-half cents because of the lower consumption and load-factor. Throughout the Wilson Avenue tunnel and Mayfair station work the average energy charge has been about 1.3 cents per kilowatt-hour.

The entire cost of the Wilson Avenue tunnel will be about $3,500,000 and of the Mayfair pumping station about $1,375,000. Both these figures are below the amounts originally estimated.

The entire work is being executed by the Bureau of Engineering, Department of Public Works, City of Chicago. John Ericson is city engineer and at the head of this bureau. Henry W. Clausen, engineer of water works construction, is in active charge of all the construction work. Joseph F. Chinlund is electrical engineer responsible for design and installation of electrical equipment. Data in this article were kindly furnished by these gentlemen.

Electric Energy Distribution of the Pacific Power & Light Company.

The Pacific Power & Light Company, operating in Oregon and Southern Washington, has compiled an interesting tabulation of sales statistics for the year 1915, indicating the distribution of electric energy in its territory for the different classes of service. This summary, as follows, shows that 37.8 per cent of sales was for commercial meter power, with electric power for irrigation, 21.7 per cent, and metered commercial lighting, 16.3 per cent, coming next in respective order. It will be noted, also, that the distribution losses, and transmission and transformer losses totaled 8.8 per cent and 16.7 per cent, respectively, of the total output.

Class of Service	KWH.	Per Cent of Sales	Per Cent of Total
Commercial lighting, metered	5,508,020	16.3	11.7
Commercial lighting, not metered	5,057,254	3.1	2.2
Commercial power, metered	12,782,903	37.8	27.1
Commercial power, not metered	3,927,760	11.6	8.3
Power for irrigation	7,326,420	21.7	15.5
Municipal street lighting, arc	1,563,345	4.6	3.3
Municipal street lighting, incand.	590,615	1.7	1.2
Street lighting, private	100,526	.3	.2
Other public service companies	984,248	2.9	2.1
Total sales	33,841,091	100.0	71.6
Used by gas department	123,864		.2
Used by water department	617,164		1.3
Used by railway department	451,105		1.0
Used elsewhere by company	96,000		.2
Total sales and use	35,129,224		74.3
Sold by power system	72,073		.2
Distribution losses	4,188,133		8.8
Feeder output	39,389,430		83.3
Transmission and transformer losses	7,908,789		16.7
Total plant output	47,298,219		100.0

Simple Method of Relieving Static Electricity in Printing Offices.

A simple and effective means of eliminating static electricity from paper being fed into a cylinder printing press has been devised by a pressman. To an old copper plate was attached one end of a copper wire, the other end being fastened to a steam pipe or radiator. The copper plate was laid between two dampened blotters and placed on the feed board beneath the papers being fed. This furnished a means of conducting the electricity to ground and relieved the "sticky" characteristic sometimes found in coated or calendered paper more particularly, causing much trouble in feeding the sheets.

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Lighting of a Modern Photographic Studio

Use of the White-Flame Arc Lamp for Portrait Photography and Description of a Typical Studio in Which It Is Used

By V. A. Clarke

IT IS said that every engineering problem is possible of more than one correct solution. This article is not written as the only true solution of the very live problem of studio lighting, but as a solution which is effective, though simple and inexpensive.

Modern photography has made lighting demands far beyond the possibilities of daylight to satisfy. Many of the portrait exposures have to be made in the late afternoon or evening when daylight is nearly or entirely absent, and

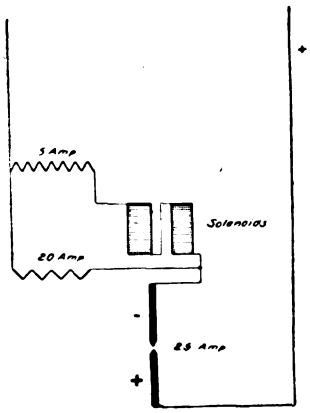

Fig. 1.—Circuit of Photographic White-Flame Arc Lamp.

even in midday the light is so variable as to preclude any certainty of duplication results. Hence, the illuminating engineer has been appealed to, with the result that every photographic exhibition shows better and better handling of this most important factor.

Artificial Illuminants.

The first artificial light to be used in the studio was the inclosed carbon arc lamp, at that time the foremost electrical unit for street lighting. Its disadvantages were many. Inefficient on a lumens-per-watt basis, it was even more so from a photographic standpoint. The inherent tendency of the arc to wander from side to side made the light far from uniform, and the predominance of blue and ultra-violet rays prevented a true rendering of color value, darkening the reds and intensifying the blues. Satisfactory portraits could not be obtained.

Within the last five or six years other artificial illuminants have largely superseded the inclosed arc. In the order of their importance these are the white-flame arc, the mercury-vapor lamp and the gas-filled tungsten bulb. All have merit and are useful in certain fields of photography. In this article no attempt will be made to enumerate the advantages and disadvantages of the two latter light sources. We will confine ourselves to a brief outline of the properties that make the white-flame lamp a desirable photographic unit and then describe its use in a modern portrait studio.

The White-Flame Lamp.

The factor of greatest importance to the portrait photographer is probably the quality of the light. We consider a print true in color when its lights and shadows correspond to the intensities of color of the subject as viewed by daylight. Hence, the nearer the photographic light approaches daylight in quality, the better will be the color of the finished print. Extended research with the spectroscope has shown that the white-flame arc gives an almost exact duplication of June sunlight through a blue sky. This also enables the photographer to correctly judge the proper length of exposure, accustomed as he is to daylight.

In order to render the readers the greatest possible service the writer has provided the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN with samples of the envelope described in this article, which will be mailed to those desiring to make a close investigation of this method or perhaps to have same reproduced for use in their business.

Equal in importance to the question of light quality is that of speed in portrait photography. To obtain a good likeness, the exposure should be made in approximately one-fifth of a second—one-half second is the limit. Facial expression is so sensitive to every passing thought that it is almost impossible for the average person to hold a natural, pleasing pose for more than one-half second. A longer exposure usually results in a blurring of the negative or else the face takes on a hard, forced look that is only too much in evidence in the finished picture. The flame arc, burning at 15 amperes or above, gives a greater

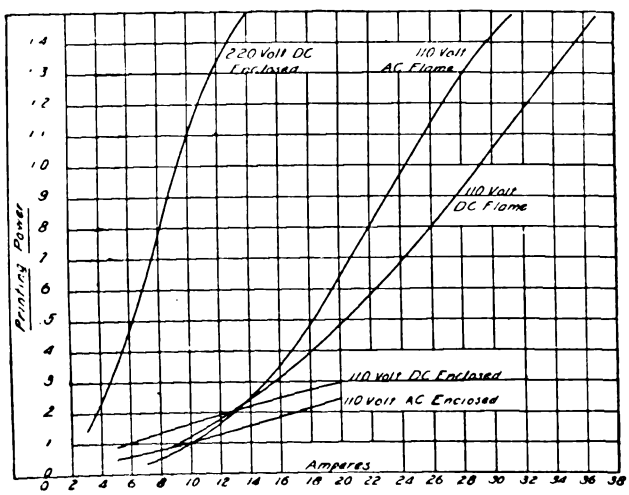

Fig. 2.—Comparative Printing Powers of Different Types of Arc Lamps.

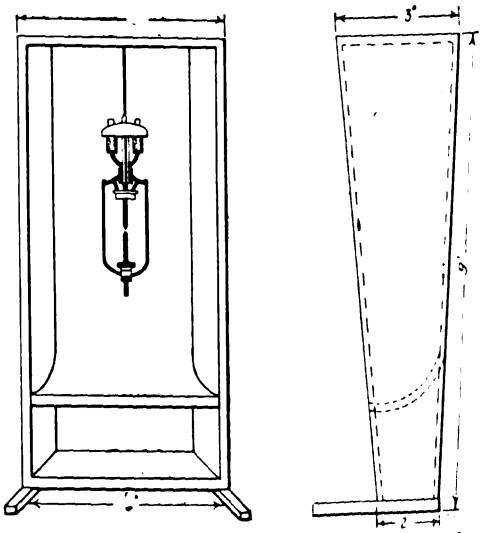

Fig. 3.—Two Views of Lamp Cabinet. Frequently the front and rear sides are parallel or even slope in the other direction.

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speed per watt of energy consumed with one exception, than any other artificial illuminant, and with it exposures of one-fifth second can always be obtained. This exception is the 220-volt direct-current inclosed arc, which has been shown to be even more efficient, though lacking in the color value necessary to good portraiture.

With the flame arc exact duplication of results can be obtained. The writer has proved by many experiments, corroborated by the experience of photographers who have used the light, that at a given current the same photographic light is always given out, and that the slight flickering has no detrimental effects on the negative.

The Butler Installation.

As far as the writer knows, the first photographer in this country to appreciate the possibilities of the white-flame arc and to install it in his studio was A. N. Butler, of Cleveland, O. His success with this form of lighting has been such that he has recently located his studio in the heart of the business district and it is this studio that we purpose to describe. The studio proper is without windows and the only direct illumination is given by his flame-arc lamp.

The lamp itself is the same one that he installed more than five years ago in his original studio. It is one of the old Adams-Bagnall inclosed types, converted to burn flame carbons. This conversion was explained in detail in the *Electrical World* of November 14, 1914, from which the sketch accompanying Fig. 1, is taken. The procedure is, briefly, to change the polarity, making the lower carbon

Fig. 4.—Specimen Portrait Made with White-Flame Arc Lamp.

positive, and then to connect a suitable shunt around the lamp mechanism so as to carry a greater current than the coils would stand. The solenoids, carrying their rated current, will take care of the arc feeding and regulation, and the additional power going into the arc through the shunt, will be transformed into a steady, powerful light of daylight color and high actinicity. Especially designed flame carbons are used and the lamp operates without any globe. A glance at the curve in Fig. 2 (taken from the article mentioned above) will immediately show the in-

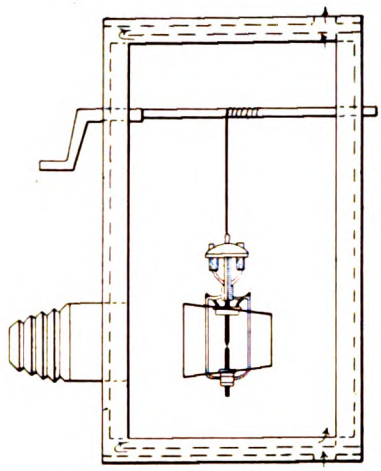

Fig. 5.—Diagram of Enlarging Cabinet. Light from Lamp Is Thrown Directly into Camera.

crease in photographic power obtained by this transformation. At 15 amperes, the printing power, or in other words the actinic effect of the light on the plate, is nearly twice as much as that of the alternating-current inclosed arc at 15 amperes, and about 15 per cent more than the direct-current inclosed arc at that current. These inclosed arcs, however, ordinarily burn at about 5 amperes, so that at 15 amperes the printing power of the alternating-current flame lamp is six times that of the inclosed arc at 5 amperes. A comparison of the direct-current lamps does not show so great an advantage at low currents. The following table will indicate this even more clearly:

Amperes.	5	10	15	20	25	30
Alternating-current flame arc	....	....	.30	.63	1.05	1.42
Direct-current flame arc	....	....	.28	.48	.75	1.05
Alternating-current inclosed arc	.05	.10	.16	.25	.....	.....
Direct-current inclosed arc	.09	.16	.24	.30	.....	.....

As was stated before, the 220-volt inclosed arc gives a peculiarly high amount of photographic light. It must be remembered, however, that the terminal wattage is double that of the other lamps at equal currents so that, on a basis of equal power consumed, it is little better than the flame lamps and suffers considerably when compared as to quality of light.

The flame lamp is hung in a large wooden cabinet, shown in Fig. 3. The inside is coated with reflecting paint, and a curtain of thin white muslin or cambric, chemically fireproofed, is stretched over the front. This curtain effectively diffuses the light and gives a broad region of strong uniform illumination falling in a slightly downward direction upon the subject to be photographed. By suitably arranging opaque and reflecting screens all the modern lighting effects are easily obtained by the skilled photographer.

The posing is done in the studio under consideration at approximately six feet from the cabinet. At this distance, with a f 3.8 portrait lens, a normal exposure requires about one-fifth second, with the lamp operating at 15 to 20 amperes. A group picture which requires a greater distance from the cabinet can be exposed at the same speed by simply increasing the lamp current to 25 or 30 amperes by means of a rheostat. Fig. 4 is a specimen of the portraits taken by this light.

Other Studio Uses.

In Fig. 5 is shown an enlarging cabinet used in this studio. A converted arc lamp is used, equipped with a reflector which throws a concentrated beam of light direct-

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ly into the back of an enlarging camera, and eliminates the necessity of a condenser lens. The cabinet is made of sheet metal and provision is allowed for air circulation as shown by the arrows.

The development of the photographic flame arc lamp has made rapid strides during the last year or two and there are now on the market at least six or eight different makes. Some of these lamps were shown for the first time at a recent photographic exhibition in the city of Cleveland. Their development has taken place along two lines: First, a stand lamp, evolved from the earlier photo-engraving lamps, used largely for spot illumination, and second, a hanging lamp, used for general illumination and in cabinets such as described. The feature of some of these new lamps is the use of a twin arc, i. e., two arcs in series. The natural arc voltage of the flame arc is in the neighborhood of 45; consequently, on a 110-volt circuit, 65 volts is lost in external resistance. With the two arcs in series, 90 of the 110 volts can be utilized as arc voltage, leaving only 20 volts to be consumed in resistance. Therefore, with the twin arc, 90 volts is used in delivered light against 45 volts for the single arc, while for either type of lamp 110 volts is paid for. The manufacturers of these lamps claim a light efficiency much higher than that obtained in the single-arc types of lamp.

In conclusion, the illuminating engineer is being called upon more and more to design the lighting for modern photographic studios, and this article is intended to give him a hint as to how it can be accomplished cheaply and efficiently. In the United States there are upwards of 60,000 portrait photographers, besides many exclusively commercial and motion-picture studios. The power they use for lighting is considerable and, being essentially off-peak load, is worth the consideration of central-station men in their attempt to fill up the "valleys" of the load curve.

Municipalities Negotiating for New Lighting Rates.—The Board of City Commissioners, Jersey City, N. J., has issued invitations to 138 cities in Hudson, Essex, Passac, Bergen and Union counties, asking officials to join its movement for a reduction in electric lighting rates now in force, such to be based according to the consumption in the different counties.

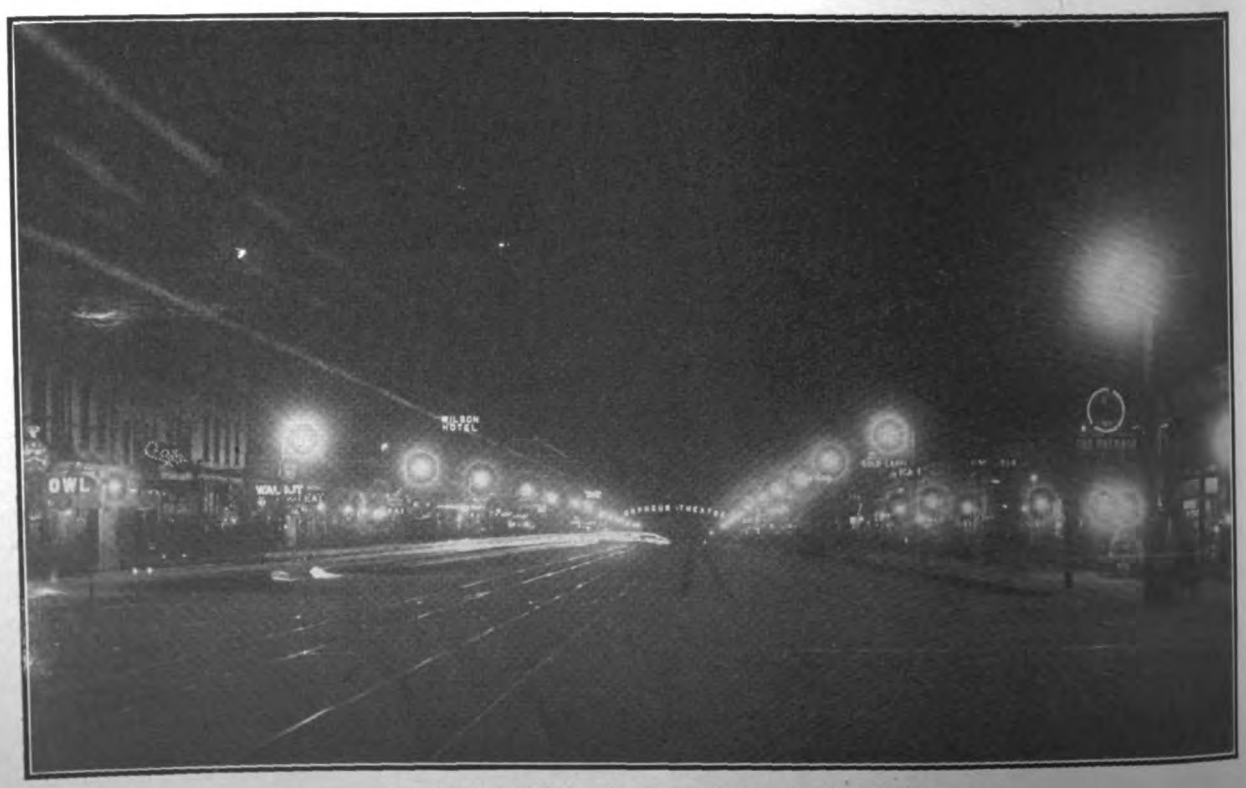
New Street-Lighting System for Salt Lake City.

Service has been established on lighting improvement district No. 1 in Salt Lake City. This is the first district to be lighted under the provision of the new law which was passed by the Legislature of 1915, which provided for the creation of lighting improvement districts and the installation of special lighting systems therein, the costs of which are to be assessed against the property owners according to the benefits derived.

This district embraces 16 city blocks and provides for the special lighting of approximately 2.5 miles of street. There are 218 four-ampere, pendent-type, luminous arc lamps covered by the contract for this service. This lighting improvement district comprises practically all of the commercial district of the city except Main Street, which is included in lighting district No. 2, which provides for a much more elaborate system. This latter system, however, is not expected to be completed for several months.

A four-ampere luminous arc lamp is supported by an ornamental bracket on each trolley pole on the street. The trolley poles are approximately 100 feet apart and the street between curb lines is approximately 100 feet in width so that a lamp is located at each corner of a 100-foot square throughout the entire course of the streets. This is equivalent to approximately 93 lamps or 30 kilowatts per mile of street lighted.

A law similar to the one under which this installation has been made appears to be by far the most satisfactory method of handling the special street-lighting problem. It overcomes most of the objections which have stood in the way of the success of most street-lighting schemes on a voluntary assessment basis. It enables the progressive property owners in the given business district to obtain a necessary public improvement in the same manner as they have secured sidewalks and gutter paving and similar public improvements in the past. It puts the burden of maintaining this improvement where it belongs, viz., on the property owner the value of whose property has increased by the improvement and who is able to obtain a greater return in the way of rent from tenants. It eliminates the troublesome feature of changing tenancy.



New Street-Lighting System at Salt Lake City, Utah.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

SPECTACULAR IRON CAMPAIGN IN DAYTON.

Special Bargain Sale Results in 1,175 Iron Sales in Course of Eight Days.

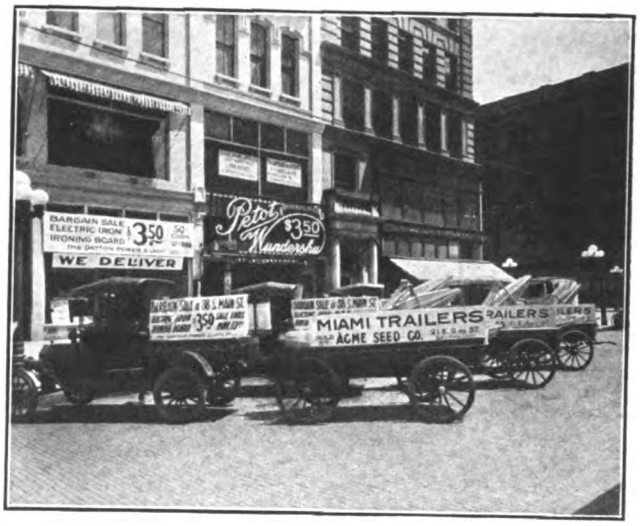
The six-day electric iron sale, conducted in August, 1915, by the Dayton Power & Light Company, resulted in 550 electric irons being sold in Dayton, Ohio. A similar sale was held from May 5 to 13 inclusive this year, which resulted in 791 electric irons being sold in Dayton (population 130,000), 149 in Piqua (population 15,000), 127 in Wilmington (population 5,000), and 108 in Xenia (population 10,000) making a total of 1,175 in the four cities in the eight days.

In 1910 the Dayton Power & Light Company discontinued the sale both of lamps and of other energy-consuming appliances. The local dealers were advised that in their interest the company would withdraw from the actual merchandising but would continue in its efforts to increase the popularity of electric household devices through the medium of advertising and direct co-operation with the retailers themselves. This co-operation has taken the form of newspaper publicity and the dissemination of advertising matter with the bills service, etc. The company's display windows have been given over to the use of the different dealers, a week at a time, to enable them to take advantage of the favorable location of the company's office and the circulation power of the big windows. At other times actual sales of apparatus have been conducted by the light and power company, and a commission of 50 cents has been paid to the dealers on every designated device sold during the period. The plan has worked well, and the increase in the use of these off-peak appliances has been satisfactory.

One of the Newspaper Advertisements Used During Campaign.

Only on the two occasions above mentioned has the company deviated from this co-operative policy.

The campaign in Dayton in 1915 featured a special demonstration and sale of a full line of heating appliances with an experienced lady demonstrator in charge of a temporary electric shop, located on one of the main business streets of Dayton. This year's campaign, however, was an "out-and-out" bargain sale proposition and was conducted in Piqua, Xenia and Wilmington the same time as in Dayton.



Automobiles with Borrowed Trailers Delivering Irons Sold During Campaign.

Before commencing the sale in Dayton the company discussed the matter with the leading electrical dealers and received their consent to carry out its plans.

One thousand electric irons were purchased from the Westinghouse Electric & Manufacturing Company early in February and plans made for the sale to commence Friday, May 5, and to continue until Saturday evening, May 13. Saturday was by far the best day in August, 1915, and therefore the dates this year were arranged so as to provide two Saturdays.

Realizing from past experience that the American housewife "dearly loves" a bargain, 1,000 No. 3 folding ironing boards were purchased, and one board was given with each iron. The two articles were sold for $3.50, the regular retail selling price of the iron, either for cash, or 50 cents with the order and $1.00 on the first day of June, July and August.

A four-page folder, featuring the proposition as a special bargain, was printed and distributed a few days previous and during the sale to all the residential customers of the company, and in addition in Dayton considerable space was used in each of the daily papers every day of the sale. Liberal use was also made of the newspapers in Piqua, Xenia and Wilmington and in the latter two cities slides were used in the motion-picture theaters.

In Piqua, Xenia and Wilmington the irons were sold at the office of the company and by means of calls on all

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residential customers. In Dayton, however, all the irons were sold at the company's main office or at the temporary store opened on Main Street, about half a block from the center of the city.

The temporary store was tastefully decorated with palms, etc.; no other appliances or articles were shown, however,

Temporary Store of Dayton Company Where Irons Were Displayed—"Blue Beauty" Standing in Door Way.

but the electric iron and ironing board. Two colored maids were busy at all times ironing in the window. The temporary store was kept open from 8 a. m. until 6 p. m. each day, except on the two Saturdays, when the store was open until 9 p. m.

Considerable attention was attracted to the store on the opening day by co-operating with one of the ready-made clothing stores, and "Blue Beauty" driving up in her automobile and having faked motion pictures taken of her walking toward the store—being attracted by the colored maid ironing in window—becoming interested—going in store—having iron and ironing board demonstrated to her in window—her purchase of iron and ironing board, and leaving the store with the electric iron. "Blue Beauty" was an attractive girl dressed in men's clothes—advertising navy blue suits. Some idea can be formed of the crowd that watched the free show and went home that night at six and told of seeing "Blue Beauty buy one of those electric irons and ironing boards, the Dayton Power & Light Company were selling on Main Street," by the accompanying illustration.

A record of the daily sales in each city is as follows:

	Dayton	Piqua	Wilmington	Xenia
May 5	72	25	22	10
May 6	99	11	21	7
May 8	58	14	14	14
May 9	72	32	12	6
May 10	91	16	12	16
May 11	93	16	5	10
May 12	98	8	10	13
May 13	208	27	31	32
	791	149	127	108

Special attention was given to prompt deliveries. Electric irons and ironing boards sold in morning were delivered in afternoon, and those sold in afternoon, the following morning. A fleet of Fords and "borrowed" trailers was used in Dayton.

When the appliances were delivered, competent young men explained how to connect up and use the iron, took voltage tests to ascertain the voltage being delivered to customer's premises, so that changes could be made at once, if necessary, and then placed fuses of proper size, if required, on the iron circuit.

The company believes that the sale was successful because of the publicity it received, the premium, the easy payments and the prompt deliveries.

ADVERTISING ELECTRIC COOKING IN MINNEAPOLIS.

Effective Sign Viewed by 20,000 People Daily Cost But $10.

One of the ways in which the Minneapolis (Minn.) General Electric Company is advertising electric cooking is by means of the sign shown in the accompanying illustration, and it might be added that the publicity received from this display is largely responsible for the success being enjoyed by the company in popularizing the use of electricity for cooking.

The Minneapolis company is at present engaged in building an extensive addition to its general office building and when the construction company erected its office, which occupies the entire width of the sidewalk, immediately adjoining the electric company's building, H. E. Young, sales-manager of the Minneapolis General Electric Company, conceived the idea of utilizing the outside wall space for advertising electric cooking.

Referring to this sign, Mr. Young states, "I really believe that a conservative estimate of the number of people that pass by this billboard, which automatically makes them step from the sidewalk into the street, is in the neighborhood of 20,000 people per day, and there is no doubt in my mind that it would be practically impossible to buy the publicity we are receiving from this billboard. And, in addition to this, the billboard is so large that it is practically impossible for anybody to pass by this display without having their attention attracted, and although of course we are unable to trace any direct results through this medium, there is no doubt that it is one of the most important links in the chain by means of which we have been able to sell up to almost a hundred ranges."

Sign on Construction Office Which Is Viewed Daily by 20,000 People.

The total cost of the display was only $10.

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One Year of House Wiring in Topeka

Topeka Edison Company Conducts Comprehensive Campaign for 12 Months, Resulting in the Wiring of Over 2000 Homes —Details of Campaign With Data on Cost to Company

THE house-wiring campaign conducted by the Topeka (Kan.) Edison Company, has just registered one year of continued success. Two-month and three-month campaigns are many and successful but the one year continuous successes are far less in number. The Topeka campaign was started April 5, 1915, and continued with unabating success for one year and is still in progress, the data accompanying this article being from April 5, 1915, to April 4, 1916.

Topeka is a city of 45,000 population, having natural gas, at 28 cents per 1,000 cubic feet and electricity at 7 cents per kilowatt-hour.

It has been served with electric service for about 30 years.

The campaign was in sole charge of Robert B. Basham of the Illinois Traction Company. Four solicitors constituted the field force known as, "The Flying Squadron."

R. B. Basham, Who Conducted the Record-Breaking House-Wiring Campaign for the Topeka Edison Company. Mr. Basham is General Contract Agent for the Company.

The Topeka Edison Company did no interior wiring but took the contracts and sublet to the contractors, a schedule having been arrived at, at which electrical contractors accept orders from the central station.

Six monthly payments were the standard terms, although on contracts of $75 or over, longer time was allowed if asked for by the prospect. Ninety per cent were within the six-month terms.

Credit was carefully watched, no contracts being passed where payment looked doubtful and this is thoroughly evidenced by the fact that out of approximately 1,600 accounts, not 16 are dead ones.

The salesmen of Basham's "Flying Squadron" work on a self-sustaining salary and commission basis. The central-station salesman secures the order at a figure higher than the schedule to the contractor. The salesman shares in this margin, thus giving him an incentive to secure fair prices for contracts taken, the salesman's commissions being 30 per cent of the profit. No commission if no margin.

The publicity part of the campaign consisted of a full-page ad to start out, then gradually dropping down to about 12 inches for two week days in one paper and 24 inches on Sunday in the other, there being two good daily papers in Topeka. This advertising was continued throughout the entire year.

Direct-by-mail letters were used effectively at various intervals. Especially is this true of that part of the campaign directed to reach the owner of rental property. The landlord is the hardest one to convince but once in line, he is a good booster. The landlord campaign was a grand success and an outline of same is given herewith. It has been the experience of the Topeka company that correspondence should bear on local conditions if possible. This is noticeable in the landlord letters. The following was the publicity used to interest this class of prospects.

Bulletin on street car, "Keep That Tenant. Wire His Home For Electric Service."

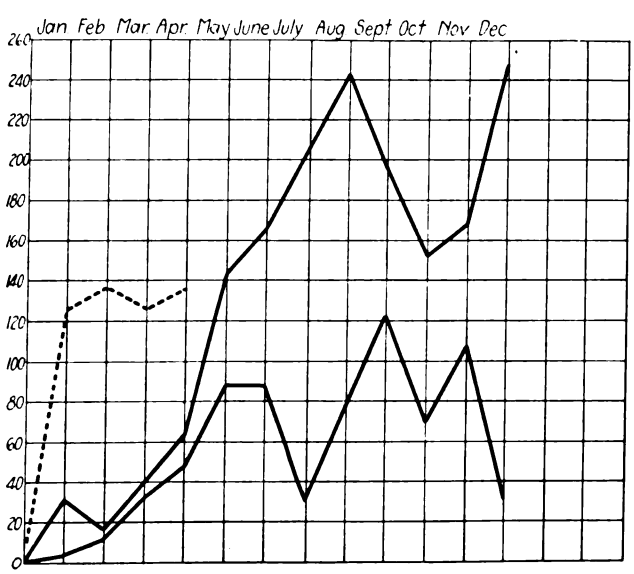
Card in street car, "Ask The Good Landlord To Give You Electric Service On The Wire-Your-Home Plan."

Two letters on wiring homes for renters.

Advertising in newspapers, "Electrified Homes For Rent."

A typical letter to owners reads as follows:

"A wire in time saves tenants. Do you use electricity in your home? Do you not think your tenants would appreciate the many electrical conveniences obtained through electric service if the house were wired just as much as you appreciate them yourself? Electric service, through the reduction in rate and the increased efficiency in lamps, together with the increased life of wall decorations and draperies, has proven to the real-estate man and the home owner that it is the most economical form of illumination for both the owner and renter. Anyone building a new house for rent, wires it for electric light. Why? For the simple reason it costs less to keep it in rentable condition. The wall and ceiling decorations will last from one to two seasons longer where electric service is used instead of flame lighting. No dirty black spots on the ceiling with electric service. If this applies to a new house, it also applies to one built for years.



Gain in Customers of Topeka Company.

"Is the house equipped for electric lights?" is one of the first questions asked by prospective renters and it is only a matter of a very short period when every rentable house in the city of Topeka will be wired for electric service or will be vacant.

"We are continuing our special house-wiring campaign for another thirty days. Why not let us make you an estimate on wiring your property and making it modern in this respect. You will save money—keep your tenant—and please everybody by doing it now. Estimates made free. You are under no obligations to us by asking for an estimate. Phone 4080 and ask for the Contract

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NET GAIN IN METERS PER MONTH—1915-16

April 5 to April 19	45
April 20 to May 19	143
May 20 to June 19	166
June 20 to July 19	216
July 20 to Aug. 19	246
Aug. 20 to Sept. 19	195
Sept. 20 to Oct. 19	152
Oct. 20 to Nov. 19	166
Nov. 20 to Dec. 19	252
Dec. 20 to Jan. 19	125
Jan. 20 to Feb. 19	137
Feb. 20 to Mar. 19	125
Mar. 20 to April 4	65
Total net gain one year	2,033
Number of customers, April 4, 1916	7,171
Number of customers, April 5, 1915	5,138
Net gain for year ending April 4, 1916	2,033
Percentage net gain for year	39.5%

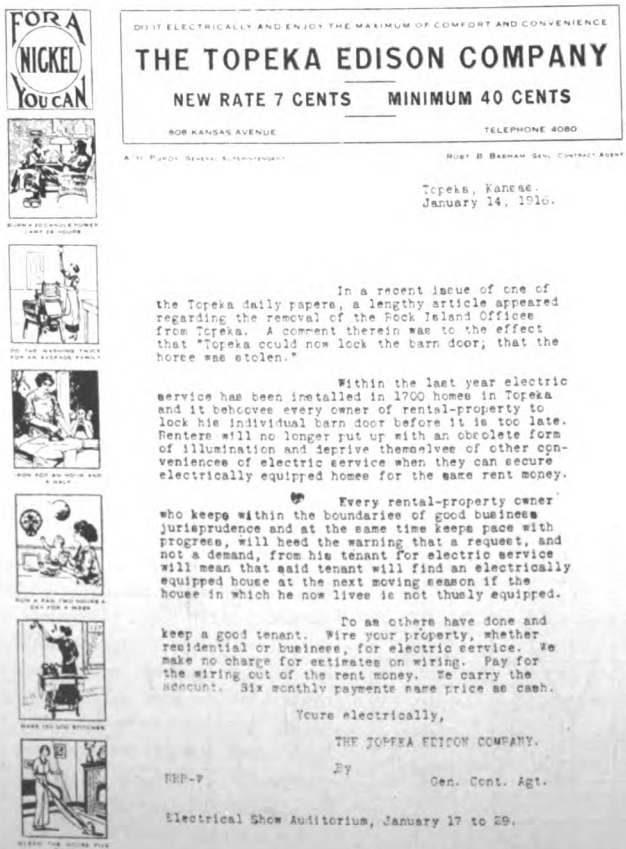
HOUSE-WIRING RECORD.

Total number of old house wiring contracts	1,512
Total number orders, poor credit and cancelled	177
Total number old house wiring jobs completed or awaiting completion	1,335
Amount business contracted—old house wiring contracts	$51,165.49
Amount business cancelled or poor credit	5,578.65
Net amount of business contracted	$45,586.84
Deducted for lamps and wiring costs	39,128.59
Gross margin	$ 6,368.25
Salaries of solicitors and stenographer for department	$ 4,151.34
Commissions, solicitors'	1,404.35
Total	$ 5,555.69
Net Margin	$ 812.56

Department. Get that estimate right now—Phone 4080. Yours for brighter homes."

Illuminated bill-board advertising was used to the extent of two 25-sheet boards in prominent locations.

The foregoing gives an outline of how the campaign was conducted. The accompanying tables give a complete summary of the results which were accomplished during the year.


FOR A NICKEL YOU CAN

DO IT ELECTRICALLY AND ENJOY THE MAXIMUM OF COMFORT AND CONVENIENCE

THE TOPEKA EDISON COMPANY

NEW RATE 7 CENTS MINIMUM 40 CENTS

808 KANSAS AVENUE TELEPHONE 4080

A. H. PURDY, GENERAL SUPERINTENDENT ROBT. B. BARNAM, GEN. CONTRACT AGENT

Topeka, Kansas.
January 14, 1916.

In a recent issue of one of the Topeka daily papers, a lengthy article appeared regarding the removal of the Rock Island Offices from Topeka. A comment therein was to the effect that "Topeka could now lock the barn door; that the horse was stolen."

Within the last year electric service has been installed in 1700 homes in Topeka and it behooves every owner of rental-property to lock his individual barn door before it is too late. Renters will no longer put up with an obsolete form of illumination and deprive themselves of other conveniences of electric service when they can secure electrically equipped homes for the same rent money.

Every rental-property owner who keeps within the boundaries of good business jurisprudence and at the same time keeps pace with progress, will heed the warning that a request, and not a demand, from his tenant for electric service will mean that said tenant will find an electrically equipped house at the next moving season if the house in which he now lives is not thusly equipped.

To as others have done and keep a good tenant. Wire your property, whether residential or business, for electric service. We make no charge for estimates on wiring. Pay for the wiring out of the rent money. We carry the account. Six monthly payments same price as cash.

Yours electrically,

THE TOPEKA EDISON COMPANY.

By

RBP-F Gen. Cont. Agt.

Electrical Show Auditorium, January 17 to 29.

Letter to House Owners.

RESULTS OF HOUSE-WIRING CAMPAIGN IN 17 CITIES.

1856 Houses Wired at Byllesby Properties During "Wire Your Home Month."

Seventeen Byllesby electric properties conducted a campaign for the wiring of already-built houses during the period March 15 to April 15, tying in with the national

Typical Street-Car Card Used in Campaign at Topeka.

campaign promoted by the Society for Electrical Development. The 17 companies secured contracts for wiring 1,856 already-built houses. In addition, and as a result of the campaign, there were placed on the companies' lines nearly 900 household electric devices such as flat irons, table stoves, percolators, etc. The cities in which the Byllesby properties co-operated with the dealers in this wiring effort together with the number of contracts secured in each are as follows:

Louisville	701	Enid	35
Minneapolis	595	Faribault	29
Ottumwa	103	Mobile	22
Stockton	102	El Reno	22
Sioux Falls	59	Northfield	13
San Diego	58	Dallas	10
Oklahoma City	46	Sapulpa	9
Grand Forks	45	Albany	4
		Fort Smith	3

The wiring contracts and appliances sold represent an expenditure on the part of the public of $87,184, this being the total amount of money received by the various electrical interests engaged in the campaign.

The campaigns conducted, except at Minneapolis, were based upon time payments offered by the wiring contractors. In some cases reduced prices were made for the one-month period, and in others appliances were given away as premiums. Inquiries were secured entirely through advertising, principally newspaper space. Most of the properties, in addition to securing the contracts enumerated,

Electrified Houses for RENT

Location	No. Rooms	Description	Price	Agents' Phone No.
120 Harrison	8	Electric Lights, Modern	$27.00	3413
1104 W. 11th	6	Elec. Lights, Modern, No Furnace	$14.00	1470
1211 W. 5th	6	Will Wire, Modern		5134 Red
1109 E. 8th	6	Elec. Lights, Modern, No Furnace	$14.00	2083
433 E. 11th	6	Electric Lights, Modern		474
426 Madison	5	Will Wire, Modern	$22.00	2391 Black
1st and Taylor	7	Electric Lights, Modern	$20.00	2428 White
1601 Topeka Ave	7	Elec. Lights, Modern, No Furnace		2818 Black
1425 Buchanan	8	Electric Lights, Modern, Sleeping Porch, Garage	$20.00	2221 Red-Sheller
1251 City	7	Electric Lights, Modern	$18.00	1546-Day
616 W. 17th	5	Electric Lights, Modern	$20.00	441
1106 Madison	5	Electric Lights, Modern, Furnace	$32.00	474
310 W. 6th	7	Electric Lights, Modern	$35.00	4296 Blue
1704 Harrison	6	Electric Lights, Modern	$13.00	3653
1300 Western	5	Electric Lights	$10.00	3862
324 Willow	6	Electric Lights, Modern		1362 Red
415 W. 7th	8	Electric Lights, Comb. a Furnace, Modern	$10.00	799
				1929

THE TOPEKA EDISON CO.

808 Kansas Avenue Telephone 4080

Sample Newspaper Advertisement.

secured valuable lists of prospects for future use, many of which will be closed during the present summer.

The campaign at Faribault is interesting in that it produced ten times as many contracts as a similar effort last fall, although it is usually conceded that fall house-wiring efforts are more successful than those conducted in the spring. The Faribault campaign last fall produced but three contracts.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

THREE REMARKABLE EMERGENCY SERVICE CONNECTIONS.

Availability of Central-Station Power Demonstrated by Sheboygan Railway & Electric Company.

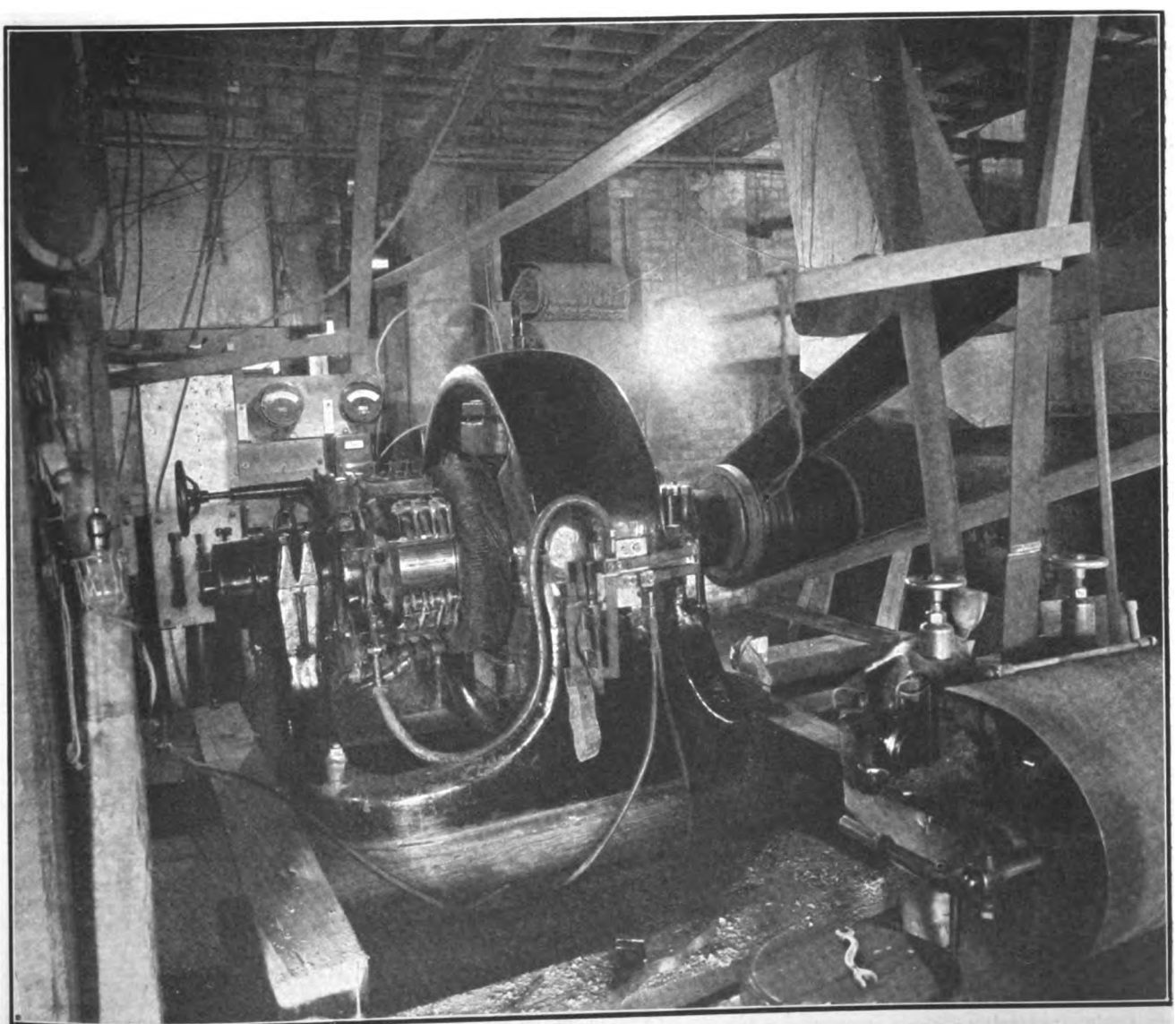
By Carroll H. Shaw.

One of the chief factors in the development of the central station has been its ability to adapt its service to every demand that is made upon it, and so steadily has progress in this adaptation been made, that it now requires some extraordinary undertaking to call the attention of its patrons to its possibilities.

One of the very usual calls upon the electric utility, especially in communities of from 10,000 to 40,000 population, is the prompt delivery and installation of small electric motors. Many companies find it profitable to maintain a stock of motors of various capacities with which to supply any emergency demands for electric power, and very frequently the calls for emergency service are from large manufacturing plants in which the isolated plant has been put out of commission by the failure of a boiler, engine or other piece of equipment that is required for the production and distribution of power.

The Sheboygan (Wis.) Railway & Electric Company has received during the past six months requests from three of the largest furniture factories in that city for temporary service. One plant was shut down for several days by the blowing out of the cylinder head of the engine. Inquiry was immediately made to the electric company as to the possibility of installing a 100-horsepower motor to operate the plant until the engine could be repaired, but upon learning that several days would be required to deliver and install so large a unit the matter was dropped.

The second call came from a large chair manufacturing plant, a portion of which had been operated by a rope



A 300-Horsepower Motor Installed in a Disabled Factory in 5.5 Hours by Sheboygan Electric Company.

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drive extending outdoors between the two separate buildings. The load was estimated to be approximately 25 horsepower. The call was made on Saturday noon and on Sunday night a 35-horsepower motor was in place ready to operate the following morning. Its installation had required bringing the motor 20 miles on the company service car, the installation of the proper transformers, service lines, meter and all interior wiring. The success of this installation and the acknowledgment by the manufacturer of the improvement of the power in that portion of the plant, may lead to the complete motorization of the factory.

The third request, however, was so very unusual that the factory representative afterward admitted he had only made inquiry as a matter of trying "everything and anything." On Saturday night the fireman of a factory employing 600 men and running a 250-horsepower engine forgot to close the blow-off valve of his boiler and as a result he soon had nothing but a furnace full of melted tubes and warped boiler plant. At 3:00 o'clock on Sunday afternoon the electric company was asked if it could furnish sufficient power to run the factory for the following week.

It so happened that during the summer a new railway motor-generator set was installed at the power station and that a smaller 200-kilowatt, motor-generator set had been placed in storage during the winter, awaiting suitable weather to move it to one of the company's substations. The motor was rated at 300 horsepower, 2,200 volts, two-phase, four wire, but was a synchronous machine without starting equipment. It was direct-connected through a flexible coupling to a 200-kilowatt, 600-volt, direct-current generator running at 600 revolutions per minute, which had been operated as a motor in putting the set on the line.

It immediately became apparent that the installation of the alternator with a motor-generator exciter set and a suitable starting motor, was out of the question. The possibility of using the direct-current machine, which was already equipped with starting apparatus, was realized, however, and after a conference with the factory officials the electric company agreed to move, install and connect-up the generator as a motor and have it in operation on Tuesday morning.

The machine weighed approximately eight tons, but with the aid of a very efficient house mover, the machine was transported more than a mile and was running at 10:30 Monday evening. Local wiring contractors installed the necessary interior connections, while the construction crew of the company ran two 2/0 and two 1/0 feeders and return from the railway feeder line to the factory, a distance of about 600 feet. One of the other furniture factories placed two of their men at the task of making a wooden pulley with a 5.62-inch bore, 22-inch diameter and having a 25-inch face. This work was completed in 5.5 hours working time and was an excellent piece of work.

The entire equipment was ready for operation at 11:30 Monday night, except that the splice in the 22-inch endless belt was not dry. At 6:00 a. m. Tuesday morning, the motor was started and operated with entire satisfaction for 11 days, while the boiler was being rebuilt.

In the operation of the machine, it was necessary to use a water barrel as a starting switch since the original starting equipment was for no-load conditions, and when all the friction load was on the motor additional starting capacity was required. After the barrel was thrown all in, the starting switch was operated in parallel with it, before closing the circuit with a knife switch.

The accompanying illustration shows the manner in which the motor was installed. In the background can be seen the pedestal-type switches that were used at the power station as well as the volt and ammeter.

SOLVING THE HEATING PROBLEM AND SECURING THE POWER BUSINESS.[1]

By A. C. Shepherd.

Probably the one problem discussed more than any other upon the central-station power salesman's first visit to an isolated-plant owner to secure the power business, is that of the heating with exhaust steam. In some cases he not only believes the heating of his factory or building costs

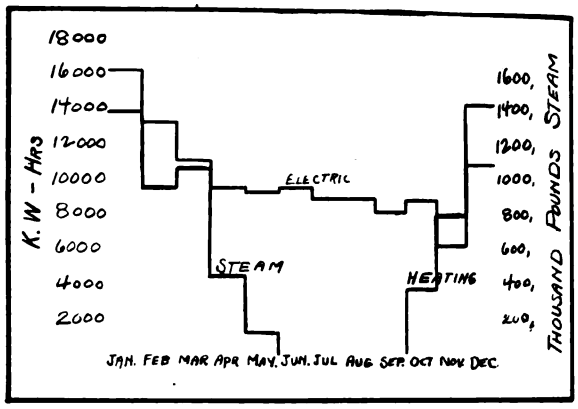

Fig. 1.—Steam and Electric Consumption of Knitting Mill.

nothing, but thinks, or has been led to believe that the power generated by steam equipment is a "by-product" and heating of factory the real cost of production.

It is this idea of the prospective customer that I desire to dwell upon, and by means of a set of curves solve the heating problem by showing that only a small part of the exhaust steam available is used, and what expense for the year could be charged to the use of exhaust steam for heating.

In Fig. 1 are plotted curves showing the purchased electric and steam consumption, month by month, over a period of one year, for a large knitting mill.

In Fig. 2 is plotted the average mean temperature per

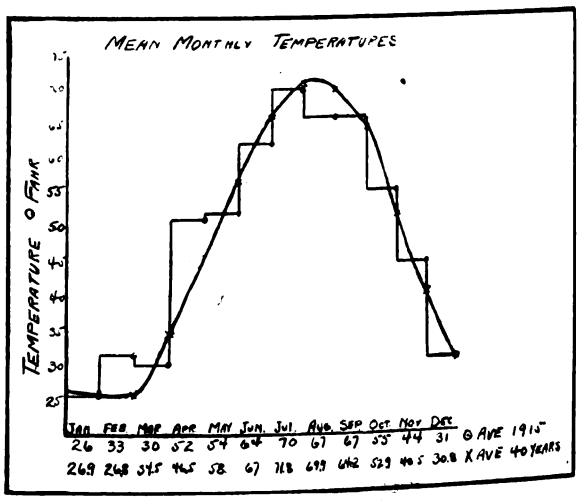

Fig. 2.—Average Mean Temperature.

month for the year 1915, and the average for 40 years, showing little variation from one year to another.

In Fig. 3 are shown the steam requirements for an assumed plant operating 55 hours per week, and heating requirements over the same period. The temperatures used were the average over 24 hours for each day during the week of October 18, 1915, which was a typical mild winter month.

The total hours of heating during the week are 24 times

1 A paper presented at the convention of Committee on New Business Co-operation of the Ohio Electric Light Association, at Springfield, O., recently.

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7, or 168, while the hours of plant operation are 55, or 32.8 per cent of the total time in which heat was required. While I have used 24 hours heating per day, the losses are not so great as when steam is entirely shut off at night.

Assuming an average power load of 100 kilowatts 55 hours per week and 50 pounds of steam per kilowatt-hour,

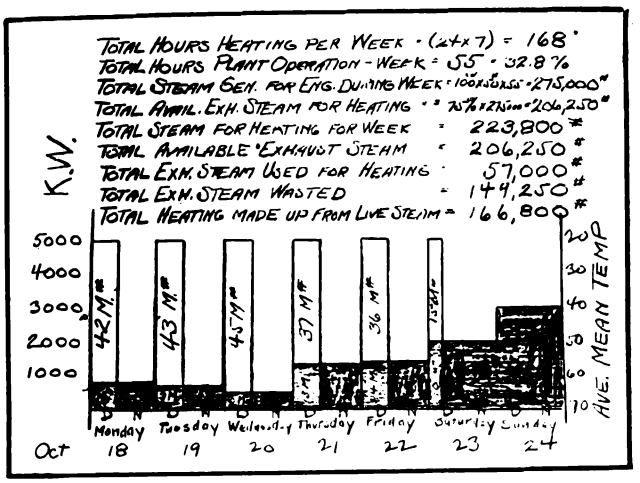

Fig. 3.—Steam Requirements of An Assumed Plant.

the total steam generated for the engine per week would be 275,000 pounds.

Although the 50 pounds per kilowatt-hour would be high for a well designed plant, it is a conservative figure for the average existing isolated plant of 100 kilowatts average load.

Of this 275,000 pounds of steam only about 206,250 pounds would be available for use as exhaust for heating, due to losses.

Out of 24 hours each day for the first five days during the week, assume an engine operated 10 hours and supplied more steam than would be needed for heating, while during the remaining 14 hours live steam would have to be used. On Saturdays when the plant operated only five hours, live steam would have to be supplied the remaining 19 hours and for 24 hours on Sunday.

Of the 206,250 pounds of available exhaust, only 57,000

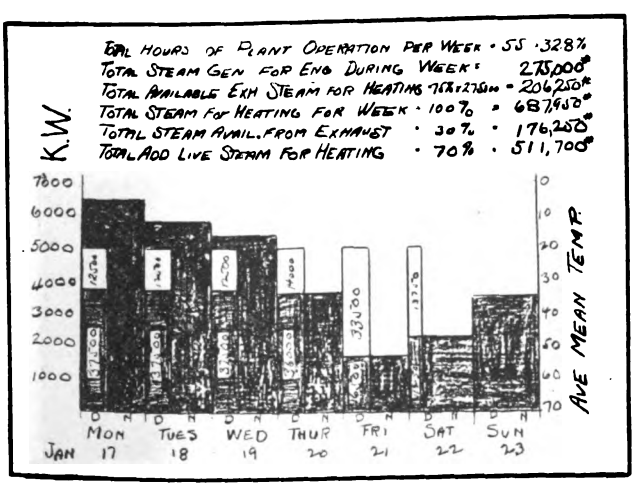

Fig. 4.—Conditions During Week of Severe Weather.

pounds would be used during the time engine was running.

Of the 223,800 pounds required for heating during the week, 57,000 is exhaust and 166,800 pounds live steam.

Fig. 4 shows the condition existing during the week of January 17, 1916, which was one of the coldest weeks of the winter During this week 687,950 pounds of steam was required for heating. On account of temperature conditions 176,250 pounds of exhaust would be used of the 206,250 pounds available. The amount of live steam to be generated for heating during the week would be the difference between 687,950 and 176,250, or 511,700, or about 75 per cent of the total required.

Fig. 5 shows the divergence of steam heating and electric load for a large office building.

The steam required for heating certain class of buildings in Cleveland is shown in the following tabulations:

	No. of Buildings	Avg. Lbs. per Cu. Ft. per Season	Avg. Lbs. per Sq. Ft. per Season
Store and office buildings	10	8.4	645
Light Manufacturing Buildings	2	3.9	485
Department stores (large)	10	3.2	400

FACTORIES:

Average pounds steam per cu. ft. per season—Direct Radiation = 6 pounds.

Average pounds steam per cu. ft. per season—Indirect Radiation = 11 pounds.

Another method of roughly estimating the amount of steam required for heating is to subtract the coal used by the isolated plant in the six summer months from the coal used in six winter months multiplied by two and the estimated evaporation factor of the plant.

This check, of course, would apply only where the greater proportion of the coal is used to provide power and the exhaust steam is used during day for heating.

The factor two is used on the assumption that the night heating, when engine is not operating, is approximately equal to the day heating.

We believe that from the data outlined above and on the charts, there is shown a method of determining the relation existing between exhaust steam and the total steam requirements of the power plant.

Also, that unless all of the exhaust steam can be used every day in the year, regardless of power-load conditions or temperature conditions, that an anlysis of the amount of exhaust steam actually used in the heating system will show the value of exhaust steam as a heating product to be overestimated in the average isolated plant.

There may be a little difference between the cost of coal for operating a high-pressure as against a low-pressure boiler, but the increased insurance, depreciation, upkeep, liability, danger of operation of all apparatus operating in connection with a high-pressure boiler plant and engine is a constant worry and trouble to the superintendent and manager of a plant.

Any live-steam requirements which could not be elimi-

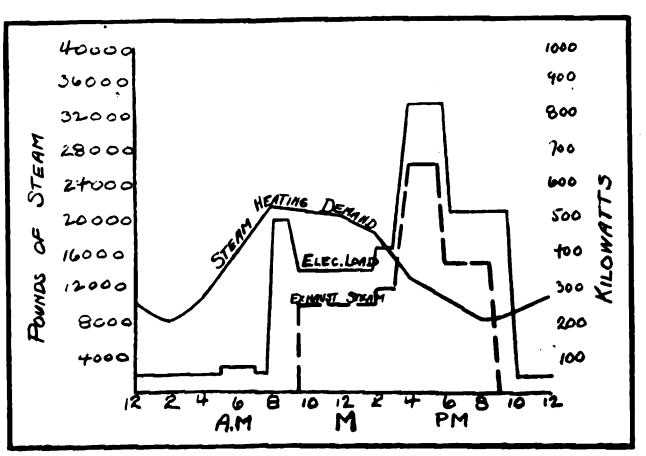

Fig. 5.—Curves of Steam Heating and Electric Loads in Office Building.

nated are often taken care of by small gas-fired upright boiler installed near the apparatus requiring live steam, namely, hot-water heaters, plating vats, cooking, etc.

The problem of heating a factory or office building with low-pressure steam is one similar to that of heating a large apartment house and can be operated at a low labor cost and without much incident worries or troubles.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

ELECTRICAL CONSTRUCTION AND EQUIPMENT OF A MODERN GARAGE.

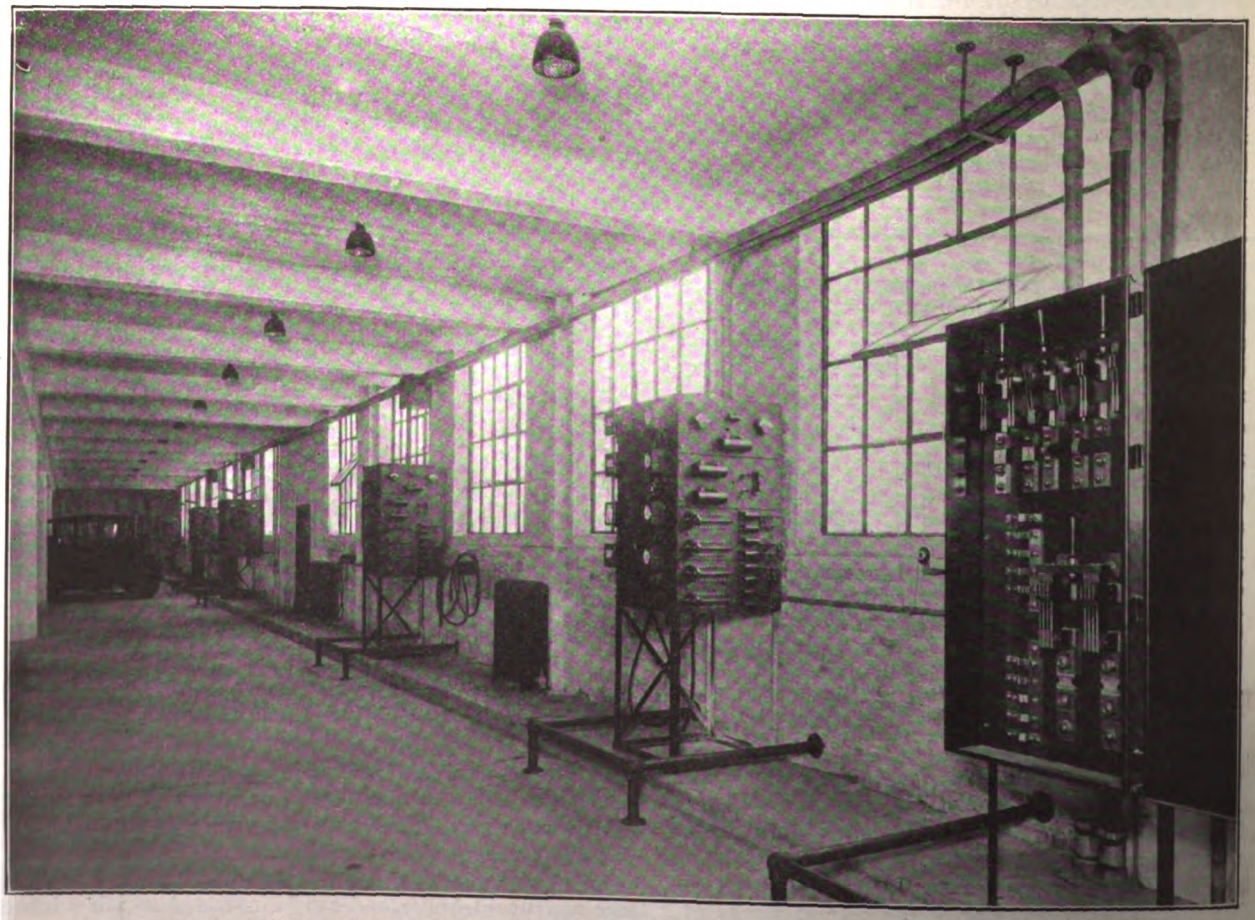
Construction Features in Connection with Providing Facilities for Charging, Lighting and Power.

The great number of electric vehicles at the present time and the assurance that future increases in their number will even be at a great rate makes anticipation of the facilities needed to properly care for such vehicles a question in which a great amount of planning and discrimination is necessary. Based on the present outlook, garage service in the future will need amplification and many firms are now taking advantage of the opportunity for preparing to furnish additional service. The proper selection of garage sites, convenient to present and prospective customers, should be augmented by facilities for giving the very best service, which necessitates the installation of the most modern equipment.

The Rienzi Garage, 554 Diversey Parkway, Chicago, Ill., erected during the early part of 1916 and recently placed in service, is a garage designed primarily for service, with modern facilities for the storage and care of electric vehicles. It occupies a two-story fireproof building, 60 by 186 feet, of reinforced-concrete beam-and-slab construction. Arrangements were made in the building plans for an addition of two more floors when the increase in the demand for electric garage service taxes the present capacity.

On the first floor there are ample accommodations for the storage of 80 gasoline cars, and modern facilities for washing, repairing and general maintenance of these cars are provided. One of the conveniences on this floor is a turntable.

The second floor is used for the storage, charging, repairing and general care of electric vehicles, facilities being provided for 90 cars. The electrical construction in the entire garage, and especially on this floor, together with the electrical devices installed, is of more than usual interest. Energy for the entire building is supplied from the private power plant of the Lessing Apartment Building, which has a capacity of 2,000 kilowatts at 110 volts direct current. Four cables, each 600,000 circular mils in cross-sectional area, connect the main switchboard with the distributing panelboard on the second floor of the garage. In order to connect these two points, it was necessary to run the cables over the boilers in the apartment building, thence in 40 feet of tunnel crossing the alley between the two buildings and thence in pipe lateral to the second floor. These cables are in four-inch conduit the entire distance. Because of the



View on Electric-Vehicle Floor, Showing Distribution Panelboard and Charging Panelboards.

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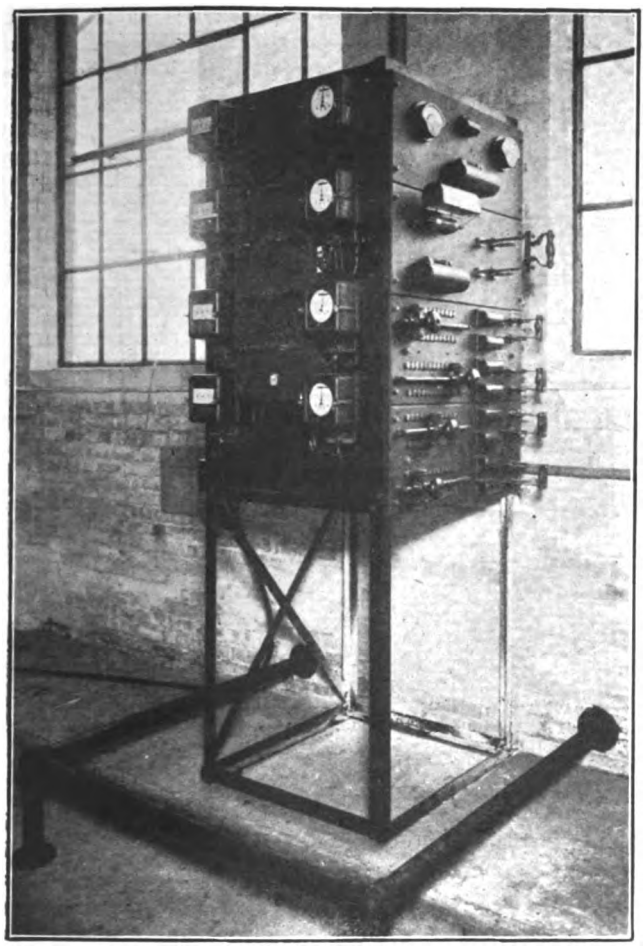


One of the Charging Panelboards.

proximity to the boilers and because they are adjacent to high-pressure steam and hot-water pipes in the tunnel, these cables were made especially for this installation by the Simplex Wire & Cable Company. The insulation of the cables over the boilers is 7/64-inch varnished cambric and double braided. In the tunnel conduit and pipe lateral the same insulation is used with the addition of a 5/64-inch lead sheath. A spare four-inch conduit is provided for future cables when the power requirements become greater.

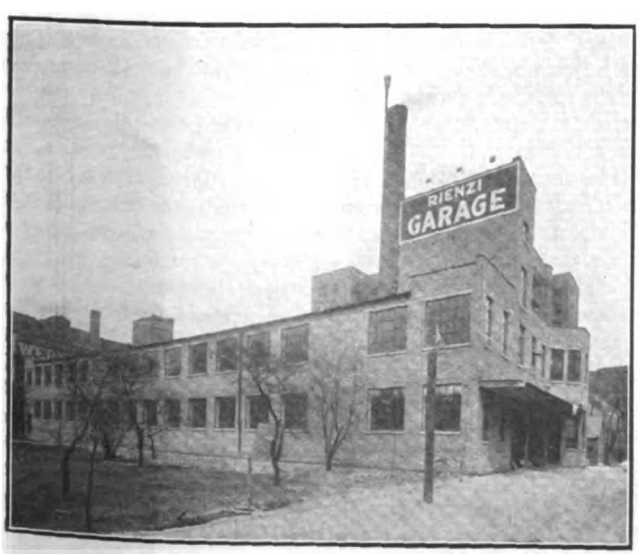
The four feeders, two of which are used for the incoming side of the circuit and two for the outgoing side, terminate at a 2,000-ampere, 250-volt knife switch in a Peerless distributing panelboard, which also contains three 800-ampere, 250-volt knife switches, one for lighting and power service and two for the charging panelboards. The main fuses for all distribution are also contained in this panelboard.

There are five Cutler-Hammer charging panelboards, each being equipped with control apparatus, rheostats, Weston voltmeter and ammeter, and plug receptacles for charging four electric cars at the same time. They are also provided with double-throw switches which permit the charging of a second group of four cars and metering the energy from the same panelboard. Each switch connects in circuit either of two meters, being connected in the positive legs of the circuits leading to the meters.

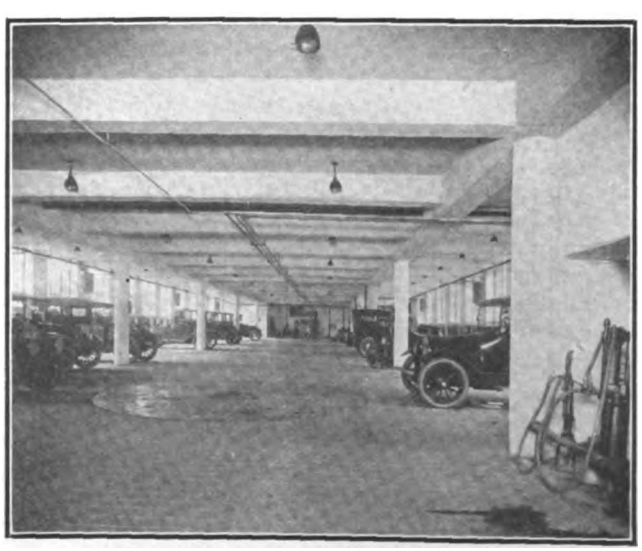
Referring to the accompanying illustration of one of the charging panelboards, the upper switch is the one controlling the entire board. Beneath this are the four specially designed switches that control the individual charging circuits. In addition to the main contacts, one of which is longer than the other, there are two other contacts made, depending upon the position of the blades. After batteries are placed in circuit for charging, the control switch is moved to make the first contact, which gives the voltage of the car batteries. Moving the blades to make the second contact, the line voltage reading is obtained. The operator then closes the switch on the first of the main contacts, which gives the ammeter reading of the charging circuit. This current is then lowered to the proper figure by the adjustment of the sliding-contact rheostat on the same side of the board, after which the switch is closed on the main contacts, which disconnects the ammeter, places the batteries on charge and connects in the wattmeter.

The reason for subdividing the charging switchboards into five separate units was to obtain economy in operation. This saving is accomplished by making it possible for the attendant to tend to the duties incident to charging while doing cleaning, repairing and other work on the car. After the car has been placed in position for charging, a specific-gravity reading is taken of the electrolyte in the batteries. This determines approximately what duration of charge will be needed. The attendant then places the batteries under charge, noting the time and the wattmeter reading on a blank form. He is then at liberty to give his attention to other work on the same car or to other duties.

Considering a typical case, if the duration of charge is estimated to be four hours and the charging current 25 amperes, the attendant may ascertain by referring to the blank form or by taking specific-gravity readings what the condition of charge is. When the batteries are nearly charged the attendant reduces the charging current to about five amperes for the finishing charge, usually given at this rate for about three hours and avoids buckling or sul-



Exterior View of the Garage.



View of the First Floor.

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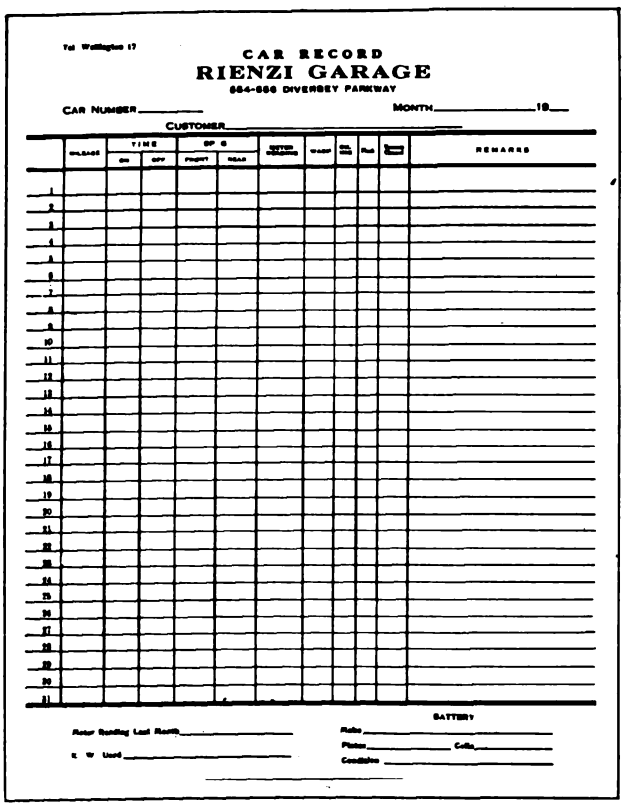
phating the battery plates. The energy consumption is recorded by Sangamo watt-hour meters, eight meters being provided for each charging panelboard.

The owners of the garage have adopted a schedule of rates for measured service for electric vehicles and are advocating this class of service as preferable to the flat rate for storage and general maintenance. Unit prices have been fixed, such as $10 per month for storage and 40 cents for washing and polishing. Energy for charging is at the rate of six cents per kilowatt-hour for the first 100 kilowatt-hours used during a month, five cents per kilowatt-hour for the next 100 kilowatt-hours and four cents per kilowatt-hour for all in excess of 200 kilowatt-hours.

The data necessary for making the unit charges are placed on a car record sheet which is kept on a slate near each customer's car. Referring to the reproduction of this sheet, the first column is for the days of the month. In the second is placed the speedometer mileage reading. In the next two are placed the time when the car is placed on charge and the time charging was completed. The next two columns are for specific-gravity readings of the batteries when charged. The next column is for the watt-


CAR RECORD
RIENZI GARAGE
664-666 DIVERSEY PARKWAY

CAR NUMBER_____ MONTH_____19__

CUSTOMER_____

	MILEAGE	TIME		SP. G.			CHARGE				REMARKS
		ON	OFF	FRONT	REAR						
1											
2											
3											
4											
5											
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BATTERY

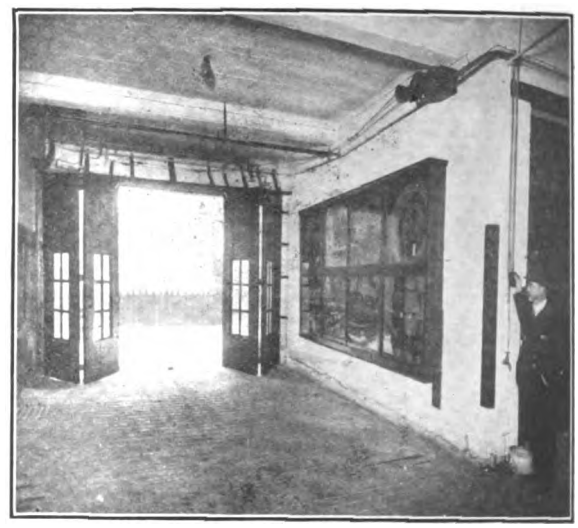
Data Sheet for Measured Service.

meter reading. The remaining columns are for other work to be done on the car. Each customer is provided with a separate wattmeter, which enables a check on the attendants' record. From data collected, it is found that the cost of charging varies from 1.1 to 1.8 cents per mile.

One of the charging panelboards is equipped with four meters, each of which can be used for measuring energy when transient cars are being charged. The control arrangement for these is the same as for the other meters. However, they have a large dial and resettable hand which registers the individual charge. The amount of energy can be read to one-fourth of a kilowatt-hour.

An elevator, with a capacity of two cars, semi-automatic control and driven by a 10-horsepower motor, is used for conveying the cars to and from the second floor. A tower was built so that the elevator is now arranged to give service to the third floor when it is added.

Of the electrical installations, the most unique is that of a Stewart door-opening and closing device. This device consists of a drum worm-geared to a 0.25-horsepower, 1,750-revolutions-per-minute series-wound motor, which together with the necesary cable and levers, accomplishes the opening and closing of the main-entrance door. The device is controlled from a number of stations, one being in the



Electrically Operated, Front-Entrance Door.

office and several located at different points on the first floor. Each station has three push-buttons, one for opening, one for closing and one for stopping the door in any position. An electric vulcanizer and an air compressor driven by a 0.25-horsepower motor are also installed in this garage.

The direct method of illumination is used in lighting the building. The wiring was installed for 60 200-watt outlets on each floor.

The electrical construction in the garage was engineered and installed by the Peerless Electric Company, 550 West Harrison Street, Chicago, Ill., under the direction of W. W. Ahlschlager, architect, 1744 Conway Building, Chicago, Ill.

Co-operation Among Kansas City Contractors.

The Magee-Reppell Electrical Company, a contracting firm of Kansas City, Mo., has made an arrangement with the Peerless Repair Company whereby it receives the electrical contracts on work picked up by the other members of the Peerless combination, which includes plumbers, carpenters, etc. There are six members, and the store of each has on its window the title "Peerless Repair Company Branch," with the number of the branch. The Magee-Reppell company's place is known as Branch 1; and all the electrical work taken by the Peerless company is done by this firm.

Two years ago W. R. Bump started the plan of providing a central office for the making of house repairs, from bricklaying and tin work to electrical repairs; six months ago the business had grown to such an extent that the Peerless company was incorporated, and various concerns brought into association.

"We realize, for one thing, that electrical repairs should be made by competent men, and preferably should be handled through a firm of contractors," said an officer of the Peerless company. "We have in busy seasons 20 to 25 men who do plastering, etc., but we employ no men for electrical work, turning all of that over to the Magee-Reppell Electric Company."

The Magee-Reppell company pays a percentage to the Peerless company on contracts given it, and receives a percentage on contracts for other kinds of repair work turned in to the Peerless company.

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INFLUENCE OF GENERATOR SPEED ON COMPOUNDING AND COMMUTATION.

By Gordon Fox.

The speed of a prime mover is controlled by its governor. By adjustment of the governor it is possible to regulate the speed within moderate limits over a range of perhaps ten per cent of the normal value. In the case of engines or turbines driving alternators it is of course desirable that the correct speed be maintained, since the frequency of the generator depends directly upon the speed of the engine. It might be stated, in this connection, that not infrequently alternators in the smaller plants not equipped with frequency indicators, are operated below speed. Since the speeds of all the motors in the system are dependent upon the frequency, it follows that in such instances the motors run slow and may thus cause a loss in production. This feature is one worthy of investigation in plants where output depends largely upon maintained speeds.

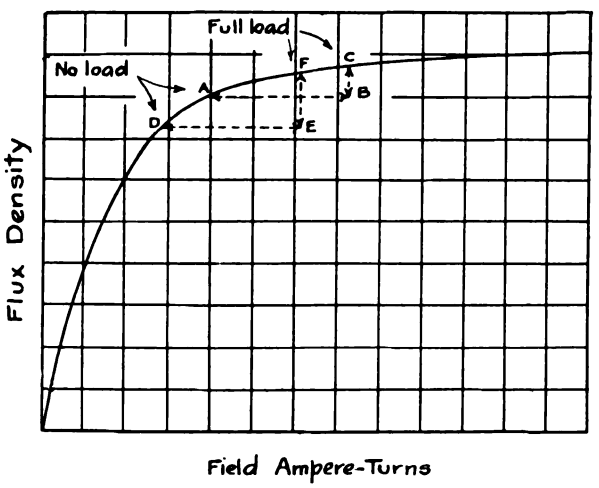

Fig. 1.—Magnetization Curve.

In the case of a direct-current plant, conditions are different. Here the motor speed is independent of generator speed, so long as the voltage is maintained. Moreover, since there is always some rheostat leeway for voltage control, it is nearly always possible to manipulate the rheostat to make up for any changes made in the speed of the prime mover.

Changes in the rotational speed of a direct-current generator may affect two operating features. The compounding will always be influenced to some extent and commutation may be either bettered or impaired, depending upon the nature of the change. We will first consider the relation between speed and compounding. In order to obtain stability of voltage the field coils of a generator are usually worked to a point a little above the knee of the magnetization curve. If the no-load normal-voltage point is below the knee of the curve, a slight drop in speed causes a decrease in voltage. This, in turn, decreases the shunt excitation and tends to lower the voltage still further, so that stability is questionable. The terminal voltage of a generator depends on the density of the field flux and the rotative speed, since these factors decide the rate of cutting the magnetic flux. It is evident that when the speed is increased the magnetic density may be decreased and vice versa, the terminal volts being maintained at a constant value. It is thus seen that the location of the no-load normal-voltage point on the magnetization curve depends on the speed. The series-field influence at full load is electrically represented by a definite number of ampere-turns. The effect which these ampere-turns may have upon the voltage depends upon the degree of saturation. If the no-load normal-voltage point be low on the curve, the series turns will have greater effect than if the iron is pretty well saturated at no-load magnetization.

Fig. 1 is the magnetization curve of a 230-volt direct-current generator operating at 250 revolutions per minute. The point A represents the magnetization corresponding to delivery of 230 volts without load at 250 revolutions per minute. The series ampere-turns are represented by the distance AB. The full-load voltage is higher than the no-load voltage by an increment BC, which represents the amount of overcompounding. Now let us assume that the generator speed is increased to 275 revolutions per minute. The no-load point corresponding to 230 volts at the terminals would now be lower on the curve, about ten per cent lower in fact, because the speed has been increased ten per cent. This point is shown in Fig. 1 at D. The same number of series ampere-turns at full load exist as before, the distance DE (equal to AB) representing this magnetizing influence. The overcompounding is here shown by the increment EF. It will be noted that the distance EF is considerably greater than BC. This means that the generator will overcompound to a greater degree when operated at 275 revolutions per minute than when driven at 250 revolutions per minute, other conditions being unchanged. The distance EF does not show the voltage rise accurately. It represents the increase in magnetic density from no load to full load. An equal increase in magnetic density will cause a greater increase in voltage at 275 revolutions per minute than at 250 revolutions per minute, so that the rise at the increased speed is, in reality, greater even than is indicated by this curve.

The corrected regulation curves are shown in Fig. 2. The curve for the generator operating at 250 revolutions per minute is here similar to the portion A to C of the magnetization curve shown in Fig. 1. This curve is not strictly accurate, as engine regulation, armature reaction and internal resistance tend to cause the voltage to decrease with load. The increase in terminal voltage due to overcompounding causes the shunt-field influence to be greater under full-load conditions. This latter factor about offsets those first mentioned, leaving the curve as shown nearly unchanged. The curve showing the voltage regulation of the generator when driven at 275 revolutions per minute is obtained from the portion DF of the curve in Fig. 1. The values are modified, however, by increasing the magnetic density increments, such as EF, by the ratio 275/250 to correct for increase in speed.

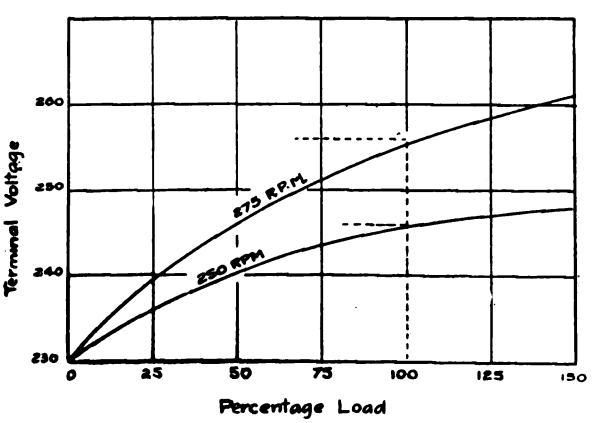

Fig. 2.—Voltage Regulation at Different Speeds.

It is evident from these curves that a change in the speed of a direct-current generator will materially change the compounding. If a generator is operated very much below rated speed it may be found that it has insufficient series effect to obtain the desired amount of overcompounding. If the generator is operated very much above speed it will likely be necessary to shunt part of the load current around the series fields to lessen their influence.

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If a generator does not afford sufficient compounding, even when driven at rated speed, it may be possible to obtain the desired result by speeding up the prime mover. Operating below speed decreases the relative series-field influence, the ratio of series to shunt ampere-turns being low. Operating above speed increases the relative series-field influence, since the ratio of series to shunt ampere-turns is increased.

The portion of the magnetization curve over which a generator operates has an influence upon the amount of curvature of the voltage-regulation curve, and this may materially affect parallel operation. In Fig. 3 are shown two voltage-regulation curves of two generators having equal voltage rise from no load to full load. They are both equally overcompounded. But, at fractional loads, for instance at half load, there is considerable voltage difference. If these two generators were connected in parallel, machine A would take a greater share of the load at this point. In order to secure correct load division over the entire operating range, two or more generators must have compounding curves which are similar. As previously stated, the shape of the regulation curve depends largely on the portion of the magnetization curve upon which a machine operates. It was shown that speed changes cause a generator to operate over different portions of the curve. It is thus evident that by slight adjustments of prime-mover speed it is possible to modify the compounding curves in such a manner as to improve the

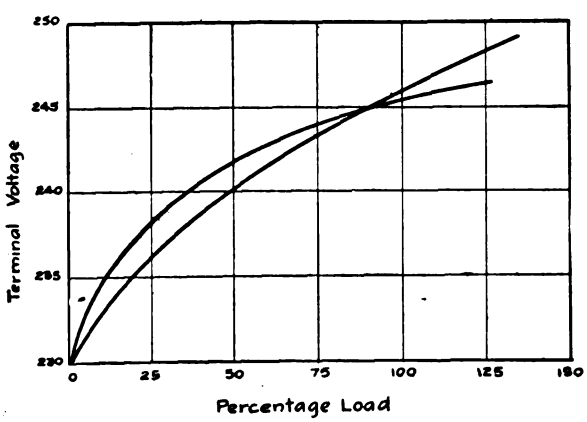

Fig. 3.—Voltage Regulation of Different Generators.

load division by causing the machines to have similar voltage-regulation characteristics.

The second effect upon operation due to speed change is in respect to commutation. A generator, driven above rated speed, will deliver rated voltage at a lower degree of magnetization than the normal value. This means that the field ampere-turns are reduced and the field iron will be worked at a lower saturation than normal. Since the armature magnetizing effect remains unchanged, its relative value or ratio to field turns is increased. This involves a greater shifting of the neutral with load changes and is unfavorable to good commutation. The full-load neutral will probably occur at a point further removed from the no-load neutral than is the case for normal operation. Relocation of the brushes thus becomes desirable.

In an opposite manner, if a generator be operated below rated speed the ratio of armature to field turns is reduced, the neutral becomes more stable and commutation is improved. Consequently, if a generator operating at normal speed tends to spark and it is found that the neutral shifts widely with load so that a single brush position will not answer for all loads, conditions may be improved by slowing down the engine or, in case of a belted machine, changing pulleys. The allowable speed reduction is limited by the ability of the machine to deliver rated voltage without cutting out the field rheostat altogether and by the compounding which, as was previously explained, is reduced with decrease of speed.

It may be mentioned that speed changes will also have an effect on the temperature of a generator. When operating at increased speeds the iron is worked lightly so that core losses are low. The increase in windage and ventilation also tends to cooler operation. In opposite manner, when the machine is operated below speed, it will tend to run warmer. The shunt field coils in particular will be affected, since more shunt ampere-turns are required to secure the desired no-load voltage.

Rapid Installation of Electrical Equipment for a Picture Theater.

Exceptionally rapid work was recently completed in the electrical installation for the Butler Theater at Ishpeming, Mich. This theater was designed to be completed by a certain day and the entire construction of the building and its equipment was finished in 59 days according to schedule. This theater was built for the Ishpeming Theatre Company and is a motion-picture house seating about 500 people. The building is 105 by 35 feet in outside dimensions and is devoted exclusively to the theater. Above the rear portion of the auditorium is a balcony.

The complete electrical work of wiring the entire theater and installing all of the electrical equipment for lighting, ventilation and picture projection was done by two men, an electrician and a helper. It was completed in 29 working days. The wiring is entirely in conduit throughout. Over the auditorium are 10 semi-indirect fixtures, each including four lamps. Three of these are 100-watt type "C" Mazda lamps for the bright illumination used at the beginning and the close of each performance; there is also one 40-watt tungsten lamp for providing the dim light which is maintained during the display of pictures. These fixtures are arranged to be lowered simultaneously by means of a single windlass with wire cables. At the outside of the exits are lights kept burning throughout the evening performance; these are installed in Newgard vaporproof receptacles. In the upper portion of the theater front are two 600-watt type "C" lamps. Along the cornice are 18 lamps to aid in outline lighting. There are also numerous lamps about the main entrance canopy, besides special fixtures in the office and lobby. On columns along the side of the auditorium are numerous wall outlets for use in connection with oscillating fans.

The operating room is in the rear of the balcony and has a large storeroom adjoining each side. It is entirely of fireproof construction. The two projecting machines are now operated from two Fort Wayne single-phase Compensarcs. A set of double-pole double-throw switches has been installed to enable the projecting machines to be thrown over to a direct-current supply from a type 14-T Wagner white-light three-phase rotary converter, which will be installed in the near future.

The architects of the building were Charlton & Kuenzli, of Milwaukee, Wis., and Marquette, Mich. The electrical work was installed by the Milwaukee branch of Henry Newgard & Company.

A Remedy for Low-Voltage Generator Trouble.

Many office buildings and the like use self-excited low-voltage generator sets for the call bells and annunciators. The load on these generators is exceedingly varying, going suddenly from no load to full load. When operating for long periods at no load the high contact resistance of the brushes and the oil film that covers the commutator will cause the voltage to drop. When the bells are in frequent use there is practically no difficulty in maintaining the voltage. As the absence of a load appeared to be the indirect cause of the trouble, a permanent load of a small lamp connected across the brushes has been successfully applied in several cases by the writer. R. L. Hervey.

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DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

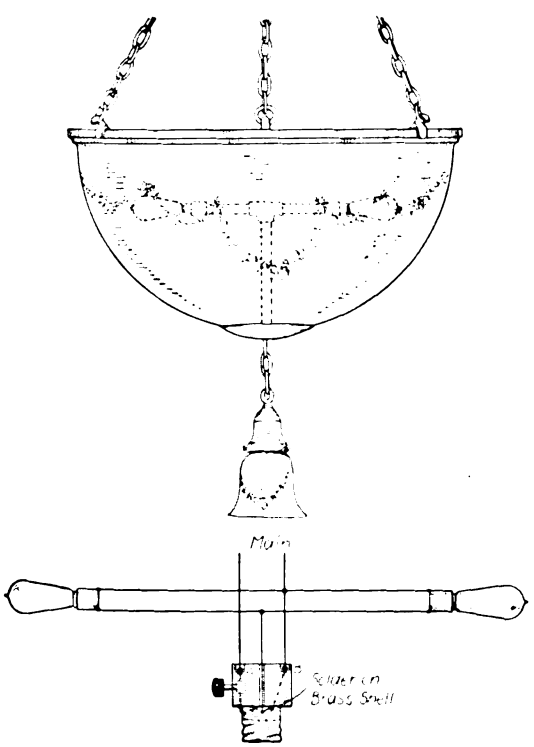
Cleaning Commutator Segments.

When rebuilding commutators, the mica between the bars is often found shellaced to the segments. This old mica and shellac should be thoroughly removed before the commutator is reassembled. The bars can be cleaned by scraping with a knife, but that is a long and tiresome job. A quicker and better method is to put the segment into a bath of alcohol until the shellac softens, then taking them out one at a time the mica can be easily removed with a wire scratch brush. R. L. Hervey.

Combination Socket and Switch.

I was recently called to an apartment in which there were two ceiling fixtures controlled by means of a single wall switch. One of these fixtures was in the rear of the apartment and was in almost continual use, whereas the fixture in the front of the apartment was lighted only occasionally. The only way to turn off the current from the front fixture was to turn the key of each individual socket separately which caused considerable trouble because two of the sockets were inside of the bowl, the arrangement being as shown in the upper part of the sketch.

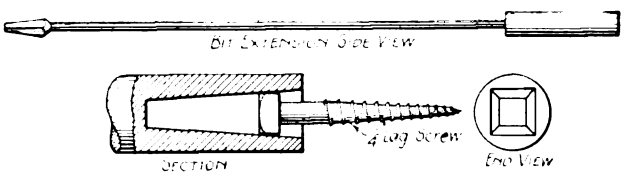
The owner wished the fixture in the front of the apartment to be controlled separately. He did not want any pendent switch hanging over the upper edge of the fixture, nor did he wish to do away with the single light at the bottom. The way I overcame this is shown in the lower part of the sketch. One of the wires going to the fixture was run directly to the key on the center socket *A*. The other wire was connected to one side of each socket in the bowl and to the center contact *B* on the bottom socket. I then tapped a short wire from the other side of the two sockets in the bowl and soldered it direct to the brass screw shell of the bottom socket at *C*. Now, by turning the key in this botom socket all three lamps in the fixture are controlled with one operation. Charles Stadmuller.



Wiring of Socket as Fixture Switch.

Fastening Cutout or Switch Boxes with Lag Screws.

In setting cutout boxes or switch boxes it is frequently the best plan to fasten them with one-fourth inch lag screws. This is especially true on concrete or brick walls where the lag screws are very much better than wood screws. Since the holes in the back of the box are usually set only about one-fourth inch from the walls of the box, it is almost impossible to use an ordinary wrench, and therefore I always use a five-eighths inch bit extension with a brace, putting the lag-screw head into the bit extension and using the same as an adjustable socket wrench. By this method it is possible to tighten up the lag screws securely without injuring the heads of same. Not only does this make a tight job, it also saves much time. H. L. Coutts.



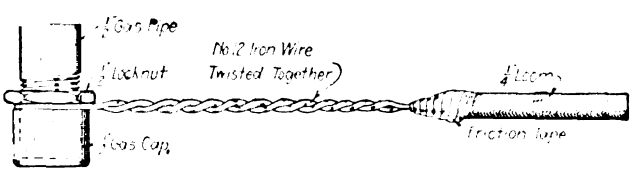
Bit Extension for Driving In Lag Screws.

Safeguarding Against Drilling Into Gas Pipes.

In extending some conduit work in an old government building, I had occasion to drill several holes through the floor, which consisted of wood laid on concrete. I was afraid of driving the star drill into the gas pipes and conduit imbedded in the floor. Therefore, I connected an extension cord from one side of a nearby lighting circuit and attached one wire to the drill, placing a lamp in series therewith. The other side of the circuit was grounded to the conduit and gas pipes. In one case the lamp lighted, showing that we had struck some of the buried piping and therefore had to seek a new location for the riser being put in. By means of this simple scheme we saved considerable trouble. J. B. Story.

Device for Soldering Pig-Tail Joints.

Much time and trouble can be saved in soldering so-called pig-tail joints by using a device such as that illustrated. Cut about two inches off the threaded end of a half-inch gas pipe. Screw a half-inch locknut on this threaded end until it is tight; then twist a No. 12 iron wire around the threaded pipe just below the nut; this is then twisted together to serve as a handle. At the bottom, screw on a half-inch gas cap. At the other end of the handle put on a short piece of quarter-inch loom held in place by friction tape to serve as a good grip and also as a protection against heat. This little device acts as a cup in which solder can be readily heated and with it a set of joints can be soldered in about one-fourth the time that is required with the ordinary soldering iron or torch and no solder is wasted in the process. J. McFarland.



Simple, Home-Made Solder Cup.

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"LET THE CODE DECIDE."

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Secretary's Message.

The Eastern Massachusetts Section held its May meeting on May 19 at the office of the commissioner of wires, Boston, and was called to order at 2:45 p. m. by President Briggs. In the absence of the secretary, who was detained at home by illness, Inspector Blaisdell, of Everett, was elected secretary *pro tem.*

The principal matters for discussion were certain cases where taps had been found improperly made in molding; desirable arrangements for switches on electric ranges and heating devices; use of service switches and cabinets set in outside walls accessible from outside. An interesting example of service conduit, which had been burned out and caused a fire on account of spliced wires within same, was shown by Mr. Fuller, of Somerville. The Section will hold one more meeting before adjourning until fall.

The members of the New York Section met in the Assembly Room of the Municipal Building on Monday evening, May 22. The gathering represented inspectors from each borough office of the Bureau of Gas and Electricity, as well as the New York Board of Fire Underwriters. G. E. Bruen, superintendent of the Suburban Fire Insurance Exchange, presided.

The feature of the evening was a talk by Dana Pierce, chief electrical engineer of the Underwriters' Laboratories. Mr. Pierce presented a review of the work being performed by the Laboratories, showing the wonderful development from the small room in Chicago, wherein tests on electrical apparatus were first made 20 years ago, to the large fireproof structure of today, with its several branches in other cities.

To show the limit to which fireproof conditions are carried in the Chicago laboratories, it is interesting to note that in the offices even the picture frames are of metal, while it was suggested, in jest, no doubt, that a rubber plant, at present resting on a metal stand in the main office, should be made of asbestos. The apparatus used and the methods employed in testing, not alone electrical fittings, but also safety appliances, were explained in detail and illustrated at the same time with stereopticon slides. At the conclusion of his lecture, Mr. Pierce was still kept busy, as almost every inspector present had a question to ask, which, of course, proved how interesting was the talk to his hearers.

Joseph Dimes, inspector from the Manhattan office of the City Department, was the "operator" of the stereopticon machine, and the way he worked his dissolving effects on the slides lacked nothing of being professional, and his question, later, as to why porcelain devices are not glazed on the back, where most exposed to moisture, showed he had missed no part of the lecturer's talk.

The New York Section has now adjourned for the summer months, and there will be no further meeting until next October.

The Secretary most earnestly asks the members to send him a few questions for use in this department at once. He wishes to send a bulletin of questions to the Executive Committee shortly, and has only about half enough material. This is not because questions have not been sent in, for he has received about a dozen, but of these more than half were unavailable for use.

Questions as to the adequacy or quality of material, for instance, which are purely matters for the Laboratories, form the subject of numerous questions, and, of course, cannot be used. Then, again, occasionally questions are sent in which merely require reference to rule and section of the Code for a perfectly definite answer. Please send along a few which really involve some point of interest or difficulty, and *do it now.*

Grounding An Autotransformer.

Question 326. If a 550/110-volt autotransformer is connected to the 550-volt, three-phase power system of a factory, should the secondary of the autotransformer be grounded?

Answer 1(D). Not if it is one of the parts of an isolated system.

Answer 2(R)*. In accordance with Rule 15*b* this secondary need not be grounded.

Answer 3(P)*. The Code permits but does not require this. (See Rule 15*b*.)

Answer 4(S)*. Rule 15 of the Code allows the grounding of secondaries where the voltage exceeds 150. I should not be in favor of grounding the secondary of a transformer of this type.

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Answer 5(B)*. The secondary of an autotransformer, the primary of which is but 550 volts, does not necessarily need to be grounded.

Answer 6(F and G). The grounding of transformer secondaries where supplied from private industrial or lighting plants where the primary voltage does not exceed 550 volts is expected under Rule 15*b*.

Answer 7(E). We should not care to encourage the grounding of the secondary systems of autotransformers when the primary voltage exceeded 150 volts.

Answer 8(O). I should judge that in this case the secondary circuit of the autotransformer should not be grounded. It is not required under Rule 15*b*. Furthermore, if the secondary circuit of an autotransformer is grounded it also grounds the primary, and if several such transformers are on the same system it is probable that there will be differences of potential between the points grounded, and consequently a flow of current over the ground wire under normal conditions, which is contrary to the Code. A further reason is that the difference of potential between the ground and other parts of the 550-volt circuit is in excess of 550 volts.

Answer 9(T). Code Rule 15*b* would not require grounding, as primary voltage does not exceed 550 volts.

Answer 10(H)*. I should not allow it.

Answer 11(N)*. It certainly should not. An autotransformer has no distinct primary nor secondary; it is really a reactance coil and you tap off in shunt to a certain reactive drop a circuit which has its own constants. There is no definite suitable grounding point. Further, we are not told whether this is on a star or delta circuit, whether it itself is a three-phase appliance, or whether it is a single-phase coil across one leg of the three-phase system. All these matters would have to be considered, and, after all, it would be a very rare case where currents of dubious amount and doubtful origin would not be continually flowing over the ground wire, while the voltages from ground to the several lines might be higher than 550 in certain cases.

Fusing Service Mains.

Question 327. On a combined two-phase power and lighting system fed from one service, are we justified in fusing the service mains according to table B, Rule 18, the lighting circuits being properly protected where connected to the service buses?

Answer 1(D). No.

Answer 2(R)*. No. In service this condition could subject rubber-covered wire to a steady current flow of a higher rating than allowed in table A.

Answer 3(P)*. No. The fifth paragraph of Rule 8*c* applies only to the leads of a single motor.

Answer 4(S)*. No. See Rule 23*c* and Rule 8*c*. These are the only rules I know of that could apply, and these state it is for one motor only.

Answer 5(B)*. We should deem it proper to fuse the service mains according to table B.

Answer 6(F and G). Rubber-covered conductors are permitted to be fused in accordance with table B, when supplying current to one motor only, requiring large starting current, and should be fused according to table A, when other consuming devices of any kind are connected thereto.

Answer 7(O). Table B of the rule may be applied to rubber-covered wires only, in protecting the branch wires supplying current to only one alternating-current motor of the the type requiring large starting current. It may be used in connection with the service mains only when such mains feed nothing except one motor, as described above.

Answer 8(T). The rules do not permit the fusing of mains for induction motors in accordance with table B of Rule 18. If rubber-covered wire is used for such mains fuse protection must be according to table A.

Answer 9(H)*. No; raise the capacity of the mains.

Answer 10(N)*. There is a curious condition here. If this motor load consists of "only one motor of the type requiring large starting current" then the service mains may be so fused; if there are more than one, however, then they cannot be.

This is because the Code does not say the wires must carry "only the current for one motor" of this type, but "the current for only one motor" of this type, and nothing is said about any other load. This may seem like a quibble, but I have very excellent legal authority for it.

Of course the purpose was that the sole load on the wires allowed this special privilege should be one single alternating-current motor of this special type, and nothing else. But that is not the wording. In both Rule 8*c* and Rule 23*c* the wording should be changed to read: "Where the sole load on a rubber-covered conductor is one alternating-current motor of the type requiring large starting current, said conductor may be protected," etc.

Answer 11(E). I do not so interpret the rule. The wording of the fifth paragraph, Rule 8*c*, seems to be against such a liberty. "Where a rubber-covered conductor carries the current of only one alternating-current motor of a type requiring large starting current it may be protected by a fuse or an automatic circuit-breaker without time-limit device, rated in accordance with Table B of Rule 18." This privilege is limited to but one motor. The mains and the service should be protected in accordance with the requirements of table A, while the sub-mains which go to but one alternating-current motor may be protected under the provision of table B. This, I understand, to apply to each individual motor which may be fed from one set of mains, but through sub-mains; the mains being protected under table A, and the sub-mains may be protected under table B, when there is but one motor supplied by each set of the sub-mains.

Louisville Company Offers Free Electric Service to the Sick.

The Louisville Gas & Electric Company has announced that it will continue its offer again this year to provide free electric service to the indigent sick, provided the beneficiary is located on one of the distribution lines of the company. All that is required is for the attending physician to vouch for the applicant, after which the Louisville Gas & Electric Company will do the rest. Last year, in order to get the proposition fairly before the physicians of the city, letters stating the proposal were sent to 700 Louisville physicians. Electric toasters or electric fans, or both, are provided. Many requests for this service were received.

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BOOK REVIEWS

"Mechanical Equipment of Federal Buildings Under the Control of the Treasury Department. By Nelson S. Thompson. Third revised edition. New York: Heating and Ventilating Magazine Company. Cloth, 402 pages (5¾x9 inches). Supplied by Electrical Review Publishing Company, Inc. for $3.00.

This volume, which covers heating, ventilation, plumbing, drainage and water supply, and even vacuum cleaners, as well as the electrical equipment, is primarily an effort at standardizing the equipment of postoffices and other federal buildings, with a view to real efficiency. However, much of the information compiled by the author is also valuable for those planning the equipment of other buildings, particularly in view of the systematic treatment and of the attention to innumerable details which count in practice. The electrical sections include estimates of the installed costs of conduits, wiring and fixtures of various types; recommendations for motors and controlling apparatus suited to various circuits and purposes; operating data for isolated plants; and a quite fair-minded discussion as to isolated plants versus central-station current. Obviously, a work of this kind cannot allow for such changes as are particularly noticeable from year to year in electrical practice and hence should only be authoritative for a limited time. Thus, the present (third) edition rules out both Gem and carbon lamps, but does not admit gas-filled lamps.

ALBERT SCHEIBLE.

"Essentials of Electrical Engineering." By John Fay Wilson. New York: D. Van Nostrand Company. Cloth, 345 pages (5¾x9 inches), 282 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $2.50.

Written by an instructor at the University of Michigan, this textbook is remarkable in its emphasizing the fact that continuous and alternating currents are governed by the same laws. Although recognizing electrical practice and illustrating the same both by cuts of standard apparatus and by diagrams of connections, Mr. Wilson's work is primarily for students familiar with trignometry and calculus. The general treatment is both clear and systematic, while the problems (of which there are nearly 350) should fix the underlying laws in the mind of the student. Appendices are devoted to developing the formulas for the calculation of inductance, hysteresis loss, capacitance, admittance, conductance and susceptance.

ALBERT SCHEIBLE.

"Alternating-Current Work." By W. Perren Maycock. New York: Whittaker & Company. Cloth, 415 pages (4¾x7¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc., for $2.25.

Although signing himself as a consulting engineer, the author of this volume is evidently a born teacher, for every chapter displays his unusual aptitude at reinforcing clear explanations with simple analogies and lucid diagrams. Nearly 200 of the 260 cuts are devoted to diagrams and mechanical analogies which, coupled with a systematic treatment of the subject, make this book equally valuable as a textbook, and as a reference volume for those seeking an authoritative treatment of alternating-current practice in a form in which it can readily be grasped. As the title implies, the volume is intended for those interested in the practical utilization of alternating currents and hence covers both the underlying principles and their application in alternators, transformers, choking coils, meters and motors. Even electric ship propulsion and single-phase railways are included. The mechanical analogies are particularly apt and help to explain such phenomena as the effects of resistance, inductance and capacity in a circuit, both singly and in various combinations. At the same time, the mathematics used has been confined almost wholly to simple algebra and arithmetic.

ALBERT SCHEIBLE.

"The Principles of Dynamo Electric Machinery." By Benjamin F. Bailey. New York: McGraw-Hill Book Company, Incorporated. Cloth, 314 pages (6x9 inches), 222 illustrations. Supplied by the Electrical Review Publishing Company, Inc. for $3.00.

In evaluating physical quantities, the use of mathematics is necessary and indispensable, but before a mathematical analysis can be made the various elements of a physical phenomenon must be clearly apprehended. This book attempts to explain the actions and reactions in electrical machinery from the physical viewpoint and with a very limited use of mathematics. At best, however, there are some phenomena whose significance can be as readily exemplified by the aid of mathematics as in any other way. The author undoubtedly appreciates this, for on occasions he does not hesitate to use the calculus even without giving the necessary physical concepts upon which the equations are based.

In carrying out his plan, the author has divided the subject matter into 19 chapters under the following headings: General Principles, Electric Motors, General Principles of Dynamos and Motors, Systems of Distribution, Characteristics of Motors, Accessory Apparatus, Rating of Machines, Efficiencies and Losses, Direct-Current Measuring Instruments, Adjustable-Speed Motors, Alternating Currents, Inductance and Capacitance, Alternating-Current Measuring Instruments, Single-Phase and Polyphase Systems, The Transformer, Synchronous Generators and Motors, The Rotary Converter or Synchronous Converter, The Induction Motor, and The Single-Phase Commutator-Type Motor.

Most of the phenomena and principles are explained in clear and simple language, but there are a few places where the author has followed well established precedents of technical book writers. For example, on page 28 the author classifies electrical machines as dynamos and motors, using the term dynamo as synonymous with generator, and then on page 29 he says: "In all dynamos, whether used as generators or as motors, etc," which evidently makes the word dynamo a generic term. On page 18 we find the armature defined as the rotating member and on page 38 the stator is called the armature. Evidently the criterion is not rotation.

In defining a vector the author has followed the practice of some mathematicians and physicists when he says "a vector has magnitude, direction and sense." The reviewer is in a position to state that the highest authorities on vector analysis and quaternions such as Gibbs and Hamilton do not ascribe to a vector the property of sense. A careful analysis will show that sense and direction as used mean one and the same thing.

Likewise in his exposition of phase difference, the author has been unfortunate in his illustration. It requires considerable imagination to visualize Fig. 74 as two generators connected in series. For beginners the illustration does not illustrate.

The book is intended to satisfy the needs of those students who do not intend to follow electrical engineering as a profession, but it undoubtedly is well adapted for a first course in electrical engineering. The reviewer heartily approves the method of attack adopted by the author, and he believes that an understanding of electrical and magnetic phenomena as explained in the book will prove of great value in more advanced study of electrical engineering.

C. M. JANSKY.

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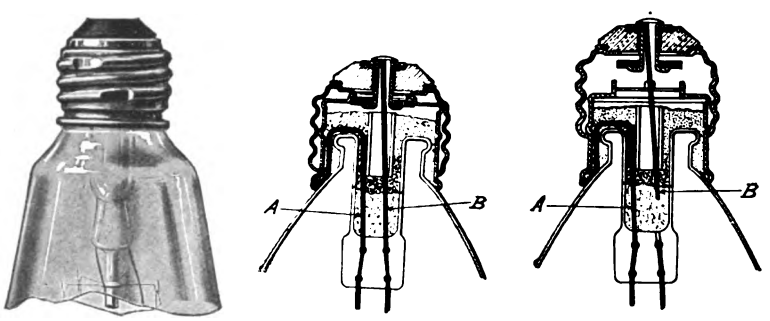
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hubbell Locking Lamps.

The problem of insuring lamps against removal has always been a vexatious one. While this is a more important matter in large public buildings, such as hotels, railway stations, municipal structures, etc., it is also a matter of importance in shops and many other places. The difficulty connected with unauthorized lamp renewal is not only on account of theft of lamps, which frequently occurs, but on account of replacing lamps by other lamps of improper size or by heating devices which should not be connected to the lighting circuit.

Quite a number of locking sockets have been developed to overcome this difficulty and practically all of these depend on a key-locking means, which means the safety of the lamp is dependent upon the conscientiousness of the electrician who has made the installation or who is responsible for its maintenance, because, if the socket is left unlocked due to negligence or other cause, the lamp of course is not protected. To overcome the shortcomings of locking sockets, this matter has been solved by the development of a new type of lamp base. This base can now be obtained in standard-voltage lamps ranging from 105 to 125 and 220 to 250 volts and various sizes from 10 to 60 watts, it also can be provided for sign lamps ranging from 2.5 to 10 watts and from 10 to 125 volts.



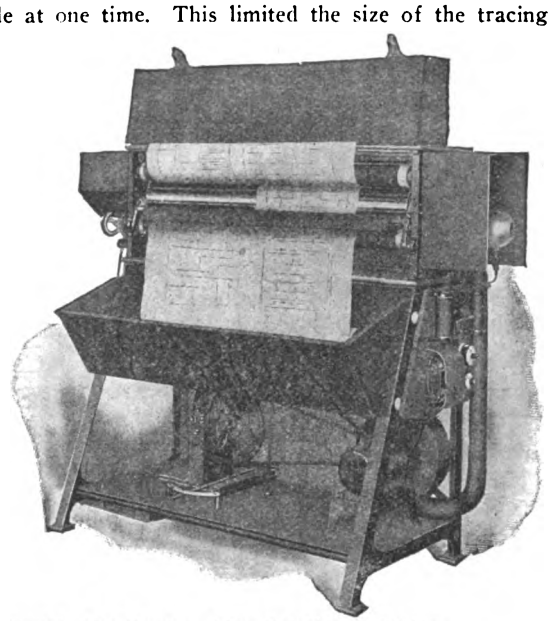
Figs. 1, 2 and 3.—Hubbell Locking Lamps, Showing Base Construction.

These locking lamps, which are being manufactured by Harvey Hubbell, Incorporated, Bridgeport, Conn., have a base consisting of two parts: the outer or rotating shell and the inner shell which is cemented to the lamp. The filament of the lamp is attached in the usual manner. As shown in Fig. 1, the lamp does not have any unusual appearance, but on studying the section shown in Fig. 2, it is seen that the two shells fit snugly within each other and both the leading-in wires *A* and *B* are soldered to the inner shell and to the center contact, respectively. Any lamp equipped with Hubbell locking base may be screwed into any standard Edison base socket, but cannot be removed from it by turning the lamp in the opposite direction because this merely revolves the inner shell without loosening the outer or screw shell. For removing a burned-out or broken lamp, it is necessary merely to give a slightly downward pull to the lamp bulb. This serves to rupture the leading-in wire *B*, which connects the center contact to the filament. As shown in Fig. 3, in the lowered position the outer shell of the base engages a reverse ratchet and this now permits the lamp to be unscrewed. It is evident any effort made to unscrew the lamp is unsuccessful and if it is attempted to forcibly pull the lamp out of the socket, the electrical connection in the base is permanently destroyed and the lamp made valueless.

From the foregoing it is seen that the Hubbell locking lamps afford a positive proof against removal. They are especially designed to permit ready insertion of a definite lamp into a socket, this to be left in service until it is to be replaced on account of burnout or breakage.

Electrically Operated Continuous Blue-Print Machine Using Cooper Hewitt Lamps.

The first Cooper Hewitt lamps used in electric blue printing were placed in front of a flat frame with reflectors behind the lamps, which allowed only prints as large as the frame to be made at one time. This limited the size of the tracing that could be accommodated, and made it necessary to reload the machine for each exposure. Lamps with flat frames are frequently satisfactory where the requirements are small, but where blue prints are large, the continuous machines are better.



Electric Continuous Blue-Printing Machine.

The Revolute Machine Company, 417 East 93rd Street, New York City, based the design of its Everett-McAdam type of blue-print machine upon a revolving glass cylinder, the light being within the cylinder and the rays striking practically perpendicular to the surface of the blue-print paper which is wrapped around the cylinder. By this scheme, 75 per cent of all the light is direct, 25 per cent reflected and none entirely lost. This makes the machine highly efficient and rapid and allows the production of a print of any length whatever.

The paper is laid over the revolving glass cylinder where it remains during three-quarters of a revolution, after which it leaves the cylinder and is caught in a suitable receptacle. The tracings are fed in between the paper and the cylinder so that the light strikes through the cylinder and the tracing on to the blue-print paper.

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Continuous rolls of any length may be fed through the machine with either long tracings or those of smaller sizes, so that an extra standard roll of 50 yards may be printed in one piece.

Special high-power lamps, made for this particular service by the Cooper Hewitt Electric Company, Hoboken, N. J., allow the machine to print at a high speed on comparatively small current consumption. This speed efficiency is due partly to the design of the machine having the lights within the cylinder, and partly to the quality of the light from these mercury-vapor lamps, which is very well adapted to blue-print work.

Arc lamps may also be used on this sort of a machine. In the case of this type of lamp, which must be hung outside the cylinder, the light passes through the cylinder to the paper on the opposite side from the lamps, and the printing is done during half a revolution. Where mercury lamps are used inside the cylinder, the light passes through one thickness of glass, and the printing is done during three-quarters of a revolution. The mercury lamps are automatic and start by the turn of a switch, and, in contrast to arc lamps, require no attention whatever during their light, which is guaranteed to average 1,200 hours.

The machine, which is electrically driven, is equipped with a variable-speed gear that allows it to be run at a speed necessary to suit the requirements of different kinds of paper and different tracings or negatives to be printed. Due to the small curvature of the cylinder and a series of endless belts which hold the paper and tracing on the cylinder, a perfect contact is obtained at all points.

The revolving glass cylinder entirely eliminates the necessity of dragging the tracings and paper over a curved stationary glass, avoids the possibility of slipping, saves wear and tear on the tracings, and gives a sharp detail to the prints.

Electrically Operated Clock and Electric Sign.

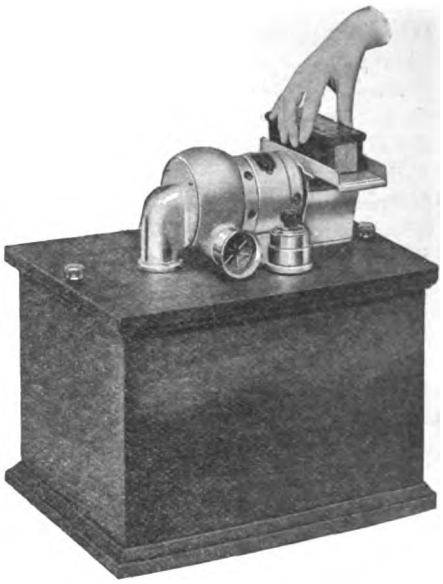
An excellent example of effective electrical advertising has recently been completed for the Westchester Lighting Company, Mount Vernon, N. Y. On top of the office building of the company its name appears in large electrically lighted letters. At the corner are the words "Light,

Electric Clock and Sign for Central-Station Company.

Heat, Power" in equally large letters. Above the latter sign is a 10-foot self-winding electric clock with dial, figures and hands outlined by electric lamps. Cluster posts and bright show windows also add to the effectiveness of the company's night display. Since the building faces the main line of the New York, New Haven & Hartford Railroad, which has several hundreds of trains passing by every day, the electrical display is exceptionally commanding of continued attention. The clock was furnished by the Betts & Betts Corporation, 256 West Thirty-fifth Street, New York. It was erected, as also the two signs, by the Federal Sign System (Electric), New York and Chicago.

Electrically Driven Eraser Cleaner.

The problem of removing chalk from blackboard erasers has for a long time been a troublesome one in schools and lecture halls. The ordinary method of pounding the erasers to remove the dust is not only very insanitary, but also hard



Electric Suction Type Eraser Cleaner.

on erasers. To overcome the disadvantages of this old method there has been placed on the market an electrically driven compact suction cleaner especially designed for removing the dust from the eraser. This it does in a very rapid, thorough and perfectly sanitary manner.

The outfit is practically a small vacuum cleaning plant. The suction is produced by means of a one-twenty-fifth-horsepower universal motor that can be operated on either direct or alternating-current circuits. The outfit is neatly made up, with all of the metal parts well nickel-plated, and these are mounted on a hardwood cabinet with mahogany finish. This machine not only removes all of the chalk dust by means of strong suction, but it also includes a rotary bristle brush, which brushes the surface of the eraser being cleaned. Thus all of the chalk is removed without any of it escaping into the room. The chalk dust is drawn into the box and the exhaust air is filtered through a very fine muslin separator.

This outfit is being manufactured by the Wisconsin Electric Company, Racine, Wis.

Frankel Solderless Connectors.

The electrical department of the Frankel Display Fixture Company has recently been incorporated under the title of the Frankel Connector Company, Incorporated, to carry on the manufacture of Frankel solderless connectors, Frankel test clips and other electrical specialties. The office and factory of the new company are located at 177-179 Hudson Street, New York City.

The illustration herewith shows several types of the Frankel connector. The phanton view in the center shows the principle of the connector and how the design has permitted the use of the fewest possible parts to make a rigid connection. This simple construction, it is claimed,

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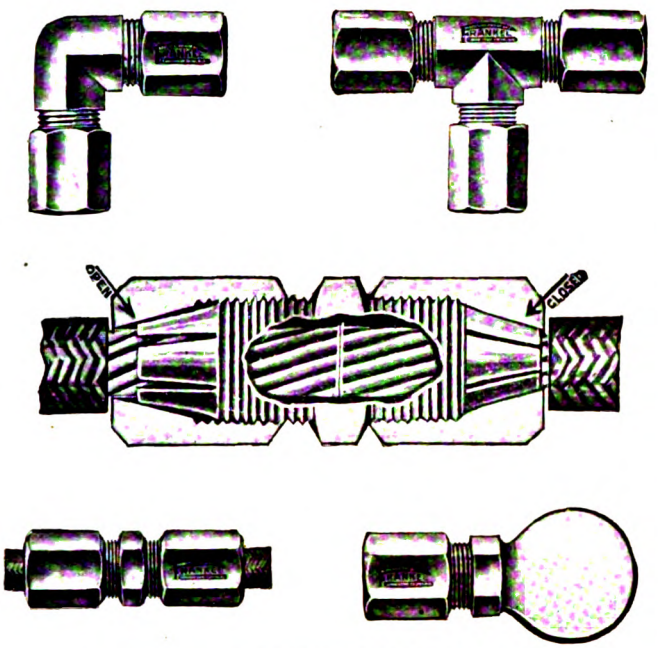
reduces the liability of the connector getting out of order and in addition provides a connection that is strong mechanically and electrically. The company is also manufacturing a line of connectors for panelboards to replace soldered terminal lugs for front and back connections.

By using Frankel solderless connectors in place of the soldered type of connection, the makers claim a substantial saving of time as well as the added advantage of providing a joint that can be broken down without harm to the cable.



Several Types of Frankel Solderless Connectors.

In the report containing the approval of the Frankel solderless connector, Underwriters' Laboratories, Incorporated, refers to a test made at 1,000 amperes in which the soldered joint being tested melted and the solder dropped from the joint, whereas the joints where the wires were attached to Frankel connectors were unaffected by the test.

Electric Water Sterilizer.

Water for drinking purposes should be pure; that is, it should be free from vegetable and animal impurities, since these constituents afford nourishment for the bacteria of typhoid or other diseases. It has been proven that these can be carried and propagated by water. Large apartment houses and hotels therefore find it profitable to maintain good systems for the purification of their water. Bottling plants that put up carbonated drinks spend much money in water purification, so that the pure fruit juices and extracts in their finished beverages may not be spoiled. Many large companies throughout the country are making money selling purified table water, and large up-to-date institutions, manufacturing plants and department stores are installing purification systems.

There are many methods of water purification. Some use filters, others chemicals, while still others treat the water by heat to remove the bacteria. Each of these methods will do the work required more or less perfectly, but there are objections to all such systems. It was due to these objections that the Electric Water Sterilizer Company, Scottdale, Pa., developed its standard No. 2 electric sterilizer.

It has long been known that electricity will decompose water into its elements—hydrogen and oxygen. It has also been discovered that at the time of the decomposition of the water, much of the animal and vegetable matter present in the water is rendered inert. The oxygen which is set free is in such a form that it will assist in destroying the lower forms of animal and vegetable life. At the same time it is made easier to filter the organic matter out of the water by mechanical filters.

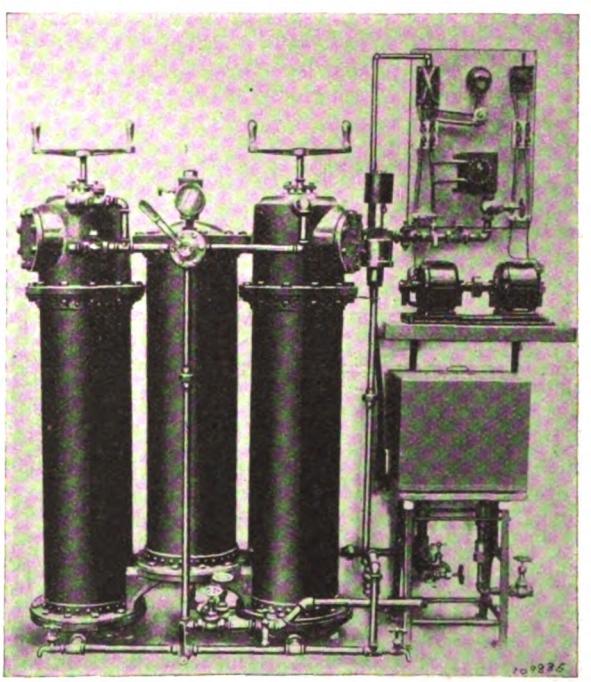
The sterilizer illustrated is composed of four essential parts, the electrode box, the coagulation chamber, the filter cylinders, and the automatic hydraulic motor and switch. The water to be purified first enters the electrode box, which is made up of a number of metal plates containing slots through which the water is passed.

After leaving the electrode box, the water flows into the coagulation chamber where the germs and bacteria are brought together. These are filtered out during the passage of the water through two filter cylinders. The water comes from the second cylinder ready for use.

Whenever water is drawn from any faucet connected with the machine, the hydraulic motor automatically closes the electric switch, so that power is being used only when the water is being drawn. When the water is turned off, the hydraulic motor stops and automatically breaks the electric circuit.

The electric circuit is insulated from the filter cylinder and water-supply line by long insulating tubes, inserted in the metal piping under the electrode box, and the electrode box itself rests on four heavy porcelain knobs, thus preventing any grounding of the circuit.

In installations where alternating current is the only available source of power, a means of changing this to direct current is advisable, as in the latter form the current consumption is less. The illustration shows an electric water sterilizer equipped with a Westinghouse motor-generator set and control panel. This set is used to change the alternating current of the supply system to direct current for use in treating the water. It is connected to an automatic switch controlled by the flow of water, so that it is in operation only while water is being drawn.



Electric Water Sterilizer with Motor-Generator.

New Bryant Socket for Indirect Lighting Fixtures.

The advantages of indirect lighting are quite generally conceded and this method of illumination has become so desirable that many fixtures of other and older types are being discarded. It often happens, however, that the wiring as originally done

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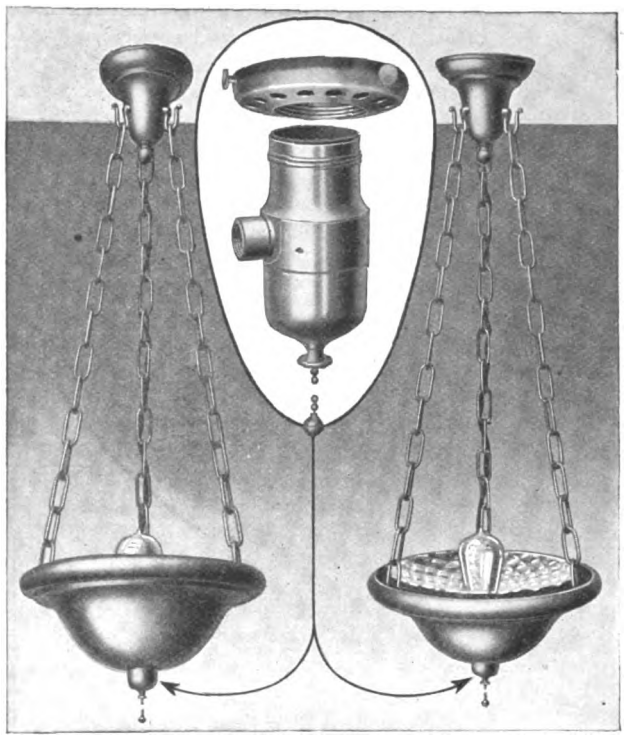


New Bryant Socket and Application to Indirect Fixtures.

has not provided for wall switches and heretofore most indirect fixtures did not permit of pull socket or button switches. In this connection an interesting innovation is the new Bryant socket illustrated herewith.

As will be noted from the illustration, this pull socket with bottom chain guide fits snugly into the bottom of the bowl and protrudes through it just enough to enhance the artistic effect. The socket has the threaded bead upon which any diameter of Uno shade-holder can be readily mounted. The bottom chain guide with pull chain hanging only the necessary length below the fixture provides a most convenient form of local control and at the same time does not mar the general artistic effect of the design of the fixture.

This same style of socket can also be used on a side-wall fixture by attaching it directly to a brass nipple extending from the outlet—the length of this nipple being governed entirely by the dimensions of the canopy and shade-holder used.

Pole-Top Gin for Line Construction.

A pole-top gin has been especially designed to meet certain demands in the erection of steel cross-arms now used so generally on wood-pole transmission lines. The original application was limited to this small field of construction, but it has since been found that it can be used on all line work where weights of any kind must be lifted and supported on wood poles, and it is meeting with considerable favor from linemen in all kinds of work.

It has been found useful in handling transformers on poles, either in new installations or in replacements. As an aid in general maintenance work, it means a saving of hours of labor and time which result simultaneously in the saving of considerable money. In trouble work, especially where time is such an important factor, it can effect such a shortening of an outage in the case where transformers break down and have to be replaced, as to warrant its purchase for use in only one such trouble case. It can also be very satisfactorily used in replacement of poles, as it obviates the necessity of a special pole hoist and a gang of pole erectors.

This pole gin, pictured in the accompanying illustration, has recently been placed on the market by the Railway & Industrial Engineering Company, Pittsburgh, Pa., and at this time a description of its various features and its operation may be desirable.,

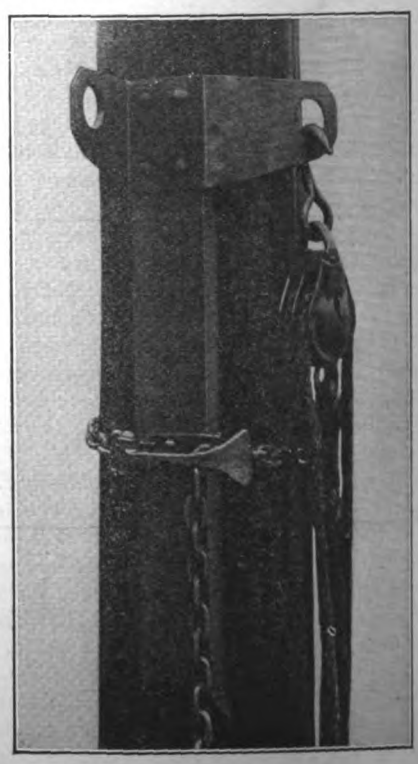
It will be noted that it consists of a main base fitted with four spurs and a chain and lever for clamping it to the pole. Tackle can be suspended from the arms at the top. To attach the pole gin the lineman jabs the lower spurs into the pole as he would a spear, then the top of the channel is thrust towards the pole, and the upper supports sink into the wood. In this position the gin will "stay put" while the handle is opened and the chain carried around the pole and linked into the catch. The handle is then closed, causing the chain to bite into the pole. In its closed position, the handle is self-locked. If the chain is too loose and does not bite into the pole firmly enough, the handle is opened, the chain disengaged from the catch and lengthened out one link, and pushed up at the back of the pole. This virtually acts so as to shorten the chain when the handle is closed again. The chain takes a firm hold and the gin is ready for use.

As the load is placed on it the lower spurs bite into the pole further and become firmly placed. This is an especially attractive feature, that is due to the simplicity and ease of attachment to and detachment from the pole regardless of the load to be carried, the gin is readily attached, and there is no danger of its slipping loose. When the work is finished it can be readily and instantly detached, although it may have carried its maximum load.

As designed, the present gin can safely carry a load of 1,500 pounds and if necessary 2,000 pounds in emergency. This capacity is ample, therefore, to handle the usual loads that are placed on the pole.

In various other classes of work where it is customary to lash a rope to the top of the pole for hoisting purposes, this gin can be used to advantage and economically. In its original application where a new transmission line was being built the groundman was able to hoist the steel crossarms from the ground into position at the very top of the pole, while the lineman without the usual strenuous effort on his part bolted the arm into place.

In all line work, the new gin will relieve the lineman of heavy lifting and give the groundman more work. This results, therefore, in a greater efficiency of the line gang.



Application of Pole-Top Gin.

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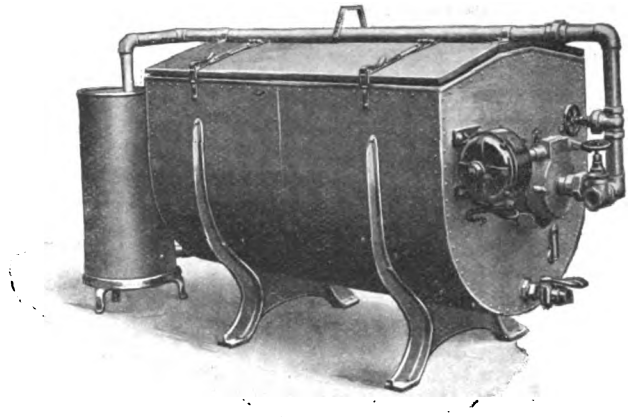
Motor Application to Pasteurizer.

The main object of pasteurization of milk is to eliminate diseases by destroying pathogenic bacteria or disease-producing germs. Milk from healthy cows, if properly handled, is free from disease germs, but exposure to air and unhealthy conditions causes such germs to accumulate and propagate in vast numbers. This tendency can be overcome by pasteurization. Physicians and scientific men claim that the use of pasteurized milk has saved the lives of a multitude of children as well as of adults, and they consider it health-giving to a very decided extent, as the process of pasteurization does not detract from the nutritive value of milk.

The widespread demand for pasteurized milk and cream has led to the development, by the A. H. Reid Creamery & Dairy Supply Company, of Philadelphia, Pa., of a line of pasteurizers using what is known as the Batch pasteurizing system. The machine consists essentially of a cylindrical vat and a spiral coil of heavy copper tubing. The coil is arranged so that it can be revolved, the ends terminating in a gland type of stuffing boxes. The water is heated in a separate tank connected to either end of the coil by piping. The water is circulated from the heater through the coil and back to the heater. The practice is to heat the milk to 140 or 145 degrees Fahrenheit and hold this temperature for 30 minutes. Then cold water is introduced into the coil and the milk cooled down to bottling temperature, which is about 50 degrees Fahrenheit or less.



Electrically Driven Pasteurizer.

The illustration shows a Reid positive pasteurizer equipped with a three-quarter-horsepower single-phase Westinghouse induction motor. The motor is direct-connected to the worm drive of the spiral coil and gives the constant speed necessary for pasteurization work.

View in One of the Factory Departments of the Metropolitan Engineering Company.

The rapid growth of the central-station industry has created a large field for electrical protective devices and specialties of various kinds, to the manufacture of which the Metropolitan Engineering Company, of New York City, has devoted itself for many years. The factory buildings of this company are located at 1238-1262 Atlantic Avenue, Brooklyn. They are large and commodious structures comprising several acres of well lighted floor space. These buildings have been constructed in accordance with the most advanced ideas of efficiency engineering and they afford special facilities for the rapid handling of large orders. From the time that material enters into the plant in its raw state until it leaves as a finished product, it does not cross its own track and moves through the various manufacturing departments on the regular scale. The view shown above is along one side of the third floor of building No. 2, where various cutout blocks, fuses, etc., are being assembled. The line of Metropolitan protective devices and specialties developed and manufactured by the company consists in part of the following: Service and watt-hour meter protective devices, alternating-current network protectors, reactance coils, subway cable racks, primary cutouts and fuses, service switches, panelboards and switchboards, direct-current cable-testing ammeters, electric bath cabinets, fixtures for type C Mazda lamps, cinder and dust catchers, electric dishwashers, electric refrigerators, watt-hour meter seals, copper terminals and sleeves, sealable fuses, etc.

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INDUSTRY ACTIVITIES

Harry W. Terry announces the removal of his engineering offices on June 1 to 486 Endicott Building, New York City.

The Hartman Electrical Manufacturing Company, Mansfield, O., has issued Bulletin No. 15, on its line of lighting and ignition switches for automobiles.

C & C Electric & Manufacturing Company, manufacturers of motors, generators and appliances, Garwood, N. J., has issued Bulletin No. 101, on its type-SL motors.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Leaflet No. 3862, on its type C1, two-speed, alternating-current, elevator motors.

Globe Stove & Range Company, Kokomo, Ind., has issued a leaflet giving directions for using Globe electric ranges. Copies will be sent to those interested upon request to the company.

The Van Dorn & Dutton Company, Cleveland, O., manufacturer of gears, announces the removal of its office in Denver, Colo., from the Ideal Building to 1633 Tremont Street, C. H. Davidson remaining as its district sales manager.

Stanley & Patterson, 23 Murray Street, New York City, have issued a mailing card announcing the opening of their new warehouse at West and Hubert Streets, New York City, where they will maintain a large stock of electrical supplies.

Mesher Ornamental Post Company, Evansville, Ind., through its Chicago district office, of which A. M. Ryckoff is manager, has received the contract for furnishing 340 ornamental standards, which will be a part of a white-way system to be installed in Springfield, O.

Western Conduit Company, Youngstown, O., announces the removal of its offices in Philadelphia, Pa., to the Pennsylvania Building. The Youngstown Sheet & Tube Company, of which the former company is a subsidiary, has also removed its Philadelphia offices to that building.

Fairbanks, Morse & Company.—At an annual meeting of the board of directors of Fairbanks, Morse & Company the following officers were elected for the coming year: Chairman of the board, C. H. Morse, Sr.; president, C. H. Morse, Jr.; first vice-president, W. E. Miller; vice-president, H. C. McClary; vice-president, H. J. Fuller; secretary and treasurer, F. M. Boughey; assistant treasurer, B. E. Cremerius, and assistant secretary, C. A. Meyer.

Arthur D. Little, Incorporated, 93 Broad Street, Boston, Mass., the well known firm of chemists, engineers and industrial plant managers, has organized its Canadian business as a separate corporation to which a charter has been recently granted. It is known as **Arthur D. Little, Limited,** with headquarters at 137 McGill Street, Montreal, Canada. The new corporation has been organized and equipped for the service of Canadian industry and the study and development of Canadian resources.

Louisville Signs Must Be Kept Burning.—Judge Samuel Boldrick in the Ordinance Court, Louisville, Ky., has upheld the validity of an ordinance which stipulates that those who install electric signs in front of their places of business over the sidewalk must keep them burning on both sides from dusk until 10 p. m. The case, which involved ten defendants, hung on this point, the city contending that since it issued the permit it had a right to stipulate conditions, while for the defendants it was contended that in this matter the city was attempting to regulate a matter of esthetics rather than exercising a police power.

Lake Superior Electrical Company, Superior, Wis., is preparing to erect a two-story office and factory building, 55 by 100 feet, at North Third Street and Grand Avenue, in that city. The company will be prepared to enter into the manufacture of electrical specialties and appliances on a larger scale than allowed by present facilities.

Dayton Engineering Laboratories Company.—It has been practically decided that the Dayton Engineering Laboratories Company, of Dayton, O., manufacturer of "Delco" electric automobile starting and lighting equipment, will be one of the companies involved in the proposed merger of motor-appliance manufacturers to form the United Motors Corporation. President Edward A. Deeds is said to have made this announcement recently. The several companies involved will remain intact for the purpose of operation, it is understood.

Ward Leonard Electric Company, manufacturer of electric controlling devices, announces the removal of its main office and factory from Bronxville, N. Y., to its new building at Mt. Vernon, N. Y. The increased demand for floor space and labor operators is the reason for the change. The company began manufacturing electric controlling devices in Bridgeport, Conn., in 1892. After two years in Bridgeport and three years in Hoboken, N. J., it moved to Bronxville, where it has been located for the past 19 years. The new factory is somewhat nearer to New York City than the old one.

Anderson Electric Car Company's New Service Station.—A marked evidence of the rapidly growing popularity and the prosperity of the Anderson Electric Car Company is soon to appear in the form of a splendid new service, repair and sales station, to be erected at the corner of Cass Avenue and Antoinette Street, Detroit, Mich. The new building will be four stories in height, and will have a floor space of about 60,000 square feet. Every convenience will be installed for efficiently and quickly handling all kinds of electric car and battery repair or adjustment work. A special feature of the service department will be the enlargement and perfection of a monthly inspection and adjustment service, for which a very nominal sum will be charged the car owner. This service will be so comprehensive and thorough that it will keep the average car in perfect running condition, thereby eleminating expensive repairs that are often the eventual result of improper care or neglect. All makes of electric cars will be welcome at the new station. A special department for automobile painting will be installed, which will be representative of the highest standards of the coach-painting art. It seems that this new Detroit electric car station will be the largest and finest establishment of its kind in the United States, and may be properly termed a fitting monument to the progress, energy and foresight of the Anderson Electric Car Company, which for the past ten years has constantly striven to place the electric car in the strong position of approval it is now enjoying. At the present time there are over 800 Detroit Electrics used in and about Detroit. More than a year ago it became apparent that the present service station of the Anderson Company, at 687 Woodward Avenue would soon become inadequate to care for Detroit Electric cars, considering the volume already in use and the rapid rate of increase, as evidenced by daily sales. The larger and more efficient facilities of the new station, the site of which was very carefully selected, therefore, appear to be merely the logical necessity created by a prosperous, well managed industry.

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PERSONAL AND BIOGRAPHICAL

MR. O. S. TAPPEN has recently been placed in charge of the Chicago office of the Bristol Company as district manager. Mr. Tappen has been connected with the Bristol Company for a number of years, at both the home office in Waterbury, Conn., and more recently at the Pittsburgh office, besides having spent some time in a temporary capacity at the Chicago office.

MR. J. M. DRABELLE, recently elected president of the Iowa Section of the National Electric Light Association, is electrical engineer for Iowa Railway & Light Company, Cedar Rapids, Iowa. He received his early education in the public schools of Umatilla, Fla., Des Moines, Iowa, and Trenton, Mo. His high-school education was received in Blees Military Academy, Macon, Mo., and West Des Moines, and he was graduated from the college of engineering, Purdue University, in 1910, receiving the degree of electrical engineer in 1915. Since his graduation Mr. Drabelle has been connected with the Cedar Rapids and Iowa City Railway & Light Company, the Boone Electric Company, the Iowa Electric Company, the Iowa Falls Electric Company and with the Iowa Railway & Light Company.

J. M. Drabelle.

MR. W. H. THOMSON, JR., who on June 1 became general manager of the Kansas City (Mo.) Light & Power Company, was graduated from Cornell University in 1898. His first executive position was that of president and general manager of the Corsicana (Tex.) Traction & Light Company. After leaving there he was employed either as manager or assistant manager of the central-station companies at St. Paul, Minn.; Fargo, N. D., and San Antonio, Tex. In 1911 Mr. Thomson was chief operating engineer of the Illinois Traction System, with headquarters at Peoria, and the following year he became general manager of the Des Moines (Iowa) Electric Company, which position he held until the recent change. His successor at Des Moines is MR. M. G. LINN, who was general superintendent of the Bloomington & Normal Railway & Light Company, Bloomington, Ill., for 15 years.

MR. LOUIS E. GOULD, of Presque Isle, Me., has been appointed manager of the Caribou Water, Light & Power Company.

MR. HENRY I. HARRIMAN, of the New England Power Company, has been elected first vice-president of the Boston Chamber of Commerce.

MR. R. M. HENDERSON, district manager of Stone & Webster Engineering Corporation, with offices at Chicago, Ill., has been elected president of the Alumni Association of Armour Institute of Technology.

MR. OTTO F. LUEPKE, until recently superintendent of the municipal electric-light and water plant at Randolph, Wis., has assumed a similar position in the municipal plant at Reedsburg, Wis. Mr. Luepke has been engaged in municipal electric-light plant work in Wisconsin for some years past.

MR. THOMAS H. BIBBER has resigned as general sales manager of the Adams-Bagnall Electric Company, Cleveland, O., and takes up immediately new duties as sales manager of the Luminous Unit Company, St. Louis, Mo. "Tom," for a long time sales manager for Edwards & Company, New York, N. Y., has struck a fast gait recently. His work with Adams-Bagnall was highly successful. His new connection is to his advantage, and the company adds a virile and enthusiastic element in calling him to its organization.

MR. CHARLES D. LE MAISTRE, of London, England, was among those who attended the Chicago conference on safety rules held by the Bureau of Standards this week. Mr. Le Maistre is secretary of the Electrical Section of the British Engineering Standards Committee, the authority which passes upon all standard engineering specifications in England. He is in this country to represent the British members of the International Electrotechnical Commission in conference with the American members. One meeting has been held in New York and another is to follow. Meanwhile Mr. Le Maistre will visit Canada and various parts of this country.

MR. J. E. ERICKSON has joined the sales organization of the Packard Electric Company of Warren, O., and will cover the territory formerly in charge of MR. BENJAMIN SMITH. Mr. Erickson's experience in the electrical field dates back to 1903 when he entered the employ of the Edison Electric Illuminating Company, of Boston, spending about a year with that concern. He then entered the engineering department of the Condit Electrical Manufacturing Company, of Boston, covering its New England territory, after which he was transferred to Chicago, Ill. Two years later he took charge of the Cleveland office of the Condit Electrical Manufacturing Company, resigning in 1914 to enter the Cleveland office of the Western Electric Company. Mr. Erickson had specialized on motor-car power plants and central-station practice, which experience peculiarly adapts him for the duties associated with his new position.

MR. W. W. STOREY has been appointed commercial agent for the Puget Sound Traction, Light & Power Company at Puyallup, Wash., to succeed MR. W. P. ELLINGWOOD, who recently met death in an automobile accident. Mr. Storey is at present commercial agent at Kent, and for a short time he will have charge of both the Kent and Puyallup stations.

MR. F. B. GLEASON, who recently became general telephone sales manager for the Western Electric Company, was formerly manager of the Western Electric Company in the Far East, with offices in Tokio, Japan. Mr. Gleason was born in Red Oak, Iowa, and was graduated from the University of Iowa in 1901. He has been identified with telephone interests since 1902, when he acted as special agent for the Iowa Telephone Company. In 1904 he became associated with the telephone department of the Western Electric Company at Chicago and in 1907 he opened that company's branch house in Dallas, Tex. In 1909 Mr. Gleason was appointed manager of the company's Pacific district, the position he held until 1912 when he was transferred to Tokio.

F. B. Gleason.

MR. BYRON T. GIFFORD, chief engineer of American Public Utilities Company, has been elected president of the National District Steam Heating Association. The association is composed of some 500 companies operating central steam and hot water heating systems.

OBITUARY.

MR. CHARLES M. EVELETH, an electrical engineer for many years employed by the New York Telephone Company, died May 24 at his home in Bayside, L. I., in his forty-fifth year.

MR. WILLIAM P. HARPER, head of the purchasing department of Allis-Chalmers Manufacturing Company, died suddenly in Milwaukee on May 27. He was connected with the company for fifteen years, was president of the Northwestern Manufacturing Company, of Milwaukee, and vice-president of the First National Bank of West Allis, Wis. A widow and son survive.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

AUGUSTA, ME.—The Central Maine Power Company has applied to the Public Utilities Commission for authority to purchase the capital stock of the Newport Light & Power Company.

BELLOWS FALLS, VT.—Plans are being considered by the City Council for the establishment of a municipal electric-lighting plant.

ENOSBURG FALLS, VT.—Plans are being considered here to erect a new electric-lighting plant to cost $10,000.

BOSTON, MASS.—The Edison Electric Illuminating Company has started construction of a large substation for the distribution of energy in the Milton district.

HOLYOKE, MASS.—The electric light department proposes to erect a coal pocket in connection with the generating station.

LYNN, MASS.—The Campbell Electric Company will erect a six-story addition to its factory here.

SHELBURNE FALLS, MASS.—The New England Power Company of this city has purchased the holdings of the Connecticut River Transmission Company, of Worcester, Mass.

PROVIDENCE, R. I.—The Rhode Island Company, which operates extensive street railways, is to build and equip two new transformer stations at Harmony and Burrillville, costing about $45,000.

MANCHESTER, CONN.—A contract for the construction of an electric railway to connect this place with Willimantic, via Coventry, a distance of about 20 miles, has been awarded. The undertaking involves about $1,000,000.

NEW HAVEN, CONN.—The Connecticut Company has awarded a contract to The J. G. White Engineering Corporation, of New York City, for the engineering and construction of a new steam power plant in this city. The plans for this power station are being prepared for an ultimate capacity of 100,000 kilowatts. Construction work on the foundation for this plant will begin this week. This plant will take the place of the company's old direct-current station at New Haven, and probably two substations will be built for local distribution of energy to the Connecticut Company's lines. The energy generated by this new plant will be in addition to that delivered to the Connecticut Company's lines by its other important stations, among which are those located at Waterbury, Bridgeport, Hartford and Berlin, Conn.

BROOKLYN, N. Y.—Plans have been prepared for a power plant to be erected by Ralph Leininger in Grand Avenue near Flushing Avenue. Helmle & Corbett are the architects.

BROOKLYN, N. Y.—The Brooklyn Edison Company has purchased property at Willoughby and Pearl Streets for an addition to its plant, to be erected at a cost of about $1,000,000.

BUFFALO, N. Y.—The Seneca Street Business Men's Association has petitioned the City Council for the installation of a modern electric-lighting system in Seneca Street.

EARLVILLE, N. Y.—Extensions to its distribution lines are being considered by the Earlville Electric Light Company.

FAIR HAVEN, N. Y.—Plans for an installation of an electric-lighting system are being considered here.

GLOVERSVILLE, N. Y.—The installation of a white-way system in the business district is being considered by the City Council.

LYSANDER, N. Y.—The Public Service Commission has approved the exercise of franchises in this city for the construction of transmission and distribution lines by the Seneca River Power Company, of Baldwinsville.

ASHVILLE, PA.—The Penn Central Light & Power Company, of Altoona, is preparing to furnish this city with electrical energy for street lighting and private consumption.

ERIE, PA.—The Erie Lighting Company has filed an application with the Public Service Commission asking permission to issue $350,000 in stock. According to the application the proposed issue will be used to retire present outstanding six-per-cent preferred stock, to provide funds for reimbursing the company's treasury, for expenditures made from earnings, for improvements, extensions and betterments to its plant during the last three years and to provide funds for the completion of an addition to the company's plant.

MARCUS HOOK, PA.—The American Viscose Company has awarded a contract to William Provost, of Chester, for the construction of a new electric power plant.

POTTSVILLE, PA.—The Eastern Pennsylvania Light, Heat & Power Company has been incorporated with a capital of $5,000 by E. G. Walborn to furnish electric service in Rahn Township.

TARBORO, N. C.—Bonds in the sum of $30,000 have been issued for extensions and improvements to the electric-lighting and waterworks systems.

SUMMERTON, S. C.—Bonds in the sum of $6,000 have been voted to complete the electric-lighting plant here. D. O. Rhame, secretary of Commissioners of Public Works, has prepared plans.

BLUE RIDGE, GA.—An electric railway will be constructed between this city and Copper Hill, Tenn., a distance of about 14 miles. H. P. Mulkey, of Blue Ridge, is interested in the project.

ROME, GA.—An ordinance providing for a special tax for the purpose of erecting a municipal electric-lighting plant is being considered by the City Council.

ROYSTON, GA.—Arrangements are being made for the development of a water-power site on Broad River at a point about eight miles from this city. Bonds in the sum of $300,000 will be issued, the proceeds to be used for the development. The J. B. McCrary Company, engineer, Third National Bank Building, Atlanta, Ga., is preparing plans.

TAMPA, FLA.—The Tampa & Eastern Traction Company has awarded a conditional contract to the Utilities Construction Company, of Norristown, Pa., for the construction of an electric railway from Tampa to Lakeland, Fla., a distance of 33 miles.

NORTH CENTRAL STATES.

EDGERTON, O.—E. A. Geauque has been granted permission by the Public Utilities Commission to sell his electric-lighting plant and distribution system to the Northwestern Ohio Light Company, of Van Wert.

COLLEGE CORNER, O.—J. H. McCray has been granted a franchise to erect and operate an electric-lighting plant in this city. It is proposed to have the plant in operation within a few months.

YOUNGSTOWN, O.—The council is considering installation of a white-way system on Front, Champion, Felps and Wood Streets.

GALVESTON, IND.—The Indiana Railways & Light Company, of Kokomo, has petitioned the Public Service Commission for permission to purchase the holdings of the Galveston Light & Power Company. If permission is granted, energy for the local system will be secured from the former company's station at Kokomo.

TOPEKA, IND.—The Hawks Electric Company, of Goshen, is negotiating for the purchase of the local electric-lighting system.

ARENZVILLE, ILL.—An electric-lighting plant will be installed here by J. G. Pratt and others of this city.

GREENFIELD, ILL.—The Central Illinois Public Service Company is planning to build a new service station in this city, to be equipped with new machinery.

EAST ST. LOUIS, ILL.—The Rapid Transit Company of Illinois has disposed of $3,500,000 worth of bonds for the purpose of constructing an electric railway from East St. Louis to Chester. The company has practically concluded negotiations for the purchase of the Wabash, Chester & Western Railroad, a steam road which operates between Chester and Mt. Vernon, Ill., and which will be electrified. D. P. Roberts is manager of the Rapid Transit Company.

CALUMET, MICH.—Plans for an ornamental lighting system for this city have been proposed by the Houghton County Electric Light Company and probably will be adopted by the city.

HESPERIA, MICH.—Reed & Speese, of Whitehall, Mich., are endeavoring to obtain a franchise for the operation of a hydroelectric plant on White River, to furnish energy for light and power to this city.

LACROSSE, WIS.—The power plant of the Wisconsin-Minnesota Light & Power Company was destroyed by a fire last week, started by lightning. The loss is estimated at $75,000, fully covered by insurance, and the plant probably will be rebuilt at once.

OREGON, WIS.—An election will be held this week to vote on the question of establishing an electric-lighting plant here.

OSHKOSH, WIS.—Tentative plans for a new lighting system for this city have been prepared by W. A. Baehr, consulting engineer, of Chicago, and are being considered by the City Council.

SHAWANO, WIS.—The city is considering plans to construct a hydroelectric plant on Wolf River near here at the cost of about $70,000.

TWO RIVERS, WIS.—The Wisconsin Public Service Company has been granted a franchise to extend its lines to this city to furnish service here. Clement C. Smith, 14th First National Bank Building, Milwaukee, Wis., is president of the company.

WASHBURN, WIS.—The Commercial Club has appointed a committee, of which F. T. Beers is a member, to obtain estimates on the cost of an ornamental street-lighting system for the business district.

ADA, MINN.—Plans are being considered for the installation of a white-way system in the business district.

ALEXANDRIA, MINN.—J. F. Druar, 312 Commercial Building, St. Paul, Minn., is preparing plans for improvements required at the municipal electric-lighting plant here.

BACKUS, MINN.—Arvig Brothers have been granted a franchise to erect and operate an electric-lighting plant here.

HARTLAND, MINN.—Plans are being discussed here for the establishment of a white-way system by J. A. Halverson and others. The electric-lighting plant being erected here will be completed by fall.

AURORA, IOWA.—The Smith Power & Light Company, of Arlington, Iowa, has been granted a franchise for installing an electric-lighting system here.

DERBY, IOWA.—A franchise to install and operate an electric-lighting system here probably will be granted to the Leon (Iowa) Electric Company.

FAIRFIELD, IOWA.—The Home Gas, Light & Power Company has been incorporated here with a capital of $10,000 by Vernon L. Hague and others. The company will manufacture and distribute electricity and gas for light, heat and power.

LYONS, IOWA.—The Commercial Club is advocating the installation of a boulevard lighting system in the business district here.

BRECKENRIDGE, MO.—The city has entered into a contract with the Hamilton Electric Light Company, of Hamilton, Mo., whereby the latter will furnish electrical energy for street lighting and private consumption.

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BURLINGTON JUNCTION, MO.—The City Council is considering a proposition from the Maryville (Mo.) Electric Light & Power Company for the purchase of the municipal electric-lighting plant. If the sale is made the company will erect a transmission line from Maryville to this city to supply energy.

BLUE HILL, NEB.—The City Council has selected plans submitted by R. A. Bradley & Company, of Hastings, for the new $7,000 municipal electric-lighting and water plant to be erected here during the summer.

HOLBROOK, NEB.—Bonds have been voted for the erection of municipal electric-lighting plant.

PILGER, NEB.—E. G. Brueggeman, of Norfolk, has been granted a franchise to erect and operate an electric-lighting plant here.

SIOUX FALLS, S. D.—A general resolution requiring all telegraph, telephone and electric distribution wires to be placed underground in certain sections of the city has been passed.

YANKTON, S. D.—Plans are being considered for a number of extensions to the street-lighting system here.

PETERSBURG, N. D.—The Petersburg Electric Company has been organized by A. R. Swendseid and others. The company will erect a power plant here in the very near future.

WASHBURN, N. D.—An addition is being built to the electric-lighting plant here to house the new generating equipment to be installed soon.

SOUTH CENTRAL STATES.

PADUCAH, KY.—For the purpose of establishing a white way on Broadway, the Retail Merchants Association has asked the city to borrow $30,000. Extensions to the municipal electric-lighting plant will be made if the plan is accepted.

WHITESBURG, KY.—The Commercial Club of this city is considering a plan looking toward establishment of an electric-lighting plant to serve the community.

LAFAYETTE, TENN.—The Clarksville (Tenn.) Ice & Coal Company has purchased the lighting and ice plant of the A. C. Burnett Company and will dismantle it.

ONEIDA, TENN.—The Skaggs-Reagan Electric Company, of Helena, Tenn., is installing a city lighting plant here. The same company has recently completed an installation at Jamestown, Tenn., and will put in a plant at Crossville.

KINGSPORT, TENN.—The Kingsport Power Company has been chartered by Edwin G. Woodling and others to furnish electric service here.

ROCKWOOD, TENN.—Present indications are that this city and Kingston will be supplied with electrical energy from the Ocoee power plant of the Public Light & Power Company. A transmission line will be built from Lenoir City and when it is ready for service the local plant probably will be dismantled and sold.

ATMORE, ALA.—A company is being organized by W. D. Owens, J. E. McCoy and others to develop a waterpower site on the Perdido River near here.

GADSDEN, ALA.—The City Council has amended the franchise to Alabama Power Company, giving the company an additional year in which to furnish the city with energy for electric light and power. The new light and power franchise will be for a period of 30 years.

COLUMBUS, MISS.—The holdings of the Columbus Light & Power Company, the stock of which for a number of years have been owned by an eastern corporation, have been purchased by Memphis capitalists, R. B. Fant has been elected president and R. B. Claggett and E. J. Lenz, both of Greenville, members of the board of directors.

CLIO, ARK.—The question of issuing bonds for the establishment of an electric-lighting system will be submitted to vote.

OKMULGEE, OKLA.—The Okmulgee Light & Ice Company is making the installation of a white-way system for this city and is making a number of plant changes and improvements.

SAPULPA, OKLA.—The Pioneer Telephone & Telegraph Company will erect a three-story building to cost about $60,000. Modern equipment will be installed.

VICI, OKLA.—The City Council is planning to call an election for the purpose of submitting to the voters a proposition to issue $25,000 in bonds for the erection of municipal electric-lighting and waterworks systems.

DATES AHEAD.

Electrical Supply Jobbers' Association. Annual summer meeting, Hot Springs, Va., June 6-8. Secretary Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

Ontario Electrical Dealers' and Contractors' Association. Annual convention, Toronto, June 6-8. Secretary, Marshall Soules, Oshawa.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 22-23. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Rochester*, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

CORPUS CHRISTI, TEX.—The Ward Island Interurban Company will soon begin the construction of an interurban electric railway from Corpus Christi to Ward Island, a distance of 10 miles. Ormsby McHarg, of New York City, is president.

DALLAS, TEX.—The Texas Southern Traction Company and the Texas Traction Company have been merged into a new company, called the Texas Electric Company. The consolidated company owns and operates 251 miles of interurban electric railway in North and Central Texas. It plans to extend the Dallas-Waco line from the latter city to Austin, a distance of 100 miles.

SANGER, TEX.—The Sanger Light & Power Company has been incorporated with a capital of $10,000 by C. P. Dodson and others to erect and operate an electric-lighting plant here.

WESTERN STATES.

CARLSBAD, N. M.—M. Tansill, owner of the Tansill power site, has applied for a franchise to supply energy for electric lighting in this city.

TUCSON, ARIZ.—Contracts for various supplies for the power plant to be erected at the University have been awarded.

LOVELOCK, NEV.—The Nevada Valleys Power Company has been awarded a contract by the County Commissioners to place lights at various points in the business and residential districts of the town of Lovelock.

ASHTON, IDAHO—The Ashton & St. Anthony Power Company has applied for a franchise to furnish electrical energy for heating purposes here.

ANACORTES, WASH.—The Anacortes Light & Water Company, in filing supplemental articles of incorporation, has changed its name to the Washington Power, Light & Water Company. It is reported that additions and extensions to the local plant and lines will be made, and that financial arrangements are practically completed.

MABTON, WASH.—The Pacific Power & Light Company has applied for a 50-year franchise in this city.

PASCO, WASH.—The Pacific Power & Light Company has agreed to install in the near future, incandescent lights, replacing the present arcs at points to be designated by the City Council.

SEATTLE, WASH.—The committee appointed by the City Council to investigate the feasibility of developing a power site 75 miles from Seattle on the Sauk and Suiattle River courses, in an unofficial statement, report that the site under contemplation as an adjunct to the present municipal plant is desirable and well worth development. A joint report will be submitted later to the Mayor and City Council for action.

BEND, ORE.—The Bend Water, Light & Power Company, under the direction of M. J. Danielson, is making improvements and additions to its plant here. Among other improvements to be made is a new generator to be installed this summer.

OAKRIDGE, ORE.—Articles of incorporation have been filed by the Billy Creek Mining Company, of Oakridge, and general offices will be maintained in this city. The company announces its intentions of engaging in the water, light and power business, as well as mining, and that the light and power field will be developed this year. The company plans to serve current to Oakridge and contiguous territory. The incorporators are N. G. Hyland, E. E. Hyland and C. E. MacFarland, all of this city.

PORTLAND, ORE.—Building Inspector Plummer has cancelled the license of the Smith-McCoy Company, electrical contractors, for alleged violation of the Electrical Code. According to reports, the company obtained permits to perform certain electrical work, which in turn was turned over to contractors, who were not registered, according to the terms of the Electrical Code.

SEASIDE, ORE.—W. H. Galvani, engineer for the Pacific Light & Power Co., has asked the City Council for a 25-year franchise. His company has purchased the Seaside Light & Power Company and desires to install a high-tension line from Astoria to Seaside.

KERNVILLE, CAL.—The Pacific Light & Power Corporation has been authorized by the State Railroad Commission to operate under a franchise in Kern County, which gives it the right for 50 years to maintain an electric power and distribution system in a portion of the county. The company intends to serve the following under the franchise at present: Kernville, Quarry, Tehachapi, Monolith cement plant and the Tropico Mining Company.

LOS ANGELES, CAL.—B. C. McEwan has been awarded the contract for additional lighting posts in the Westgate lighting district.

LOS ANGELES, CAL.—The City Council has passed an ordinance providing for the submission to voters at the special election to be held on June 5 of a proposition for the acquisition and construction of a municipal telephone system and the issuance of bonds in the sum of $8,000,000 to pay for the same.

LOS ANGELES, CAL.—The city of Los Angeles and its board of Public Service Commissioners have applied to the State Railroad Commission for a determination of the conditions and manner of the crossing of the high-voltage power lines of the Pacific Light & Power Corporation with the proposed high-voltage power lines of the city and the lines of the Southern California Edison Company.

NEEDLES, CAL.—W. C. Richling was here recently to look over the ground and route for an electric railroad between Needles and Oatman, Ariz. A preliminary survey will be made on which to estimate the cost of the proposed line.

OCEANSIDE, CAL.—H. H. Jones, manager of the San Diego Electric Company, was here recently in connection with the proposed purchase of the local electric plant.

PLACERVILLE, CAL.—A suit has been started in the Superior Court by the Pacific Gas & Electric Company for the condemnation of land in this county which it desires for the right-of-way of a transmission line being constructed between Nevada and San Joaquin Counties.

SAN PEDRO, CAL.—Property owners have petitioned the City Council for the installation of ornamental lights on Sixth Street between Beacon and Pacific Avenues.

SANTA BARBARA, CAL.—Plans are under way for the construction of a radio station on Santa Cruz Island.

CANADA.

VANCOUVER, B. C.—According to reports, the British Columbia Electric Railway Company and the city of Vancouver have completed arrangements whereby the company will install 400-candlepower nitro-

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gen-filled arc lamps with clear globes, to replace the 350-candlepower carbon lamps with frosted globes now in use.

YORKTON, SASK.—Debentures to the amount of $47,500 have been sold by this city, the proceeds to be used for the installation of a second 500-horsepower generating unit in the municipal electric-lighting plant.

Proposals

ELECTRIC BELLS.—Sealed proposals will be received at the office of the business manager of the Board of Education, 730 Tribune Building, Chicago, Ill., May 31, for electric bells for sundry schools, according to plans on file in the office of the repair department.

MOTOR-DRIVEN PUMP.—Sealed proposals will be received June 7 at Room 406, City Hall, Chicago, Ill., for furnishing and delivering in the Rogers Park Pumping Station, 7200 Sheridan Road, on foundations prepared by the city, one motor-driven centrifugal pump and all auxiliaries, appurtenances and accessories, according to plans and specifications on file in the office of the Department of Public Works. W. R. Moorhouse, Commissioner of Public Works.

ELECTRICAL SUPPLIES.—Sealed proposals will be received at the office of the Superintendent of Prisons, Department of Justice, Washington, D. C., until June 19, for furnishing and delivering at the United States penitentiary, Atlanta, Ga., addition to main switchboard, power tablets, etc., and electric feeders for light and power to west main cell wing, in accordance with specifications. Copies of the specifications, together with further information, may be had upon application to the above-named office.

ELECTRIC ELEVATORS.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., June 22, for the installation complete of an electric passenger elevator in the United States post office and courthouse at Opelika, Fla., and for an electric passenger elevator in the United States post office, courthouse, and custom-house at Corpus Christi, Tex., in accordance with the drawings and specification, copies of which may be had at that office in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9710, Washington, D. C., one feeder panel and equipment, and 17,000 feet of weather-proof copper wire. Schedule 9715, Newport, R. I., 15,000 feet ebonite tubing. Schedule 9718, Brooklyn, N. Y., 50 parabolic searchlight mirrors. Schedule 9720, Philadelphia, Pa., 5,000 solid, arc-lamp carbons and 10,000 feet flexible cord for portables. Schedule 9732, Norfolk, Va., 12 portable, 0.25-horsepower ventilating sets. Schedule 9732, Brooklyn, N. Y., 20,000 feet of double-conductor wire and 47,000 feet of twin-conductor wire. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

ELECTRIC-LIGHTING SYSTEM.—Sealed proposals will be received June 16 at Trenton, Neb., for furnishing material and labor for the construction of an electric-lighting system, separate bids being received as follows: For the furnishing of all labor and materials for the construction of the complete improvement; for the furnishing of one 35 to 40-horsepower oil engine direct connected to one 25-kilowatt direct-current generator, storage battery, switchboard, and all necessary labor and materials for the installation of the complete plant equipment and for the furnishing of all labor for the complete construction of the pole line and street-lighting system; for the constuction of a brick power station building. A. L. Taylor, Village Clerk. Fairbanks, Morse & Co., Engineers, Omaha, Neb.

New Incorporations

ROUNDUP, MONT.—A. L. Powell Power Company. Capital, $1,000,000. Manufacturing and construction. Incorporators: A. L. Powell, M. C. White and others.

BEAUMONT, CAL.—Riverside County Gas & Power Company. Capital, $100,000. Incorporators: G. W. Lindsay, W. H. Ranhart, F. N. Hawes, K. R. Smoot and L. H. Gates.

ST. LOUIS, MO.—J. C. C. Waldeck Electric Railway Company. Capital, $10,000. Build an electric railway. Incorporators: J. C. C. Waldeck, A. Bischoff, F. Schmidt and others.

LOUISVILLE, KY.—Best Manufacturing Company. Capital, $100,000. Manufacture electrical and other appliances for automobiles. Incorporators: G. H. Turner, A. T. Burgevin and S. S. Fitzpatrick.

BAY SHORE, N. Y.—Universal Lighting Systems Corporation. Capital, $100,000. Manufacture lighting and heating systems. Incorporators: G. W. Lindsay, W. H. Randall and H. P. Porter, New York City.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 21,221. HYDROELECTRIC PLANT.—An American consular officer in the Far East advises that a mining company in his district is planning to install a small hydroelectric plant and wishes to receive quotations from American manufacturers for a complete equipment. Correspondence should be in French and quotations in francs. Measurements should be stated in the metric system.

NO. 21,230. ELECTRIC POWER PLANT.—An American consular officer reports the publication in a trade journal of an invitation for bids for the supply and delivery of overhead mains and street-lighting equipment, power-station equipment, service meters, line transformers, and accessories, in New Zealand. Sealed tenders for the supply of this material will be received by the Town Clerk, Oamaru, New Zealand, until June 23, 1916. Copies of the specification, conditions of contract, and forms of tender, together with blue prints, may be seen at the council's offices, Oamaru, and copies may be obtained on payment of $5.11 for each contract. The Bureau has no further information in regard to this opportunity.

NO. 21,239. ELECTRIC LAMPS.—A dealer in electrical apparatus in Spain informs the Bureau that he desires to communicate with American manufacturers of so-called "one-half watt or nitrogen" electric lamps.

NO. 21,256. ELECTRICAL SUPPLIES AND MACHINERY.—A firm of exporters and importers in the Orient desires to be placed in communication with manufacturers and exporters of electrical supplies and machinery for the manufacture of silk and cotton tape. Catalogs and price lists, etc., should be sent. References are furnished.

NO. 21,330. CARBONS, ETC.—An American consular officer in the United Kingdom reports that a man in his district desires to receive quotations on carbons used for cinematographs measuring 12 inches in length by 16 and 22 millimeters. He is also in the market for metal filament bulbs for flash-lamp batteries.

Financial Notes

The Grand Rapids (Mich.) Railway Company has been granted permission to issue $3,500,000 in bonds in order to retire outstanding bonds and take care of current liabilities.

The Long Island Lighting Company, of Northport, N. Y., has applied to the Public Service Commission for authority to issue $92,000 par value of additional five-per-cent, 25-year, first-mortgage bonds, under a trust mortgage heretofore approved by the commission, and $80,000 par value of the capital stock of the company.

An income balance of $129,418 for a nine-month period ending March 31 is shown in a financial statement recently submitted by the San Francisco-Oakland Terminal Railways with its request to buy new cars. The statement shows that its total operating income for this period was $837,278; its gross income, $885,157, and its total deductions from gross income, $755,739.

The Greenfield (Mass.) Electric Light & Power Company plans to put in effect an issue of employee's stock to the amount of $50,000, in $10 shares, to be subscribed for by people in the company's employ, and will probably petition the Gas and Electric Light Commission for approval of such an issue, in the near future.

Lincoln Gas & Electric Light Company has called for payment at 101 and interest on July 1 the $500,000 three-year six-per-cent collateral notes due July 1, 1917.

Middle West Utilities Company announces that it will pay on June 1 through the Illinois Trust & Savings Bank the $3,500,000 six-per-cent collateral-trust notes dated June 1, 1913.

The California Railroad Commission has authorized the Mount Whitney Power & Electric Company to issue at not less than 96 $450,000 first-mortgage six-per-cent bonds, the proceeds to be applied to various capital expenditures on the properties.

New Orleans Railway & Light Company has sold to Bertron, Griscom & Company, Reilly, Brock & Company and the Hibernia Bank & Trust Company, of New Orleans, $3,250,000 refunding and improvement five-per-cent bonds, due 1949, and $3,250,000 two-year six-per-cent notes. Proceeds of these securities will pay off the $4,000,000 six-per-cent notes maturing June 1, give the company ample funds for improvements made and to be made, and also will purchase and cancel $1,000,000 of the French series of refunding and improvement five-per-cent bonds. A selling syndicate has been formed and is offering the notes at par and interest and will soon make an offering of the five-per-cent bonds.

Papers are being drawn up for a three-year extension of the Chicago Elevated Railroad Company $14,000,000 two-year five-per-cent notes. The interest rate will be raised to six per cent, according to an understanding recently reached in New York between the Samuel Insull Syndicate and the National City Bank, which holds a majority of the notes and will carry those presented for payment upon maturity on July 1. In case any holders of notes of the Chicago Elevated do not agree to the extension, but present their holdings for payment on July 1, Samuel Insull has made an arrangement with the National City Bank whereby the payments will be made.

Dividends.

	Term	Rate	Payable
Conn. Power, pf.	Q	$1.50	June 1
Dom. Pw. & Trans., com.	—	2 %	June 15
East. Shore Gas & Elec., pf.	Q	1.5 %	June 1
Interstate Elec. Corp., pf.	Q	1.75%	June 1
National Carbon, com.	Q	2 %	July 15
Penn. Water & Pw.	Q	1 %	July 1
Pensacola Elec., pf.	S	$3	June 1
Stand. Gas & Elec., pf.	Q	1 %	June 15
Third Ave. Ry.	Q	1 %	July 1
United Rys. & Elec., pf.	S	2 %	June 1

Reports of Earnings.

PHILADELPHIA COMPANY.

The Philadelphia Company has issued its pamphlet report for the year ended March 31, 1916. Income account of the Philadel-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 29	May 22
American Tel. & Tel. (New York)	129⅜	128⅞
Commonwealth Edison (Chicago)	141⅜	141
Edison Electric Illuminating (Boston)	238	235
Electric Storage Battery common (Philadelphia)	63	64½
Electric Storage Battery preferred (Philadelphia)	63	64½
General Electric (New York)	170½	172¼
Kings County Electric (New York)	130	129
Massachusetts Electric common (Boston)	—	37
Massachusetts Electric preferred (Boston)	—	—
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	122	—
New England Telephone (Boston)	132	132½
Philadelphia Electric (Philadelphia)	27⅝	27¾
Postal Telegraph & Cables common (New York)	83½	85
Postal Telegraph & Cables preferred (New York)	68	68
Western Union (New York)	96	94
Westinghouse common (New York)	62	62
Westinghouse preferred (New York)	70	70

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phia Company proper compares as follows:

	1916	1915
Total earnings	$8,028,519	$7,288,753
Expenses and taxes	3,405,047	3,406,884
Net earnings	4,623,473	3,881,869
Other income	2,658,048	2,312,527
Total income	7,281,520	6,194,395
Charges, rents, etc	2,393,235	2,251,092
Balance	4,888,285	3,943,304
Improvements, betterments, etc.	1,030,902	1,106,736
Surplus	3,857,383	2,836,568

PITTSBURGH RAILWAYS.

Pittsburgh Railways Company has issued its pamphlet report for the year ended March 31, 1916. Income account compares as follows:

	1916.	1915.
Gross earnings	$12,123,276	$11,670,091
Total operating expenses	7,243,388	7,615,120
Taxes	447,516	438,082
Net operating revenue	4,432,372	3,616,889
Auxiliary earnings	48,017	46,435
Total net earnings	4,480,389	3,663,324
Other income	107,435	112,832
Total income	4,587,824	3,776,156
Rent and current interest	2,974,531	2,955,797
Interest on funded debt	389,106	389,621
Net income	1,224,187	430,739
Interest on debentures	600,000	360,739
Improvements, depreciation, etc	512,579	.....
Surplus for year	111,608	100,000
Previous surplus	627,274	636,982
Deductions from surplus	89,672	109,708
Profit and loss surplus	649,210	627,274

MONTREAL LIGHT, HEAT & POWER.

Montreal Light, Heat & Power Company reports income account for fiscal year ended April 30, 1916:

	1916	1915
Gross earnings	$6,977,168	$6,717,106
Expenses and maintenance	2,856,798	2,881,198
Depreciation and renewals	675,000	650,000
Net earnings	3,345,370	3,085,908
Interest charges	487,181	485,198
Dividends	1,870,940	1,827,500
Surplus	987,248	769,243

COLUMBIA GAS & ELECTRIC.

	1916	1915
April gross	$ 787,924	$ 720,932
Net	427,505	382,456
Total income	467,326	423,171
Surplus after charges.	126,134	86,152
Four months' gross	3,477,541	3,241,859
Net	1,886,497	1,737,775
Total income	2,039,931	1,893,346
Surplus after charges.	690,252	543,485

For April, 1916, gross of South Covington & Cincinnati Street Railway increased 5.7 per cent, electric revenues of Union Gas & Electric Company, 17.3 per cent, and gas revenues, 3.6 per cent; electric revenues of Union Light, Heat & Power Company increased 12.3 per cent and gas revenues 28.5 per cent over corresponding month of preceding year.

GREAT WESTERN POWER.

Great Western Power Company has issued its report for April and the 12 months ended April 30. The figures for April are:

	1916	1915
Operating revenue	$293,519	$237,392
Operating expense and taxes	101,479	64,381
Net	192,040	173,011
Other income	272,688	201,682
Total income	228,984	193,851
Interest in funded debt	139,942	106,521
Surplus	89,041	87,330
Accrued dividends	12,500	.....
Balance of surplus	76,541	74,830

For the 12 months ended April 30 the figures are:

	1916	1915
Operating revenue	$3,326,362	$2,727,850
Operating expense and taxes	1,114,212	826,519
Net	2,212,449	1,901,331
Other income	272,688	201,682
Total income	2,484,837	2,103,013
Interest on funded debt	1,420,743	1,229,455
Surplus	1,064,094	873,558
Accrued dividends	150,000	.....
Balance of surplus	914,094	873,558

DUQUESNE LIGHT.

Duquesne Light Company has published its pamphlet report for the year ended March 31, 1916. Income account compares as follows:

	1916	1915
Total earnings	$5,368,025	$4,938,862
Expenses and taxes	2,672,874	2,737,580
Net earnings	2,695,151	2,201,282
Other income	224,386	258,658
Charges, rents, etc	727,803	690,836
Balance	2,191,734	1,769,104
Discounts, depreciation, etc.	577,247	204,954
Surplus	1,614,487	1,564,150
Previous surplus	571,117	243,743
Total surplus	2,185,603	1,807,893
Preferred dividend	205,702	46
Common dividend	1,264,706	1,236,730
Improvements and betterments written off	95,774	.....
Total deductions	1,566,182	1,236,776
Profit and loss surplus	619,421	571,117

PACIFIC GAS & ELECTRIC.

Pacific Gas & Electric reports for April, first four months of 1916 and twelve months ended April 30 as follows:

	1916	1915
April gross	$1,486,528	$1,512,103
Net after taxes	598,413	652,125
Total income	627,482	680,975
Surplus after charges	292,314	324,641
Four months' gross	6,364,436	6,261,430
Net after taxes	2,684,635	2,765,731
Total income	2,864,164	2,865,895
Surplus after charges	1,507,497	1,405,331
Balance after preferred dividends	1,055,468	1,040,868
Balance after common dividends	630,755	558,350
Twelve months' gross	18,633,307	17,448,235
Net after taxes	7,863,612	7,335,439
Total income	8,356,856	7,629,640
Surplus after charges	4,314,932	3,077,652

BYLLESBY PROPERTIES.

Combined earnings of public utility properties operated by H. M. Byllesby & Company, including Northern States Power and Standard Gas & Electric, were as follows for April and twelve months ended April 30:

	1916	1915
April gross	$1,388,331	$1,272,839
Net after taxes	683,227	602,256
Twelve months' gross	16,039,031	14,862,419
Net after taxes	7,913,921	7,116,491

CALIFORNIA-OREGON POWER.

California-Oregon Power Company reports for 1915 as follows:

Operating revenue	$392,350
Operating expense	332,406
Net	59,944
Non-operating revenue	5,998
Gross corporate income	65,943
Interest on funded debt	213,063
Other interest deductions	680
Miscellaneous deductions	3,897
Total deductions	217,641
Net corporate loss for year	151,698
Miscellaneous additions	2,295
Miscellaneous deductions	16,757
Surplus December 31, 1914	25,720
Deficit December 31, 1915	140,439

GEORGIA RAILWAY & POWER.

	1916	1915
April gross	$ 586,137	$ 527,389
Expenses and taxes	317,085	306,839
Net earnings	269,052	220,550
Four months' gross	2,322,014	2,132,689
Expenses and taxes	1,302,318	1,268,889
Net earnings	1,019,696	863,800

New Publications

RICHMOND REPORT.—The annual report of the Electrical Department of Richmond, Va., for 1915 has been printed. It covers electrical inspection and street lighting, which is done by a municipal plant. E. W. Trafford is city electrician.

MINERAL RESOURCES.—The United States Geological Survey has issued two large volumes dealing with "Mineral Resources of the United States for 1914." Part I treats of metals, while Part II deals with nonmetals. Figures for production are given and are followed by a series of articles on individual topics. The two volumes comprise 2,190 pages.

Electrical Patents Issued May 16, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,183,870. Portable Electric Lamp. H. M. Greist, F. W. Beckert and G. L. Hinman, assignors to The Greist Mfg. Co., New Haven, Conn. Structure of standard having sheet-metal base.

1,183,871. X-Ray Tube. E. Grimes, Des Moines, Iowa. Delivers beam of parallel rays.

1,183,875. Electrical Circuit. R. V. L. Hartley, assignor to Western Electric Co., New York, N. Y. Network containing thermionic amplifier.

1,183,877. Electromagnetic Regulating Device. G. Honold, assignor to the firm of R. Bosch, Stuttgart, Germany. Comprises compression resistance with provision for maintaining even distribution of resistance mass.

1,183,881. Apparatus for Interconverting High-Potential Polyphase and Direct Electric Currents. C. G. Koppitz, Youngstown, O. Alternating winding tapped to segments of commutator, commutator and brushes relatively rotated in synchronism with current.

1,183,882. Means for Transferring High-Potential Electric Currents in Parallel Equal Arcs. C. G. Koppitz, Wilkinsburg, Penn. For converting alternating to direct current.

1,183,883. Means for Transferring High-Potential Electric Currents as Interrupted Arcs. C. G. Koppitz, Wilkinsburg, Penn. Modification of above.

1,183,890. Electrical Controlling System. A. E. Lundell, assignor to Western Electric Co. Telephone trunking system.

1,183,912. Electromagnetic Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Electrically controlled valves effects pressure reduction in auxiliary reservoir to supply fluid to brake cylinder.

1,183,913. Electric Fluid-Pressure Brake. W. V. Turner, assignor to Westinghouse Air Brake Co. Electrically controlled valve vents fluid from piston chamber to apply brakes.

1,183,923. Selecting Apparatus. F. A. Watkins, assignor to Western Electric Co., New York, N. Y. Semi-automatic telephone system.

1,183,924. Electrically Heated Vessel. W. L. Waters, Milwaukee, Wis. Immersion heater suspended from tea-kettle lid.

1,183,925. Electric Heater System. W. L. Waters, Milwaukee, Wis. Body has heating coils of high and low electrical input, which are automatically substituted for each other according to temperature of body.

1,183,926. Heating Apparatus. W. L. Waters, Milwaukee, Wis. Heater between compartments delivers more heat to one than other.

1,183,946. Leak-Nullifying Means for Telegraph Systems. J. H. Bell, assignor to Western Electric Co. Condenser arranged to be charged and discharged by operation of key, thereby momentarily de-energizing relay and opening line circuit.

1,183,949. Electric Therapeutic Device. F. F. Burdick, Milton, Wis. Adjustable support for electric heater.

1,183,951. Jar for Electric Batteries. R. N. Chamberlain, assignor to Gould Storage Battery Co., New York, N. Y. Details of ceramic structure.

1,183,992. Method of Cast-Welding Electric Bonds. J. C. Lincoln, Cleveland, O. For applying bonds to rail ends by use of arc.

1,183,993. Method of Bonding Railway Rails. J. C. Lincoln. For applying bond of relatively higher thermal and electric conductivity to rail ends by use of arc.

1,183,995. Car-Control System. P. J. McGowan and R. J. Dikeman, New York, N. Y. Controller on rear car rendered operative or inoperative by motorman on forward car.

1,184,001. Loading Coil for Telephone Lines. W. Merz, assignor to Western Electric Company. For phantom line systems.

1,184,017. Relay. P. M. Rainey, assignor to Western Electric Co. Details of polarized device.

1,184,020. Switch - Stopping Mechanism. J. N. Reynolds, assignor to Western Electric Co. For telephone switch.

1,184,029. Automatic Safety Device for Automobiles. E. Schatz and B. Whitehouse, Vincennes, Ind., assignors of one-third to E. Morgan, Vincennes, Ind. Gage connected with crank casing has contact controlling float.

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1,184,047. Pupin Coil. E. Thuermel, assignor to Siemens Halske, A. G., Berlin, Germany. Special winding.

1,184,054. Trolley-Wheel Adjuster. G. Ulrich, Los Angeles, Cal. Telescoping sleeve at end of pole secured thereto by spring opposing both reciprocating and turning movements.

1,184,056. Self-Contained Generating and Lighting Unit. H. R. Van Deventer, Sumter, S. C. Armature of magneto carries lamp.

1,184,063. Pull-Switch Socket for Electric Lamps. R. B. Benjamin, Chicago, Ill. Combined socket and shade with pull cord between lamp and shade.

1,184,086. Chemical Process. C. Ellis, Montclair, N. J. Process of hydrogenating oils, etc., comprising use of nascent and electrolytic hydrogen.

1,184,089. Apparatus for Transferring Knitted Fabric. H. T. Fleischer, Philadelphia, Pa. Mounting of lamp, etc., for lighting transferring.

1,184,090. Direction-Predicter for Vehicles. H. J. Frerks, Chicago, Ill. Indicating lamps under control of driver and passenger.

1,184,091. Electric-Storage Cooker. R. E. Frickey, Redding, Cal. Arrangement of heat-insulation and storage devices.

1,184,104. Electric Switch. C. J. Klein, assignor to the Cutler-Hammer Mfg. Co., Milwaukee, Wis. Two-push-button mechanism for socket.

1,184,105. Electric Attachment Device. C. J. Klein, assignor to Cutler-Hammer Mfg. Co. Attachment plug and receptacle with contacts having snap action independent of rate of movement of plug.

1,184,134. Combined Car Signal and Control Apparatus. H. Rountree, assignor to National Pneumatic Co., New York, N. Y. For elevators; when car door opens and switch closed motor is inoperative and signal operative.

1,184,135. Dry Cell. J. Rudolphs, Henriksdal, Sweden. Porous electrode treated with hygroscopic material absorbs moisture from air to prevent drying out of pasty electrolyte.

1,184,157. Dynamoelectric Machine. E. J. Andrews, assignor of one-fourth to G. L. Chindahl, Chicago, Ill. Armature comprises circuit-changer for changing connections of coils to wave or lap winding.

1,184,161. Connector for Electrical Conduits. H. D. Betts, assignor to Thomas & Betts Co., New York, N. Y. For spirally wound conduit.

1,184,162. Selector Switch. G. A. Betulander, assignor to Betulander Automatic Telephone Co., London, England. Structure of device for telephone system.

1,184,163. Automatic Telephone System. G. A. Betulander, O. Grahn and N. G. Palmgren, assignors to Relay Automatic Telephone Co., London, England. Arrangement of circuits, selectors, impulse transmitters, etc.

1,184,169. Elevator System. E. L. Dunn, assignor to Standard Plunger Elevator Co., Worcester, Mass. Arrangement of signals in automatic system.

1,184,178. Electrical Vaporizing Apparatus. M. W. Hanks, Indianapolis, Ind. Structure of device having spaced electrodes which can be set for vaporizing certain amount.

1,184,183. Switch. A. A. Kent, Philadelphia, Pa. For ignition circuit.

1,184,200. Apparatus for Heating Water. J. E. E. Nash, Palmyra, Nebr. Immersion device.

1,184,224. Dynamoelectric Gear of the Unipolar Type. M. Breslauer, Berlin, Germany. Combination of two machines with stators forming a common housing.

1,184,230. Vibrating Rectifier. D. C. Davis, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Has auxiliary flux for opeating during starting period in Wheatstone-bridge arrangement for charging batteries.

1,184,233. Rectifying Apparatus for Electric Currents. F. Giglio, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Electromagnetic vibrator arrangement.

1,184,234. Electrically Lighted Switch. W. M. Goehrend, assignor of 40/100 to V. K. Wyndeard and 20/100 to A. F. Goehrend, Aberdeen, Wash. Lamp in push button lighted when latter depressed.

1,184,236. Electric Heater for Soldering Irons. J. T. Hawkins, Tacoma, Wash. Structure of heating chamber for receiving irons.

1,184,244. Electric Piano-Player with Damping Device. J. F. Kelly, Pittsfield, Mass. Inductive means controls magnetism of key-operating magnets.

1,184,262. Controlling Mechanism for Alternating Machines. A. Redfield, Ogden, Utah. Magnetic circuit of compensator is varied.

1,184,264. Controller for Groups of Electric Circuits for Advertising and Other Purposes. E. Savoye, St. Etienne, France. Contacts controlled by ball rolling between compartments in shiftable container.

1,184,266. Voltage Regulator. E. O. Schweitzer, Chicago, Ill. For lamp and motor load branches connected in parallel to service transformer.

1,184,273. Electric-Conduit Junction-Box. F. H. Terry and H. M. Bigwood, Wolverhampton, England. Manner of connecting pipe to box.

1,184,313. Electrical Plug. D. E. Bown, Crafton, Pa. Details of device having single integral main member.

1,184,336. Combination Wire Support for Electric Distribution. J. L. Fay, assignor to W. N. Mathews and Brother, St. Louis, Mo. Pole bracket.

1,184,376. Radio Telegraphy and Telephony Receiver. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., Boston, Mass. Manner of associating detector with receiving coil and earth.

1,184,396. Electrically Illuminated Shoe. J. E. Trimble, Chicago, Ill. Ornamental device with battery lamp for toe of shoe.

1,184,400. Lamp. E. W. Wilson, Chicago, Ill. Details of headlight reflectors.

1,184,402. Spark-Plug Tester. W. S. Witter, Toledo, Iowa. Cap for applying current.

1,184,430. Temperature-Control Mechanism. A. De Khotinsky, assignor to Central Scientific Co., Chicago, Ill. In water heater, units cut in and out by thermally controlled electromagnets.

1,184,434. Method of and Apparatus for Wireless Telephony and Telegraphy. C. D. Ehret, Philadelphia, Pa. Separately generating high-frequency oscillations, of high and low power, modifying latter by speech and transmitting resultant.

1,184,453. Mining-Machine Truck. E. L. Hopkins, assignor to Jeffrey Mfg. Co., Columbus, O. Comprising reeling mechanism for electric cable.

1,184,454. Electrical Switch. B. D. Horton, Detroit, Mich. Iron-clad.

1,184,456. Electrochemical Treatment of Metal-Bearing Material. W. H. James, assignor to New Refractory Ores, Limited, Johannesburg, Transvaal, South Africa. Refractory precious metal ore made amenable to cyanide process by treatment with anode solution on electrolyzing eodium chlorid.

1,184,458. Vacuum Cleaning Machine. J. B. Kirby, Cleveland, O. Mounting of motor.

1,184,460. Process of and Apparatus for Regulating Synchronous Motors Controlling the Speed of Converter Collector Brushes. C. G. Koppitz, Youngstown, O. Fixed frequency maintained.

1,184,461. Safety Appliance for Elevators. J. J. Kuntz, Brooklyn, N. Y. Details of cam switch.

1,184,503. X-Ray Apparatus. M. Alden, Springfield, Mass. For holding tubes.

1,184,520. Electric Furnace Permitting the Extraction in a State of Purity of Zinc from Its Ores. E. F. Cote and P. R. Pierron, assignors to Societe Anonyme pour Electrimetallurgie du Zinc, Procedes Cote et Pierron, Lyon, France. Ores melted in arc and resistance furnace and indirect resistance furnace in which zinc vapors separated and condensed.

1,184,536. Portable Electrical Measuring Instrument. M. B. Kassel and A. Finkenberg, New York, N. Y. Battery tester has coil which is zigzag strip stamped from sheet-metal body.

1,184,539. Electric Table Attachment. D. H. Kendelhardt, Brooklyn, N. Y. Push buttons on reeled cords.

1,184,570. Trolley Ear. W. A. Rice, Huntsville, Mo. For engaging round wire.

1,184,573. Trolley-Wire Support. G. H. Goff and L. Rollins, Roda, Va., assignors of one-half to W. A. Owens, Roda, Va. Clamp for "8" wire.

1,184,597. Apparatus for Regulating Street Traffic. J. G. Wallmann, Oakland, Cal., assignor of one-third to C. A. McCann, Berkeley, Cal., and one-third to J. G. Sherry, Oakland, Cal. Manually operated and has horn and semaphore carrying lamps.

1,184,598. Apparatus for Regulating Street Traffic. J. G. Wallmann, Oakland, Cal. Semaphore and fluid-pressure whistle operated by electromagnets.

1,184,602. Train-Controlling System. T. Williams, Eddystone, Pa. Special switch structure.

1,184,607. Cinematographic Apparatus. W. H. Anderson, London, England. Solenoid closes safety shutter if sprocket fails to grip film.

1,184,613. Light Reflector for Engine Cabs. J. L. Boyd and L. Sawallirch, Glendive, Mont. Has electric socket and will also receive gas or oil lamp.

1,184,636. Trolley-Pole. A. E. Feagan and J. C. Nelson, Marine City, Mich. Links connecting pole with stand.

1,184,657. Timing Device for Electric Circuits. S. J. Paul, Los Angeles, Cal. Details of interrupter mechanism.

1,184,658. Time System. A. A. Radtke, assignor to Electric Time Recorder Co., Chicago, Ill. Successively energized magnets, controlled by rotary switch and time mechanism, rotate shaft.

1,184,664. Vibrator. W. R. Sorgel, assignor to International Electric Tool Co., Milwaukee, Wis. Arrangement of segmental switching device for rapidly energizing and de-energizing magnet.

1,184,675. Vibrator. W. H. Gaulke, assignor to International Electric Tool Co. Related to above; operated from alternating current.

1,184,676. Lamp Shade. E. G. George, Springfield, Ill. For incandescent lamp; body frame and cap from single sheet.

1,184,678. Switching Device. D. D. Gordon, assignor to Yost Electric Mfg. Co., Toledo, O. Pull-socket movement.

1,184,685. Electric Fire-Alarm System. J. L. Flagg and F. T. Towers, assignors to Watson-Electric Co., Paterson, N. J. Comprises combination of storage battery and preferred energy source.

1,184,692. Automatic Means for Operating Valves of Gas Generators. J. C. Shaw, assignor to The Bartlett Hayward Co., Baltimore, Md. Governed by time-controlled electrical mechanism.

1,184,704. Electrical Synchronizing for Talking Motion Pictures. G. P. McDonnell, St. Louis, Mo., assignor of one-half to J. M. Hockmuth, St. Louis, Mo. Interrelated signals for motor-driven phonograph and hand-operated picture machine.

1,184,706. Resistance Grid. W. H. Keller, Norton, Va. Non-cast iron, for rheostats and heaters.

PATENTS EXPIRED.

The following United States electrical patents expired on May 30, 1916:

725,763. Ground Detector. E. M. Hewlett, Schenectady, N. Y.

625,786 to 625,788. Electric-Lighting Device. S. E. Mosher, Chillicothe, O.

625,792. Electromagnetic Mechanism for Actuating Engine Valves. E. W. Naylor, Philadelphia, Pa.

625,797. Telephone Switchboard. J. M. Overshiner, Elwood, Ind.

625,806. Operating Dynamoelectric Machines. E. W. Rice, Jr., Schnectady, N. Y.

625,816. System of Electrical Distribution. E. Thompson, Swampscott, Mass.

625,823. Telegraphy by Means of Electric Light. K. Zickler, Brunn, Austria-Hungary.

625,828. Cable Coupling. F. E. Case, Schenectady, N. Y.

625,830. Inspector's Indicating Wattmeter. F. P. Cox, Lynn, Mass.

625,875. Electrically Controlled and Operated Railway Signal. W. Daves, Jersey City, N. J.

625,915. Controller. T. von Zweigbergk, Cleveland, O.

625,921. Rotary Circuit-Breaker. H. Boas, Berlin, Germany.

625,923. Magneto-Bell Striker. R. Brueckner, Boston, Mass.

625,938. Accumulator Plate. H. B. Osborn, Chicago, Ill.

625,953. Electric Device for Propelling and Controlling Vehicles. R. M. Hunter, Philadelphia, Pa.

626,009. Transmitting Movement to a Distance by Electromagnetic Mechanism. E. Raverot and P. Belly, Paris, France.

626,017. Incandescent Electric Lamp. R. W. Carroll, Blandinsville, Ill.

626,020. Mechanism for Starting, Stopping and Reversing Direction of Motion of Electric Motors and for Controlling Speed of Same. F. H. Foster, New York, N. Y.

626,033. Electrolytic Apparatus and Process of Treating Impregnators Therefor. M. Perreur-Lloyd, Paris, France.

626,065. Insulator. W. E. Holmes, Newton, Mass.

626,111. Telephone-Connecting Circuit. G. K. Thomson, M. and T. C. Wales, Jr., Newton, Mass.

626,131. Selective Electric Signal. J. A. Barrett, Summit, N. J.

626,132. Selective Privacy-Switch for Multiple-Station Telephone Lines. J. A. Barrett, Summit, N. J.

626,134. Prepayment Electrical Meter. C. O. Bastian, London, England.

626,135. Electrolytic Meter. C. O. Bastian, London, England.

626,143. Insulated Joint for Electric Fixtures. E. E. Clift, Philadelphia, Pa.

626,146. Telephone Toll Circuit. H. M. Crane, Boston, and T. C. Wales, Jr., Newton, Mass.

626,168. Trolley Catcher. F. N. Kelsey, New Haven, Conn.

626,172. Rotary Transformer or Synchronous Motor. B. G. Lamme, Pittsburgh, Pa.

626,190. Electric Arc Lamp. J. R. Perin, Chicago, Ill.

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ELECTRICAL REVIEW

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EDITORIALS

UTILITY COMMISSIONS AND CONTRACTS.

State utility commissions have frequently found it necessary to interfere in private contracts between electric companies and their customers in order to prevent discrimination. When a definite rate schedule is prescribed by a commission, or is filed by a utility and accepted by a commission, it is usually regarded as superseding any special contracts which may previously have been in force. Contracts between a utility corporation and a municipality, such as are frequently included in a franchise ordinance, come in a different category, however. A special rate in such cases, or even free service to the municipality, may be regarded as compensation for franchise privileges, and is to be regarded in the same light as a cash payment or an annual tax or license fee. Where such stipulations have been made in the franchise it is consequently not necessary that rates for service should be the same to a municipality as to a private consumer.

The determination of the legality of such a rate is not a matter for commission decision. The legality is not based upon the reasonableness of the rate, but upon the authority of the municipality to attach conditions to the exercise of the franchise powers when granting them. In most of the states municipalities have such powers, but where any doubt arises as to the status of such a rate, the question is one to be settled by a court of competent jurisdiction.

Such a case arose not long in New Jersey, where the Public Service Electric Company declined to continue free service to the City of Plainfield after the passage of the Public Utilities Act, claiming that such free service would be illegal, even though the service was contracted for in consideration of the right to maintain a distribution system in the streets. The city carried the matter before the Board of Public Utility Commissioners, which ordered the company to comply with the terms of the contract. The company appealed to court, and obtained a decision setting aside the order of the Board. The Court of Errors and Appeals has affirmed this decision, holding that the Board of Public Utility Commissioners went beyond its powers in attempting to enforce performance of contract, which power lies in a court of chancery. The opinion states very clearly, however, that the passage of the Public Utilities Act did not affect the validity of the contract in question, and that the abrogation of this contract is not involved in the question before the court. In other words, while technically the company has won a decision, it is only necessary for the city to take the proper legal procedure to have the contract enforced.

LIGHTING RECESSED DISPLAYS—A FIELD FOR THE CENTRAL STATION.

A valuable field for long-hour lighting service may be found by many central stations in the development of displays of goods in corridor wall recesses adjacent to the mercantile establishments handling the commodities. In some cities the advantages of this kind of service are well appreciated, but in others little has been done to enlarge business along these lines. Even where the corridor of an office building is well lighted, the installation of a luminous display in a recess has real "pulling power," as advertising men say, and such an application of electric service is of maximum value in cases where immediate entrance into the drug store, haberdashery, or whatever the shop may be, can be had from the main corridor.

If such a display is arranged near the building entrance, and consequently on the street floor, its drawing power naturally exceeds that of a display in an upper floor corridor. Nevertheless, there is an opportunity, in a busy building, for a good deal of useful recess lighting upstairs, if the structural features of the establishment permit. The cost of this kind of advertising runs pretty low in view of the availability of small-powered tungsten lamps. A couple of 15-watt units, for instance, will provide excellent illumination for a recessed display two or three feet long by a foot and a half to two feet high and six or eight inches deep, if some intelligence is employed in the choice of reflectors. If this seems too small for the display of dark goods, let four 10-watt tubular lamps be provided along the top of the recess, and the effect on the passer-by in an upper floor corridor will be excellent. Good judgment must, of course, be applied and due account taken of the natural lighting conditions, as in some of the more modern office buildings the amount of daylight is so great, even on intermediate corridors, that there is very little demand for artificial illumination of even recessed exhibits, except after dusk, and the tendency toward early closing of offices may render such an installation of little value in exceptional cases.

It is just the older buildings, however, that need the stimulating effect of special lighting to enable their occupants to compete more successfully with lessees of newer structures. There is a temptation sometimes to over-energize recessed exhibits, as in a recent case where two 60-watt carbon incandescents were installed at the top of a recess containing hos-

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iery, the recess being about the size mentioned above. Here two 25-watt tungsten lamps would have provided an admirable volume of light, with superior color qualifications and a bill for energy less than half of that actually obtained. The time-honored custom of getting free renewals on the carbon lamps led the owners of the haberdashery to continue using carbons, and the result was a much poorer illumination than could have been secured at less cost. Of course, it should not be necessary in these days to emphasize the value of providing the customer with the most efficient lighting possible, even at the sacrifice, temporarily, of some of his energy consumption. In dealing with the recessed-lighting customer, the long-hour qualities of the service really put it on the plane of window and sign lighting, and in a good many cases a flat rate with up-to-date equipment will work out better for the customer than metered service. This much is true, also, that the less the service is made to cost the more quickly and lastingly it will become popular, and the more the central station and the lamp and fixture dealer and manufacturer will find such an outlet attractive.

MIXING DAYLIGHT AND ARTIFICIAL LIGHT.

The question of proper illumination in factories and workshops is one of considerable interest to both the factory manager and the central-station man. Some interesting tests have recently been made in England which have a direct bearing upon this question of the proper selection and utilization of the lighting equipment in buildings devoted to these purposes. Continuous records were kept of the power absorbed by a factory during the course of the working day and the average results from a number of such records permits some conclusions of wide application. It may be assumed that there is a direct relation between the amount of power required and the amount of work turned out, so that the former is to a certain extent a measure of the latter.

It was found that the amount of power delivered to the factory had a maximum value during the hours of natural daylight and that it fell off markedly as dusk approached. When artificial light was first switched on there was no corresponding increase in the amount of power required. In fact a tendency in the opposite direction was observable. After twilight was ended and complete dependence was placed upon artificial light, a maximum power demand was again reached almost equal to that under daylight conditions.

It is concluded from the above tests that the mixture of daylight and artificial light which, for most systems of light is decidedly different in color value, does not produce results favoring productive labor. There is probably a psychological and a physiological factor involved here, which we will not attempt to go into, but the result is one which may be applied even without a knowledge of the underlying causes. The exclusive use of artificial light in cases where natural light is insufficient appears to be preferable to any attempt to partially use daylight and supplement it with light from artificial sources. When daylight is insufficient for proper illumination, it would seem better to entirely exclude it by the use of window shades or other suitable equipment.

INVESTING IN GOOD WILL.

A change in ownership is often a critical step in the life of an electric service company with respect to the relations of the management to the local community. If outside interests acquire the property, the policies of the new owners are sure to be scrutinized with a degree of local interest scarcely conceivable to the man at a distance. Much depends on making a good start when the control of affairs passes into the new hands, on showing the local public that, above all, the policy of the square deal will govern mutual relations, and also on indicating anything contemplated in the way of betterments.

In a recent instance, the new managers of the small local plant invited over three score prominent citizens and officials to a reception and dinner at a local hotel, for the purpose of becoming better acquainted and of outlining the company's policies. A local judge acted as toastmaster, and the president and manager of the property addressed the gathering, both men coming from the home office of the controlling syndicate. They pointed out the desire of the company to co-operate with the citizens, its duties toward its stockholders, plans for getting increased business through the organization of new departments, and emphasized that the plant would continue to be managed as an independent one, and not as a subsidiary of any holding company. One of the officers told the gathering how in another town served by a company under the same general management, a committee of which he was a member was instrumental in bringing eleven new industries to the community, one coming from Great Britain. In this way eleven previously empty factory buildings were all occupied, and the speaker informed the assemblage that the same interest would be shown in furthering the development of the new territory taken over. The announcement was made that the buildings of the company would be painted this season; that a large electric sign would be installed on the plant, and a slight reduction in rates was announced. Other speakers outlined the possibilities of developing the community's business to a larger volume, and paid tributes to the management of the old company.

Occasions of this kind afford an opportunity to invest in good will which is well worth considering, and go a long way toward disarming that attitude of doubt toward the benefits of a change which is often maintained in a locality where strangers come into control of certain public services. Such a "get-together" meeting as the one mentioned is none too common, but may the number increase.

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THE VALUE OF MAINTENANCE SERVICE FOR MOTORS.

Every central-station company, whether large or small, has on its lines motors and also domestic and other appliances which are either moribund or actually dead as revenue producers. In the case of motors, the brushes perhaps merely need readjusting, or the windings may need radical repairs, while in the case of household appliances the heating units may require renewing. While the apparatus is in the defective condition it takes no current and produces no revenue for the company and to all intents might as well be in the scrap heap.

Often this inert condition could be remedied by a little advice, or perhaps a mere suggestion. Quite likely the customer owning such apparatus would be glad to have the motor or appliance put in condition for service, at his own expense, if he knew just where to go.

We have in mind an instance, which is typical of thousands of similar cases, in which a large retail coal dealer owning a portable load conveyor driven by a five-horsepower motor, was deprived of the use of the machine, and, at the same time, the central station lost the income naturally derived therefrom, because the owner did not know where to send the motor for repairs, and did not realize it could be readily detached from the machine.

Ordinarily the loader would take 150 to 200 kilowatt-hours a month, which means something like $10 worth of energy for each 25 working days. At the time, the machine had been idle four or five months. A suggestion from the central-station power salesman as to where to send the motor for the needed repair, its approximate cost, and how to disengage it from the machine, might have saved the company the loss of forty or fifty dollars' worth of business—as much as a whole house, or two houses, use in a year—and in this case, it was a daylight load which was being metered on the lighting schedule.

Some central stations find it worth while to send an inspector to homes where domestic appliances are installed, to make a periodical inspection of apparatus and make slight repairs on the spot, if needed. But such companies as do not believe this would be practicable could at least check up the meter readings of power users, note the ones showing decreased consumption, and get in touch with the concerns to learn why the motor equipment is not being used at the normal rate. The cost of this work would be richly repaid in the certain immediate return of revenue and also in the perhaps more valuable result of redeeming the reputation of electrical service which such machinery, when out of commission, is sure to acquire.

It is often possible for electrical contractors to build up a worth-while business in periodical inspection and adjustment of apparatus, as many consumers realize the value of such inspection and are willing to pay for it. Incidentally the contractor is thus put in line for many repair jobs which might otherwise go elsewhere.

AN EXAMPLE OF GOOD PUBLICITY.

The completion of a new office building, the enlargement or reconstruction of a generating station, or the inauguration of a system of improved street lighting affords a text for local newspaper articles about public-utility development which do a vast amount of good. In a recent editorial in these columns on "Making Construction News Interesting," several aspects of publicity were discussed, and we should not refer to the matter at this time had not an unusually interesting example of such work come to hand in the shape of a clipping from the Haverhill (Mass.) *Gazette,* which affords a concrete suggestion for the central-station manager who is in sympathy with such publicity, but who does not possess a developed "news sense."

At Haverhill a new office was the occasion for a 14-inch article in the above mentioned daily. The article emphasized the growth of the company in the past ten years from a plant with 500 to a system with 4,000 customers; told the reader about the corresponding increase in the number of employes; contrasted the generating station of a decade ago with the remodelled plant of today, with appropriate reference to the abandonment of belted, engine-driven equipment and the rapid increase in generating capacity through the use of turbines, showed how hand-fired boilers have been superseded by high-powered units fired by automatic stokers, touched upon the modernizing of the switchboard and installation of various underground conduits in the business center at a cost of $200,000, and emphasized the extension of electric service to suburban villages formerly without the pale of such supply.

The article called the reader's attention to the fact that the company is now installing a single generating unit equal in power to the combined equipment of present service, the latter in itself being five times the capacity of that operated by the company ten years ago. As Haverhill was one of the earliest users of titanium arc lamps, the article also touched upon the improvements in street lighting effected in the past decade, and pointed out the present acceptability of the titanium arc outside the white-way district, the adaptability of magnetites to the latter and the fitness of incandescent lamps for outlying streets. The fact that the company is the city's largest taxpayer was mentioned, with the total to be paid into the city treasury this year. Advances in interior lighting methods were also touched upon, with the comment that the local price of electricity has been cut from 20 to 11 cents per kilowatt-hour in ten years. Other pertinent matters were mentioned, such as the policy of the Tenney syndicate to employ local people so far as possible and to follow the local slogan in developing the community's interests.

It is surprising how much interesting information of this kind can be compressed into a small space, if only a few words are brought in about each subject. Such a story, well broken into short paragraphs, makes good reading for the local subscriber and customer and goes a long way toward demonstrating the solidarity of interest between the public utility and the community.

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Happenings in the Industry

Important Extensions Planned by Utah Company—Flood Lighting of Sheepshead Bay Speedway—Illuminating Engineering Research in England—Activities of Associated Electrical Manufacturers—Massachusetts Commission Discusses Rates—Lamp Testing Results—Oklahoma Association Holds Successful Convention—Pennsylvania Contractors to Meet

IMPORTANT EXTENSIONS PLANNED BY UTAH POWER & LIGHT COMPANY.

Contracts With Coal Mines for Power Makes New Lines Necessary.

The Utah Power & Light Company will start construction soon on an extension to its transmission system into the Carbon County coal fields, the present objective being the coal mines located in the vicinity of Helper and Blackhawk, Utah. This extension will require the construction of approximately 130 miles of transmission lines. The route will be from Springville, Utah, through Spanish Fork Canyon to Helper and Price with a 30-mile side line from Helper to Blackhawk. The work is in the nature of a rush job as the line must be completed and ready for operation by September 1 of this year.

This extension is interesting as illustrating the advantages of electrical energy from central generating stations as compared with isolated generating plants. A few years ago one would have predicted that the coal mines would be one of the last fields which the central-station company could hope to secure, due to the fact that the cost of coal delivered at the mine tipple is so small that the fuel cost is practically negligible. In fact, many mines make no charge whatever for the fuel used by their power plants since they are able to utilize material which would otherwise be a waste. Before beginning work on this extension the Utah Power & Light Company had entered into contracts with four of the mines in this important coal field for power aggregating 1,200 kilowatts, these contracts being made at the company's standard wholesale power schedules.

There are many conditions, of course, which make the sale of energy to coal mines possible, some of the more important ones being as follows: Some of the coal companies own several mines scattered over quite an area and are continually opening up more. They must either install electric generating plants at each mine or a central generating plant and install and maintain quite an expensive distribution system. In either case even though the cost of fuel be small the labor expense is comparatively high if the class of labor which such a system requires in order to operate satisfactorily be employed.

The load-factor of individual mines is relatively low, ranging between 15 and 20 per cent. Even the diversity which may be obtained from the mines of any individual company gives the power plant serving them a low load-factor with consequently low efficiency. The central-station company, however, by taking advantage of the diversity of an entire district and combining it with the diversity of an already large system can obtain a very satisfactory character of load.

The power load of any given mine or any system of mines rapidly increases, due, first, to the normal growth of the business, but what is perhaps more important, due to the fact that as the mine is developed the power consumption per ton of coal mined steadily increases. This is due principally to the greater consumption of the haulage and ventilation systems. Power plants, therefore, are rapidly outgrown. The coal companies must either install plants greatly in excess of their immediate needs and operate them for a considerable period at inefficient loads or continually enlarge their power plant capacity which again spells inefficiency. One of the factors which made it possible for the power company to secure the initial contracts, which guaranteed the construction of this present line, was the fact that one of the large mining companies in the district was confronted with the problem of discarding its present plant and spending a large sum of money on a new one or purchasing central-station energy.

Forty-five, fifty, fifty-five and sixty-foot wooden poles will be used in the construction of this line. An "A" type frame will be used for supporting the transmission wires, the three cables being carried in a horizontal plane by four disk suspension-type insulators with five disks on strain insulators. The conductors will be spaced 13 feet apart. The line is being built for 130,000-volt operation, but will be run at the present at 44,000 volts. The tower spacing is quite irregular, due to the rugged and uneven nature of the country over which it passes. The standard spacing adapted for level country is 500 feet, but the spans will range between 150 feet and 1,500 feet.

The conductors will consist of a cable having a five-sixteenth-inch steel core surrounded by 12 strands of copper wire equivalent to 2/0. The total diameter of the cable is slightly in excess of one-half inch. Since this is to be only a single-circuit line it has been designed with unusual attention, to details with a view of obtaining as nearly as possible uninterrupted service.

Three crews will be engaged on the work. One will start on the Springville end and work toward Gilluly, another at Gilluly working towards Helper and a third on the branch line from Helper to Blackhawk. The installation is being done by the Phoenix Construction Company, under the direction of A. B. Cudebec.

Telephone Statistics of Canada.

The following table shows the capitalization, cost, revenue, operating expenses, and other data connected with the telephone interests of Canada for 1913, 1914 and 1915:

	1913	1914	1915
Capitalization	$59,847,004	$70,291,884	$74,284,991
Cost	$69,214,971	$80,258,356	$83,792,582
Revenue	$14,879,278	$17,297,268	$17,601,672
Operating expenses	$11,175,689	$12,882,402	$12,836,715
Remuneration	$6,839,308	$8,250,253	$8,357,029
Number of telephone companies	1,075	1,136	1,396
Wire mileage	1,092,586	1,343,090	1,452,360
Telephones	463,671	521,144	533,090
Employees	12,867	16,799	15,072
Persons per telephone	16.2	15.5	15.1
Persons per mile of wire	6.8	6.0	5.6

Telephone companies' net earnings, as represented by the difference between total receipts and operating cost, were $4,764,957. This was better by $350,091 than the result for 1914.

The following are the different classes of organization: Government, 4; municipal, 62; stock, 584; co-operative, 601; partnership, 28; private, 117; total, 1,396.

In Manitoba and Alberta practically all telephone interests are in the hands of the local governments. In Saskatchewan the provincial government operates in all the large centers, but has not taken over the 520 small units that spread their wires over the rural sections of the province. In all the provinces there is a growing tendency toward consolidation.

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Flood Lighting of Sheepshead Bay Speedway.

The flood lighting of the Sheepshead Bay Automobile Speedway and of the 160-acre field in its interior will make it the largest illuminated area in the world for holding nighttime outdoor sporting activities, automobile races and military maneuvers. An initial installation of 370 General Electric flood-light projectors, each with a 500-watt, gas-filled Mazda lamp, will be used to illuminate this large space with a light intensity never before attempted on so large a field.

The Sheepshead Bay race track is just out of New York City, near Coney Island. For years it was the annual scene of famous horse-racing events, and the center of attraction for horse lovers throughout the country. Today the great two-mile track has been turned into an automobile speedway and the interior oval is to be used for athletic and military purposes. The two-mile track is 70 feet wide, inside of which is a 30-foot safety zone. The oval field contains nearly 160 acres of turf. This largest and finest automobile speedway is constructed of heavy plank, two inches thick and ten inches wide, placed edgeways and banked 25 feet at each turn.

The interior field will be lighted from 224 flood-light projectors spaced all around the outer edge and directed upon the field. These units will be installed on poles 30 feet above the track and will give an even intensity of illumination over the total field of approximately 50 to 100 times full moonlight. This intensity will be further increased in the section just opposite the grandstand by focusing 114 additional flood-lighting units on this space, the projectors being located at the top of the grand stand and well out of the line of vision of the spectators. The indirect light from these lamps will also light the boxes in the lower tier of the grand stand. Thirty-two additional flood-lighting units will be installed to light the fences, thus lessening the number of patrolmen necessary to guard the track.

The 224 projectors around the two-mile track are arranged so they can be readily turned upon the race course, producing a ribbon of light for the entire two miles of 70-foot track and the 30-foot safety zone. With this arrangement all light sources will be hidden from the eyes of the drivers and the light will come from both sides of the track, always flooding ahead and in the same direction as the speeding machines.

The light source is a 500-watt Edison Mazda type C lamp with a concentrated filament. The lamp is mounted in a projector which has a reflector made of highly polished aluminum spun to a true parabola. The reflector is held in a cast-iron casing and equipped with a door having a round pane of heat-resisting glass that is one-half inch thick.

The flood-light projectors are to be arranged so that any number of lights can be turned on or off at any time, independent of the others, so as to give a certain section brighter intensity of illumination or a lower degree, if desired. The flexibility of the light units allows for a narrow beam of high intensity, or a beam of less intensity, and the fact that the beam can be easily directed either up or down, or sideways, makes it adaptable to all conditions. For instance, the lights can be turned up in the air so as easily to illuminate aeroplanes 500 feet above ground.

Immediately opposite the grand stand will be a parking or repair area for disabled automobiles or those which have to drop out of the race for any reason. This "pit" will be illuminated to approximately twice the intensity of the track so the spectators will be able to witness this interesting part of the race.

Historical pageants, athletic events, a cowboy "stampede," etc., will also be held at night during the coming summer. Heretofore really big outdoor events could only be held during the daytime and not at night when most people have both the time and inclination for amusement.

The speedway will be supplied with current by the Brooklyn Edison Company, from one of its nearby substations. Current will be distributed at three points, the largest feeder being near the grand stand where most of the current will be used. A 200-kilowatt transformer will step the current down from 2,200 volts to 100 volts, 60 cycles, at the grand stand and two 100-kilowatt transformers will be used for this purpose at the other feeding points. A contract has already been signed for 50,000 kilowatt-hours for the first year, and in a year or more, it is expected the load will reach 200,000 kilowatt-hours per year.

Illuminating Engineering Research in England.

On May 9 in London, England, the Illuminating Engineering Society of Great Britain considered the interim report of its Committee on Research. At the end of 1914 the committee was unable to proceed with its work, but it is thought that the present moment, when so much attention is being devoted to scientific and industrial research, is favorable for the resumption of its regular proceedings.

The report therefore set out a long list of subjects specially deserving of research at the hands of the Society, classifying them under the following headings: (a) photometry, standards of light, and researches on color; (b) electric, gas and other illuminants; (c) lighting appliances; (d) general. In the course of detailed references to these four classes it is pointed out that the time is ripe for promoting greater uniformity in methods of testing and describing the illuminating value of lamps of various kinds, and that it would be advantageous if general agreement on this point could be obtained.

As regards glassware required in the British lighting industry, considerable inconvenience has been caused by the shortage of many kinds of glass hitherto imported and it is stated that there are opportunities for research in connection with the manufacture of these varieties of glass in England. It is therefore proposed to appoint a sub-committee to consider a number of aspects of this matter, if possible in co-operation with other bodies interested in the study of glassware.

Street lighting, after the war, will be a good field for effort, particularly as regards the development of more decorative forms of design as well as more scientific treatment of lamp shading and light distribution. The war has impressed people with the importance of street lighting and the conception of a minimum illumination desirable in the interests of safety should be heartily encouraged.

The many questions of interest in connection with searchlights cannot be fully considered at present, as the co-operation of the military and naval authorities is desirable, but experiments on the following points have been suggested: Possible improvements in efficiency (as, for example, those involved in the new searchlight evolved by O. Lummer of Breslau). Investigations into the various points suggested by Mrs. Ayrton in connection with the choice of carbons, best electrical conditions, etc.; also into the type of electrical generator best adapted for searchlights. Preparation of simple instructions for working searchlights. Attempt to define more precisely the "range" and the "candlepower" with a view to these quantities being specified in the future. Inquiry into the best color of light, as regards its effect on penetrating power

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and on the apparent sharpness of objects illuminated by the searchlight beam.

Other matters for research mentioned by the committee include the lighting of rifle ranges, library lighting, the lighting of museums and picture galleries, and the lighting of hospitals. In regard to the last of these, the lighting of hospital wards is admittedly often unsatisfactory. The lighting of operating tables requires investigation, and the subject might be studied in connection with field hospitals using portable illuminants.

Section for Fan Motors Organized by Associated Manufacturers.

In response to an invitation issued by the general secretary of the Associated Manufacturers of Electrical Supplies, a meeting of the manufacturers of electric fan motors was held at the Hotel Biltmore, New York, on May 17, to consider the advisability of forming a Section in the association.

Practically all of the leading manufacturers of fan motors were represented at the meeting, which was called to order by the general secretary of the association, Charles E. Dustin, who briefly outlined the objects desired to be attained by the formation of a Fan Motor Section.

Thomas M. Debevoise, counsel of the association, explained in detail the benefits to be derived through the co-operative efforts of manufacturers in the development of the art under central control and within legal limits, giving a very general talk on the activities which might be considered in the section with accompanying advantage to the members.

Upon the question being submitted as to the desirability of forming the Section it was moved, seconded and unanimously carried that a Fan Motor Section be formed. T. H. Bibber, formerly with the Adams-Bagnall Electric Company, was elected temporary chairman of the meeting and A. F. Chamberlain, of the Robbins & Myers Company, temporary secretary. Mr. Chamberlain was later elected permanent secretary of the Section, and E. O. Waymire, of the Dayton Fan Motor Company, was elected permanent treasurer.

Nominations for permanent chairman were made, same to be submitted to the board of governors, and this appointment will be made at the next meeting of the board.

Modern Office Lighting Coming Into Vogue in England.

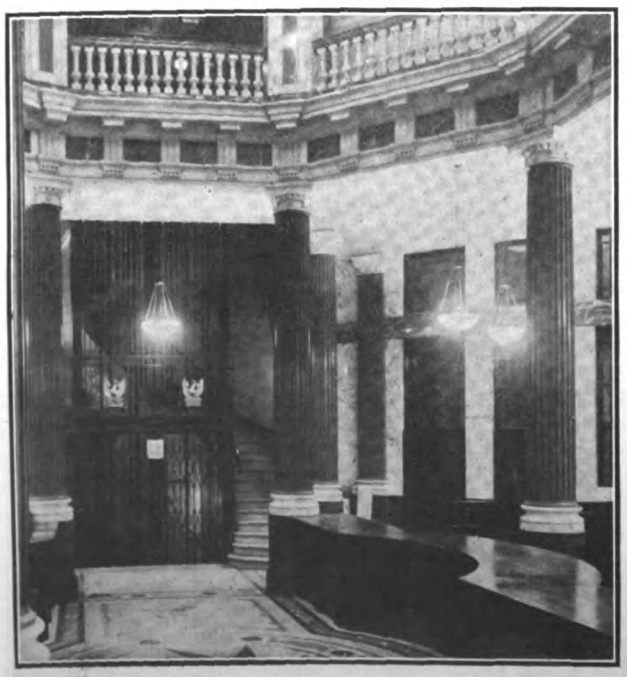
The introduction of incandescent lamps of high candlepower and improved efficiency, and particularly the "half-watt" or gas-filled tungsten lamps, is gradually bringing about a change in England in the methods of lighting large interiors, such as banks and offices.

Until recently the general method used in London banks and offices was to provide a local shaded light for each operator, and clerks rarely viewed with approval the use of general lighting. It has been assumed that for close and arduous clerical work a local well shaded light, with the rest of the room in comparative subdued illumination, is preferable. This may be due partly to the belief that the subdued surroundings "rest the eyes" when they are transferred from looking at the brightly illuminated book or paper, but it is also probable that with the older forms of lamps the general illumination was rarely on a sufficient scale so that only by using local lamps could a really adequate illumination be provided.

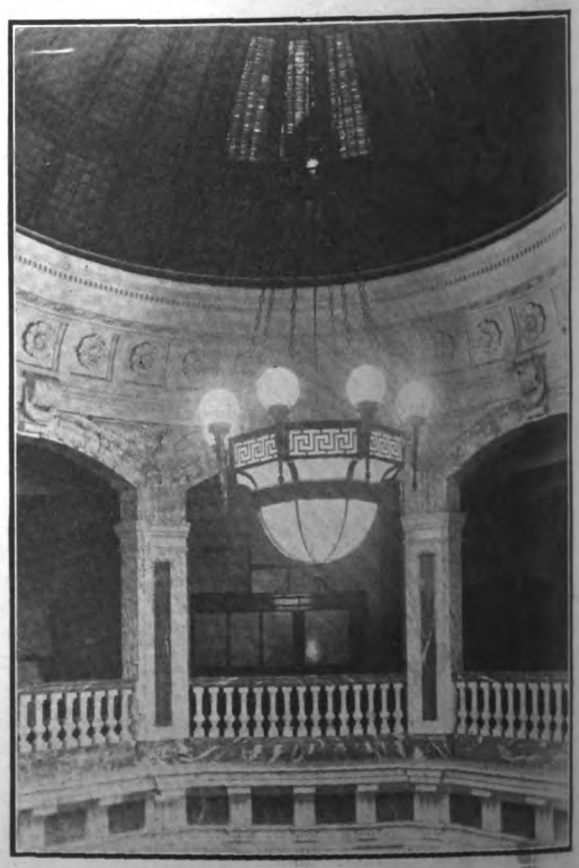
General lighting of the right kind has, however, several distinct advantages, one of them being that the lamps can be placed high up and are not liable to be broken by incautious manipulation of bulky ledgers.

The accompanying illustrations refer to the lighting of the new building of the Phoenix Assurance Company in the city of London, which was recently described in *The Illuminating Engineer*. The lighting is carried out by semi-indirect white diffusing glass bowls furnished with 100-watt gas-filled tungsten lamps. This is probably one of the largest semi-indirect installations in London. The lamps are hung at a height of 14 feet, the illumination on the counter being about 3 to 4 foot-candles, and on desks under the galleries 4 to 6 foot-candles.

The system of lighting is in good accord with the architectural features of the building, which are in Georgian style. The fitting under the dome is particularly effective. A somewhat curious effect is produced by the gray columns. It is interesting to note that these columns will eventually be of marble, "held up" during the German occupation of Mons.



Semi-Indirect Lighting in Insurance Office.



General Lighting of Main Lobby of London Office.

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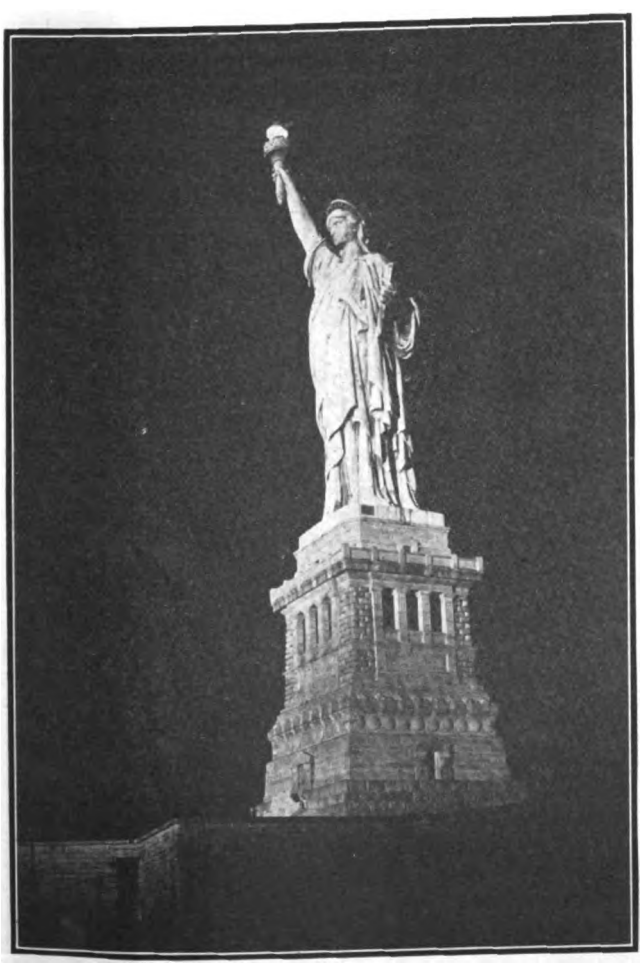
Maine Commission Authorizes Purchase of Large Lighting Plant.

The Maine Public Utilities Commission has approved the purchase of the capital stock of the Westbrook Electric Company by the Cumberland County Power & Light Company. The Westbrook Company, with headquarters in that suburb of Portland, Me., was organized by a large paper manufacturing concern to furnish itself and the town with power and light. When the Maine Utilities Act went into effect it became necessary to separate the electric business from the paper company, and the lighting company was organized with a capital of $110,000.

An agreement was entered into last June for the sale of the stock to the Cumberland company at the par value of $110,000. Citizens of Westbrook made an attempt to either municipalize the plant or to form a local company to take the plant over, but without success. The Commission held that the attitude of citizens, who claimed that the town should be given the advantage of a lower price from that which should be approved for purchase by a corporation, was a mistaken one.

Flood Lighting of Statue of Liberty.

The accompanying illustration shows the Statue of Liberty in New York Harbor flood-lighted from the battleship *Michigan* on May 31, and gives an idea of how the statue will appear when permanently lighted, as proposed by the New York daily *World*. As previously announced in these columns, this publication has inaugurated a campaign to raise a fund from voluntary contributions to permanently light the statue, and contributions of $1.00 are being solicited from every member of the electrical industry. Contributions received by the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN for this worthy cause are acknowledged on another page of this issue.



Statue of Liberty Flood Lighted.

Massachusetts Lighting Commission Discusses Demand vs. Meter Rates.

An important decision, involving some principles of rate-making that are particularly applicable to summer-resort communities, has been rendered by the Gas and Electric Light Commission of Massachusetts on a petition of customers of the Vineyard Lighting Company for lower prices. The company supplies gas and electricity in Oak Bluffs, and the latter also in Vineyard Haven and Edgartown. During the winter, service is confined to the dark hours, but in summer 24-hour service is provided. A short street-car line is operated with its power.

Up to June 1, 1915, the lighting company had a monthly charge, based on connected load or maximum demand, of 87 cents for the first 25-watt lamp equivalent, 62 cents for the next two, and 44 cents for each added unit, subject during June to September inclusive to a 20-per-cent, and the remainder of the year to a 30-per-cent discount. As an alternative there was a meter rate of 25 cents a kilowatt-hour for the first 75 hours' monthly use of the demand and 5 cents for excess current, subject to like discounts. Less than 15 per cent of customers were on metered service.

The above schedule proving inadequate, the following rates were substituted:

June to September, 25-volt-ampere unit: one unit, $1 per month; two, $1.80; three, $2.40; additional units, 60 cents. Minimum season charge, 1.5 months' bill; $9 advance payment required. Demand rates, October to May, 60 per cent of summer rates. Off-peak power, 7 cents per kilowatt-hour.

The new schedule increased the summer rates, particularly of stores, hotels, etc., formerly enjoying metered service. It was argued at hearings that a meter rate is the only fair rate. "It is true," said the Board, "that a kilowatt-hour is now the established unit for measuring electricity. It represents a definite amount of energy. As between customers with like conditions of supply, it is probably the fairest basis of charge." But in the present case the company's investment is almost entirely to provide for a brief summer business, when the maximum demands of all customers are coincident.

Hence the summer customers must bear nearly the full burden of the plant, and "it is doubtful whether a metered rate would provide as fair an apportionment of this burden as their respective demands upon the station," the Board says.

But the Commission finds that while a demand basis of rates works fairly in the case of ordinary customers who use their demands steadily, such is not perhaps the case with hotels, stores and other business places, which have large but intermittent demands, or of varying duration.

It is common to recognize in rate-making both demand and consumption, but an alternative meter rate offered to business customers will meet objections to the present schedule, and should be extended, the Board says, to users of electricity for cooking and heating from a separate circuit.

The Board does not endorse a demand rate as being superior to a meter rate generally. If, in the present case, the load improves, a gradual change to the meter system is suggested. "There are some serious disadvantages in the present plan, and not the least is the uneconomical consumption of current by customers once their demands are established. But this last feature affects so small a proportion of the costs, as compared with any effective plan for correcting it, that it may be neglected until the load-factor improves." The Board recommends the establishment of a 25-cent meter rate for churches, hotels and business places, and to users of cooking and heating current, subject to a five-per-cent discount in summer and 40-per-cent discount the rest of the year.

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VARIABLES OF LAMP-TESTING RESULTS.

By Preston S. Millar and L. J. Lewinson.

Tests are undertaken frequently to determine the relative quality of different makes of incandescent lamps. Such tests are involved in variables which make the accomplishment of the ultimate purpose very difficult. These include variables of the test method and operation, variables of sampling the products to be represented and variables inherent in the lamps.

If it be assumed that the test methods are correct; that the test is conducted accurately; and that the lamps are operated at one and the same correct efficiency, the results of the test should be correct. But there remains the all-important interpretation of such results before conclusions may be drawn. At this point the representative nature of the samples tested is brought into question. Samples are representative only of the size of lamp which is investigated and conclusions cannot be drawn from the test regarding the relative performances of lamps of some other sizes. This is obvious. It is likewise true, though less obvious, that the samples cannot be considered to be strictly representative of products made in another factory or of lamps made in the same factory by another process, or of lamps made in the same factory by same process at some other time. In brief, a test of a given group of samples has properly only a narrow application to the particular product which these samples represent.

In many instances lamps are submitted to the Electrical Testing Laboratories for life tests with a view to guiding purchasers in the selection of the best make of lamp. These samples often are obtained in the open market, and for any one make may include lamps produced at different times in different factories by different processes. In some cases sample groups have even been found which include lamps intended to be operated at different efficiencies. It is impracticable to apply effectively the results of tests upon such lamps, and comparisons between two makes of lamps represented by such samples are not necessarily significant.

It is not the purpose of this article, however, to discuss either the sampling question or the accuracy of test method. For the moment it is proposed to assume that no such variables are involved. It is now assumed that two comparable, homogeneous lamp products are to be sampled for life-testing purposes. How many samples of each should be tested, the inherent variability of the product alone being considered, in order to obtain reliable comparative values?

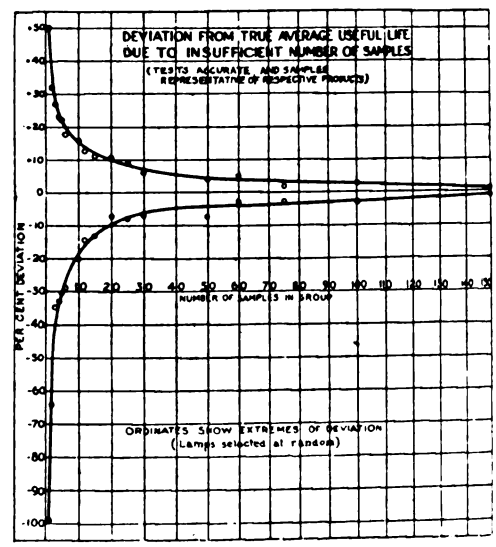
A study has been made recently at the Electrical Testing Laboratories to obtain information bearing on this question. A total of 300, 40-watt Mazda sample lamps were tested, representing one make of lamp manufactured by one and the same process, throughout a period of four months in three factories. This is the nearest approach which has been realized to a test of a large number of samples representative of a product made in one factory by one process at one time.

The average performance of all 300 lamps is considered to be the best known value. This is expressed in useful life, or hours elapsed during the decline of the lamp to 80 per cent of initial candlepower, or until earlier failure.

The statistical study was designed to indicate the extent to which the average performance of smaller groups of these samples deviated from the average performance of the entire group. For the purpose the lamps were arranged in chance order and the useful life results were separated into groups of the desired number each. The deviation of the average of each such group from the true average was computed. The number of groups of each size which were studied is indicated on the accompanying diagram, which shows also the extreme deviation for groups of each size from the correct average value. These maximum deviations are shown in the table.

Number of Lamps In Group	Deviation of Lowest Average from True Average Per Cent	Deviation of Highest Average from True Average Per Cent
1	99.0	52.0
2	64.2	32.0
3	34.9	27.0
4	33.0	23.0
5	35.5	22.1
6	28.8	17.7
10	20.0	15.7
12	14.5	12.7
15	13.1	11.0
20	7.2	10.5
25	8.0	8.8
30	6.9	6.0
50	7.4	3.9
60	3.0	5.0
75	2.6	2.0
100	3.0	2.6
150	0.9	0.9

On the diagram the zero deviation line represents the average useful life of all of the 300 lamps. The extent of the deviation from such value of the lowest average value found for any group of each of the sizes investigated is indicated below this zero deviation line and an approximate curve is drawn through such points. The maximum deviation in the direction of greater value experienced among groups of the various sizes is indicated by



Maximum Deviation From True Average Life.

points above the zero deviation line, and an approximate curve is drawn through these points. The diagram therefore shows for a group of sample lamps of stated size the range of deviations from the correct value which have been encountered and indicates the reliability factor for sample groups of various sizes when the only variable encountered is that inherent in the lamps, all variables of test and all variables of sampling being eliminated. If, therefore, ten lamps of Make A are compared on life test with ten lamps of Make B, and in each case the lamps are properly representative of a particular output of Makes A and B respectively, the average useful life of the ten lamps may in each case be the correct average life of the two products, or it is possible that the average of Group A may be 15 per cent higher that the true average value of the product which the samples represent, and the average of Group B may be 19 per cent lower than the true value for the product represented. In such event the error in the comparison due to the test of insufficient number of samples would be of the order of 34 per cent. The probable accuracy lies between a correct representation of the relative useful lives of these two products and a representation which differs by 34 per cent, but the reliability of the comparison cannot be considered to be much better than the latter.

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OKLAHOMA ASSOCIATION HOLDS VERY SUCCESSFUL CONVENTION.

Large Number of Delegates Discuss Varied Topics at Annual Meeting in Oklahoma City.

The first session of the fifth annual convention of the Gas, Electric & Street Railway Association of Oklahoma was held Tuesday afternoon, May 23, at the Lee-Huckins Hotel, Oklahoma City, President W. J. Dibbens, of the Guthrie Gas Light, Fuel & Improvement Company, presiding. An address of welcome was given by A. T. Boys, City Attorney of Oklahoma City, response being made by Vice-president Hugh J. Cooper, Commissioner of Water, Light and Ice, Weatherford, Okla. President Dibbens, in the annual president's address, discussed several questions of particular importance to utilities in that part of the country emphasizing such points as the safety movement and the taxation of public utilities.

The first paper to be presented was on "Fuel Economy," by A. J. Neff, of Abilene, Tex. In the discussion, Mr. Jorden, president of the San Bois Coal Company, emphasized the fact that economy in the use of coal commenced in the method of mining, and rather deprecated the habit of some states passing legislation regarding such, arguing that this should be left to the mining engineer. He felt that the ultimate solution of the economical use of coal would be the perfection of apparatus for the burning of pulverized coal. J. W. Knox, general manager of the Oklahoma Railway Company, asked about the purchase on the British-thermal-unit basis, which Mr. Jorden agreed to, this being the first time so far as ascertainable that coal has been offered on that basis in Oklahoma. Others participating in the discussion were L. G. Purtee, of the Oklahoma Railway Company; L. W. W. Morrow, of the University of Oklahoma, and V. K. Stanley, of Tonkawa. The second paper was on "Wash Day Yesterday and Today," by C. H. Talmage, sales manager of the Western Electric Company at Kansas City. This was an illustrated talk showing old and new methods of washing and indicating the economy of washing by electricity.

Tuesday evening a luncheon was given at the hotel. During the evening the isolated plant of the hotel was down for about 20 minutes, which brought to the minds of the delegates the advantages of central-station service. It was impossible to use even breakdown service, as the isolated plant and all connected apparatus is for direct current, while the Oklahoma Gas & Electric supply is alternating current.

At the Wednesday morning session J. W. Scroggs, of the University of Oklahoma, gave an analysis of taxation principles in general as introductory remarks to his subject, "The Taxation of Public Service Corporations." He argued that there should be no tax on public service corporations. Regulation and taxation approach the utilities from both sides and must finally squeeze them out. Regulation of rates should be sufficient for the solution of local difficulties. A lively discussion followed, being participated in by Galen Crow, of Guthrie, who analyzed the difficulties before the present Board of Equalization. F. W. Insull and G. W. Knox, of Oklahoma City, also entered the discussion as did S. P. Render, former owner of the Comanche Light & Power Company at Lawton, who analyzed his case by which he killed the law placing a gross collection tax on public service corporations in addition to the ad valorem tax. Under this law something like a million dollars has been collected by companies who did not fight. The second paper of the morning session was given by W. R. Molinard on "Publicity." The discussion following was chiefly congratulatory, as Mr. Molinard had well outlined the subject.

The Nunn Electric Company, of Amarillo, Tex., which recently opened an establishment at Oklahoma City, entertained the entire convention body at luncheon.

Wednesday afternoon L. W. W. Morrow presented a paper on "Diesel Oil Engines." There was considerable discussion, though there were few Diesel-engine owners present. J. H. Felgar, of the University of Oklahoma, brought out the fact that using oil at 18,000 British thermal units and using the fuel quantities given in Prof. Morrow's paper an average operating thermal efficiency ranging from about 16 to 23 per cent was obtained. This included all load conditions. J. W. Knox questioned the use of Diesel engines for railway substations, and Mr. Pollister, of the Busch-Sulzer Company, stated that the oil engine would not be able to stand the sudden overloads of railway operation unless substations were close enough together so one substation could help out another. At the end of the discussion Mr. Pollister gave an illustrated talk on the development and principle of the Diesel oil engine, showing the latest Busch-Sulzer types. W. G. Ashton, State Commissioner of Labor, made an address in which he emphasized the point that safety first is up to the industries of the nation, in that they are organized and can lead the safety movement. He requested assistance from the association in the solution of electrical difficulties, as the appropriation for his department does not permit the employment of an electrical engineer. In the discussion Professor Morrow suggested use of posters which should be illustrations of the accidents which might happen, placing the posters near the machinery. There followed a detailed discussion of equipment for certain machinery, particular mention being made of the valve gears on Corliss engines for which no satisfactory safety device has yet been found. The grounding of secondaries also came up in the discussion.

The annual banquet was held Wednesday evening, F. W. Insull, of the Public Service Company of Oklahoma, being toastmaster. Various speakers were heard from, including Dr. Scroggs, of the University of Oklahoma; State Labor Commissioner Ashton; Galen Crow, of the Public Service Company; P. L. Leuis of the Wagner Electric & Manufacturing Company; H. E. Musson, electrical engineer of the Corporation Commission of Oklahoma; Max Starrett, of the Electric Appliance Company of Dallas, and others.

The first paper Thursday morning was given by R. K. Johnston, of Pauls Valley, on "New Business." Those participating in the discussion were W. P. Jones, of the Oklahoma Gas & Electric Company; Mr. Carey, of the Public Service Company; F. H. Tidnam, of the El Reno Gas & Electric Company; G. W. Knox, of the Oklahoma Railway Company, and many others. Mr. Jones related the experience he had had getting the local dealers to co-operate with the Oklahoma Gas & Electric Company, which of itself does not handle any supplies. He brought up the question of securing flour mills for electric load and it developed that average figures show five to eight kilowatt-hours necessary to grind a barrel of flour. The millers seem to think that about nine cents should grind a barrel and from this the approximate rate can be found which rate the miller could afford to pay. The second paper of the afternoon was given by Mr. Mullergren on "Street Lighting Service and Contracts." In the discussion, F. W. Insull suggested an element of risk in allowing the municipality to own apparatus on the lines of the company on account of the increased hazard to the company if the municipality did not keep up its equipment. H. J. Cooper saw danger of municipal-ownership agitation to the detriment of the privately owned corporation because the municipality owning its own water system, and then owning a lighting system, might suggest the purchasing of generating equipment and from that develop as a factor in the business. Speaking, however, as a municipal officer, he stated difficulty was experienced in trying to pay for lights and keep within the six-mills-per-

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dollar valuation, which is the maximum allowed Oklahoma cities for running expenses. A city might, however, issue bonds and pay interest on same and sinking fund in addition to the six mills, and it will sometimes be a temptation to so do. H. V. Bozell, of the University of Oklahoma, suggested, in order to overcome the difficulty of the city being the loser on the contract basis, in case more efficient lamps were put into service, that a contract be arranged covering a constant charge based on investment and maintenance plus an energy charge and with a contract provision regarding the character of lamps to be used.

Under committee reports the main discussion was concerned with probable legislation during the coming winter, a particular bill mentioned being one for the right of eminent domain along public highways, to allow the companies to build into the country. This privilege is not now allowed Oklahoma companies. Another bill discussed was one making it necessary for a privately or publicly owned utility to obtain a certificate of public convenience or necessity from the corporation commission before erection or operation. This would practically give an indeterminate franchise and also give the corporation commission control of competition. It appears to be the only way to surmount the constitutional provision that term franchises shall be given but that they shall not exceed 25 years in length.

At the annual election, the following officers were chosen for the ensuing year:

President, C. H. Kretz, Okmulgee.

First vice-president, T. F. Carey, Norman.

Second vice-president, C. B. Shaffer, Chickasha.

Secretary and treasurer, H. V. Bozell, Norman.

Directors until May, 1918, R. K. Johnston, Pauls Valley, and W. E. Blackwell, Afton.

Electrically Lighted Shooting Traps.

A gun club in a Boston suburb has had installed at its traps a means for artificial illumination which enables the gunners to shoot clay pigeons at night equally well as by day, if not better, as there is less diversion of one's attention from the work in hand. A battery of eight 250-watt Mazda C stereopticon lamps, in special reflectors, each giving 67,000 candlepower, is mounted on a platform 15 feet high. The platform is made of braced joist with two 2 by 8-inch planks as a platform, over which on one-inch pipework are the lamps and reflectors, with only about 1.5 inches between units. The reflectors are elevated at about a four-degree angle above the horizontal, and the lights converge on one another, each giving about a 20-degree angle of light.

About 75 feet in front of the lighting equipment are three pigeon traps. Five converging concrete "handicap walks," with one yard square spaces marked off and chalked to denote distance from the trap, are the gunners' stations.

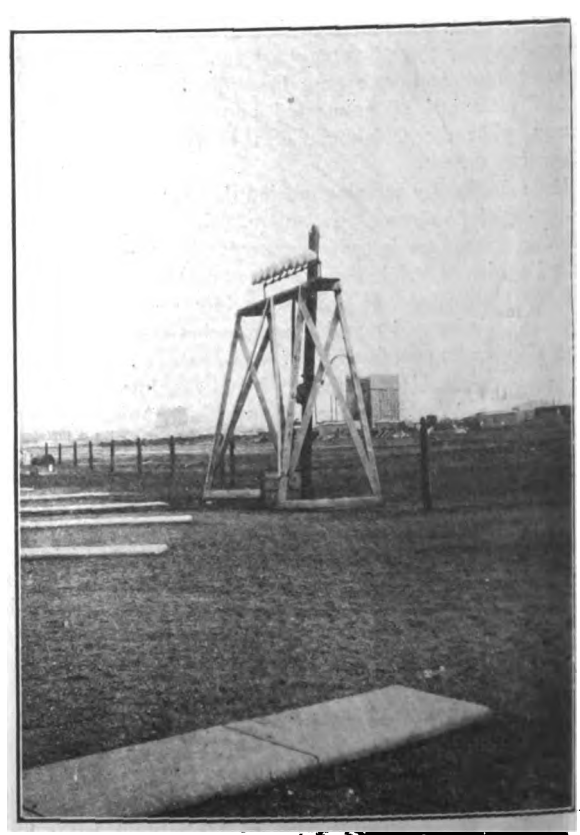
The energy is supplied by the Malden Electric Company, whose commercial engineer, Cyrus Barnes, devised the scheme of nocturnal illumination.

Pennsylvania Electrical Contractors' Association to Hold Convention June 21-22.

The annual convention of the Electrical Contractors' Association of Pennsylvania will be held in Wilkes-Barre, June 21-22, under the auspices of the Wilkes-Barre Electrical Contractors' Association.

The morning of the first day will be occupied with registration and inspection of exhibits at the Hotel Sterling. A large amount of space for exhibits has been arranged for, and it is expected that manufacturers and jobbers will be well represented. Luncheon will be given by the Wilkes-Barre contractors, and, following a business session of the state association in the afternoon, there will be an open session for contractors, manufacturers and jobbers. In the evening those in attendance will be guests of the Wilkes-Barre contractors at the annual banquet. Speeches will be made on "Central-Station Co-operation," "The Value of National and State Membership" and "The Several Branches of the Electrical Industry." The program on June 22 is chiefly devoted to entertainment.

H. N. Rust, 42 Market Street, is chairman of the committee on arrangements.



Two Views of Shooting Traps Equipped with Reflectors for Night Practice—There Are Eight 250-Watt Lamps Used.

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Miscellaneous NEWS NOTES

Floodlight "Preparedness" Marchers.—A feature of the Boston preparedness parade of May 27, in which a large number of electrical men marched, including delegations from Stone & Webster, Charles H. Tenney & Company, Boston Edison Company, Electric Storage Battery Company, and General Electric Company, was an arrangement for floodlighting the late marchers, in the evening, by means of searchlights equipped with shifting color screens.

Cincinnati Electric Club Elects Officers.—The following officers have been elected by the Cincinnati Electric Club, at a meeting held for that purpose: President, C. M. Crowfoot; first vice-president, L. T. Milner; second vice-president, T. J. Creaghead; secretary-treasurer, O. B. Marsh; directors, W. W. Freeman, Walter Draper and T. J. Ryan. Opposing tickets were put up by the "Amperes" and the "Volts," honors being about even between them in the election.

Court Upholds Right of City to Buy Utility.—The Kentucky Court of Appeals has upheld the right of the city of Mayfield, Ky., to issue $200,000 in bonds for the purchase of the Mayfield Water & Light Company, in accordance with the terms of a contract entered into by the city and the company 25 years ago. The bond issue involves a greater assessment than the present state constitution admits, but the court holds that since the contract was made before the adoption of the present constitution it does not affect the situation.

Mining Congress to Meet in Chicago.—The nineteenth annual session of the American Mining Congress will be held at the LaSalle Hotel, Chicago, Ill., during the week of November 13, 1916. The purpose of the convention will be to inaugurate plans by which all branches of the industry may work together in the solution of common problems. A general meeting will be held each morning, and the convention will then divide itself into Precious Metals, Iron and Steel, Oil and Gas, Lead and Zinc, and Coal Sections, each discussing subjects of special interest to that branch of the industry.

Booklet Issued on Industrial Lighting.—The Commercial Section of the National Electric Light Association has issued an illustrated 16-page booklet entitled "Better Industrial Lighting." In emphasizing the need for better industrial lighting, sections are devoted to the effects of lighting on production, light versus spoilage, accident prevention, welfare of employees, the cost of better lighting, and how to solve the lighting problems. The booklet has been prepared for local distribution, by central-station companies. The chairman of the Publications Committee is C. A. Littlefield, of the New York Edison Company.

Telephone City Exhibited at N. E. L. A. Convention.—One of the exhibits at the convention of the National Electric Light Association that attracted much attention was a large drawing of the buildings of the Chicago Telephone Company grouped to make a telephone city. The drawing embraces the company's 47 office buildings and four other telephone structures, and is a visible manifestation of the size and importance of the telephone industry. In the center of the drawing rises the company's main office building—20 stories in height—the largest telephone building in the world. The other buildings are placed according to their geographic locations in the city and suburbs. In the buildings represented there are 1,370,358 square feet of floor space devoted to switchboard rooms, offices, rest-rooms, storage, etc. To operate this plant about 13,000 persons are employed, of whom 7,000 are telephone operators. The company now has in service more than 540,000 telephones in Chicago and suburbs and the total originating calls average 2,800,000 per day. The "telephone city" picture is the work of H. M. Pettit, a well known artist.

Memphis Electrical Organizations Give Safety-First Demonstration.—The various members of electrical organizations of Memphis, Tenn., were guests on May 27, of the Memphis Consolidated Gas & Electric Company, which gave a safety-first entertainment at East End Park, demonstrations and speakers carrying out the idea. Organizations of employees of the telephone, street railway and Merchants' Power Company and members of the Jovian League were present.

Jovians Organize at Harrisburg.—A rejuvenation was held in Harrisburg, Pa., June 1 and an organization of the Jovian League was formed in that city. Foremost in the organization plan was P. H. Bailey, commercial manager of the Harrisburg Light & Power Company, a well known Jovian. The degree team of the Philadelphia Jovian League installed the local order, about 30 electrical men of Harrisburg becoming Jovians.

Public Service Commission Rules in Harmony Company's Case.—The Public Service Commission of Pennsylvania has issued orders dismissing the complaint of the New Castle Electric Company and the Pennsylvania Power Company against the Harmony Electric Company, which it was alleged was doing business in territory occupied by the two complaining companies and was constructing crossings over their wires without complying with the Public Service Commission laws.

Use of Gas Declines in Massachusetts.—The Gas and Electric Light Commissioners' annual report for 1915, just issued, discloses the fact that the per capita use of gas in Massachusetts for the year showed a decrease from that in 1914. The total production of gas of all kinds amounted to 15,786,630,000 cubic feet in 1915, while in 1914 it was 15,536,223,500 cubic feet, a gain of only 1.7 per cent in actual output. During the year the population of the state increased about 2.5 per cent.

Profit-Sharing Plan Inaugurated by Denver Utility.—The Denver Gas & Electric Light Company has formulated an employees' profit-sharing plan, which will take everybody into count from the $30 a month office boy to the $10,000 a year executive officer. The plan has just became official after the board of directors of the Cities Service Company voted to sell to employees of the company preferred and common stock to the value of $3,600,000. The stock can be purchased in blocks of two shares of preferred and one of common, valued at $300 each, and each employee can buy stock up to the amount of his annual salary, and will be given five years in which to meet the payments. According to the present market price each employee would make a profit of approximately $150 on each block. The action leading to the profit-sharing plan was first taken at the Chicago convention of Doherty employees.

Chicago Lighting Bonds Approved.—At the election held on June 5 the voters of Chicago approved by a substantial majority the issuance of municipal lighting bonds aggregating $3,750,000. Brief reference was made in our issue of May 20 to the plans for the extension of the city's street-lighting system now made possible by this bond issue. In substance it will mean the displacement of practically all gas and gasoline lamps still in service and the installation of 5,800 600-candlepower and 25,400 100-candlepower gas-filled tungsten lamps. There also will be provided a generating station in connection with a garbage-incinerator plant to supply 2,000 kilowatts and three additional substations. The extension will provide standard street lighting in many outlying sections where it has hitherto been inadequate. In some of the older sections of the city the street lighting will also be brought up to standard by installing additional lamps. All of the 25,400 100-candlepower lamps will be fed from steel-armored underground-cable circuits.

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Wisconsin Utilities Evaluated.—Wisconsin street-car companies and the light, heat and power companies operated in connection with them are valued at $62,688,000, according to the 1916 assessment figures of the state tax commission. This is an increase of $715,000 over the assessment of 1915.

Electric Blaze at Toledo.—The Toledo Beach Company, one of the properties operated by the Toledo (O.) Railways & Light Company, has started what it believes will be an exceptionally successful season financially, as well as a notable advance in electrical display. More than 100,000 Mazda lamps are being used on the grounds, and prominent among the features are ten large electrified American flags.

Electric Taxicabs for Chicago.—A new field for the electric vehicle is that of taxicab service, for which it is pre-eminently fitted. Electric taxicabs have for some time past operated in Detroit with success. The Detroit Taxicab & Transfer Company now operates a fleet of 75 electric cabs. The American Motor Livery Company, of Chicago, has recently placed an order with the Milburn Wagon Company for 12 electric town cars to be delivered November 1. The new cab will be of the limousine type and will accomodate five passengers.

Kansas City Engineers Discuss Preparedness. — The monthly session of the Kansas City (Mo.) Section of the American Institute of Electrical Engineers was held May 31, Prof. George C. Shaad, of Lawrence, Kan., electrical engineer on the Industrial Preparedness Committee for Kansas, told of the work being done. He said that the industries with $200,000 annual output had been listed, and probably the smaller ones would now be studied. R. H. Barber, of the Barber-Dwinnell-James Electric Company, spoke on storage batteries, his address being followed by a discussion of the increasing demand for batteries, particularly on farms and in small towns. The Section adjourned until October.

Kansas City Jovians Hear Speech on Public Service.—John H. Lucas, president of the Kansas City Light and Power Company, was the principal speaker at the last meeting of the Jovian Electric Club of Kansas City this spring. Mr. Lucas declared that the public interest required the co-operation of city and company for the production of the best service to the citizens, and that the company heartily welcomed any investigation or inquiry by a citizen or by the city government which would make the public more familiar with the workings of the company. While the Electric Club sessions are over for the summer, a rejuvenation of the Jovian League was held June 6.

Michigan Section, N. E. L. A., Changes Convention-Cruise Dates.—Owing to litigation involving the steamer *Rochester*, which had been chosen by the Association for its convention cruise, this boat has been replaced by the steamer *Arizona*, necessitating a number of changes in the itinerary of the trip. The boat will leave Grand Haven at 1 p. m. Sunday, June 18, arriving at Parry Sound Tuesday morning, Penetang Tuesday noon, Sault Ste. Marie Wednesday, and Grand Haven 3 p. m., Thursday, June 22. The cost of the boat trip remains at $33 per passenger. C. G. Stricker, 18 Washington Boulevard, Detroit, is the reservation clerk, and Herbert Silvester, Rochester, Mich., is secretary of the Section.

Pacific Telephone Companies Merge.—The Pacific Telephone & Telegraph Company and the Sunset Telephone & Telegraph Company have filed with the California Railroad Commission a joint application for authority for the Sunset company to sell to the Pacific company all its property and assets in California. The application states that the sale is desirable because the Pacific company is operating all the property of the Sunset company and considers it best that the ownership of the property should be in the corporation which is charged with the responsibility of its management. The consideration of the sale is fixed at $10. The total amount of the capital stock of the Sunset company is $15,000,000, all owned by the Pacific company.

Illinois Contractors to Meet at Rockford.—The annual meeting of the Electrical Contractors' Association of the State of Illinois will be held at the Nelson Hotel, Rockford, Ill., on June 16 and 17. Among the topics to come up for consideration will be the report of a committee that has looked into the question of closer co-operation between the central stations and the contractors. A commitee that has considered the matter of concentric wiring from many standpoints will present a report. An exhibit of concentric wire and fittings will also be made. The annual election of officers will be the principal feature.

New Location for Western Electric New York Retail Store.—Bigger, better business, coupled with the tendency of the electrical industry to center up town, has resulted in a new location for the Western Electric Company's retail store in New York City. In its new quarters in the Tilden Building, 105 West Fortieth Street, the store is situated but a short distance from Broadway, and is in the heart of a rapidly growing commercial section. Because of more commodius quarters, a larger assortment of electrical goods will be carried at the new location. A complete line of electrical supplies, both staple and specialties, is carried in stock.

Extension of Power Business in Lancaster, Pa.—The current issue of *Electric Motor*, published monthly by the Edison Electric Company, of Lancaster, Pa., is devoted almost entirely to facts and figures regarding the growth of the company's power business. Various customers are classified according to industries and the size of each installation is tabulated. Numerous illustrations of motor applications are also given. On January 1, 1908, the company supplied a total of 2,965 horsepower, while on January 1, 1916, the total connected power load had reached the imposing figure of 16,261. A portion of the issue is devoted to an illustrated description of Engleside station, the principal generating plant of the company.

Lynn Section, A. I. E. E., Holds Annual Meeting.—The annual meeting of the Lynn (Mass.) Section of the American Institute of Electrical Engineers was held May 24. The report of the secretary-treasurer showed that the Section comprises 782 members, 100 being members of the national body. This shows a gain of 232 during the past year and makes Lynn the second largest Section in the country. Fourteen meetings were held the past season, the average attendance being 330. Plans were made to establish a library in connection with the Section. The following officers were elected for the ensuing year: Chairman, Gordon M. Campbell; secretary-treasurer, Morris B. Carroll; executive committee, F. H. Bowman and F. W. Mace; chairman membership committee; A. K. Warren. After the business meeting an interesting lecture on "Recent Developments in Research Work" was given by L. A. Hawkins, of Schenectady.

Manufacturers of Electrical Supplies Elect Officers.—At a meeting of the Associated Manufacturers of Electrical Supplies, held at the Biltmore Hotel, New York City, June 5, a new section, called the Line Material Section, was formed. A. L. Wilkinson, of the Ohio Brass Company, was elected temporary chairman of the meeting; H. L. Garbutt, of the Westinghouse Electric & Manufacturing Company, permanent secretary, and Robert C. Buell of the Johns-Pratt Company, permanent treasurer. The permanent chairman will be appointed at the next meeting of the board of governors to be held June 21. At a meeting of the Moulded or Formed Insulation Section, also held at the Biltmore June 5, the former officers were re-elected, these being E. B. Hatch, of the Johns-Pratt Company, chairman; Joseph Steinberger, of the General Insulate Company, treasurer, and R. W. Seabury, of the Boonton Rubber Manufacturing Company, secretary. At a meeting of the Fuse Section, held at Lennox, Mass., June 1 and 2, H. R. Sargent, of the General Electric Company, was elected chairman; F. V. Burton, of the Bryant Electric Company, treasurer, and Robert C. Buell, of the Johns-Pratt Company, secretary.

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Electricity at Summer Amusement Resorts

Furnishing of Service to Summer Parks Profitable for Central-Station Companies Because of the High Rate Obtainable and the Off-Peak Characteristics of the Load

Industrial Power Series—Article No. 166.

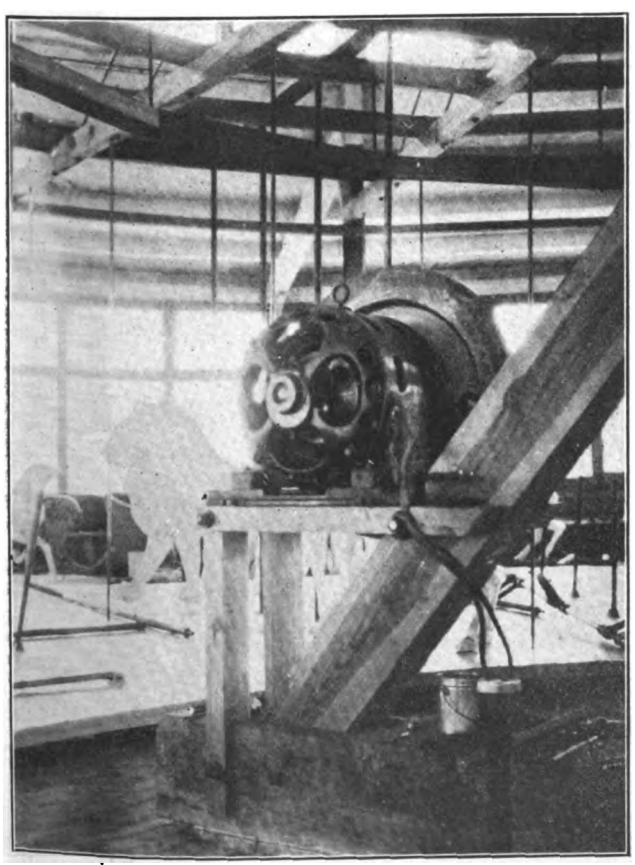
THE purpose of this article is to call attention to the various uses of electric power and lighting service in the operation of seaside, lake or country recreation places. Every city and town of considerable size has, within a short car ride, one or more pleasure parks, beach resorts or picnic grounds with more or less features, such as roller coasters, merry-go-round and the like. Sometimes such parks are operated by the street railway company, and the motor applications is from the company's system; but in many cases the pleasure resorts are run as independent propositions, and furnish fruitful fields for central-station service.

The old days when the "merry-go-rounds," or "flying horses," were operated by a little steam engine on wheels, which caused diversion by periodically blowing up, are happily of the past. However, the operation of the familiar features by electricity is not yet universal, the gasoline engine still being used to a considerable extent. Wherever amusement resorts are found which are not connected to central-station circuits, or indeed wherever such resorts exist with isolated plants for their operation, there is a chance at hand for some profitable work on the part of the central station's commercial department. The business is of a fruitful kind (1) because the load comes in the summer season, when power and lighting generally are at their minimum; (2) because the power portion of it is an all-day and every-day load, and (3) for the reason that an excess price can properly be asked, and will readily be paid, for service of this character.

A description of the features of a typical amusement resort's electrical installation is likely to be of interest and value to central-station power salesmen, and also to motor salesmen. Such a resort is the famous Nantasket Beach, near Boston, Mass. Here is one of the finest sand beaches on the entire Atlantic Coast. It is reached by hourly steamers from Boston and also has electric and steam railway connection with the nearby cities of Quincy and Brockton. It is situated in the town of Hull, which has a municipal distributing plant, which obtains the greater part of its energy from the Weymouth Light & Power Company over a 5,000-volt double transmission line about seven miles long. Up to the first of the present year the town operated its steam generating plant, but found it more economical to purchase the bulk of its energy at 3 cents a kilowatt-hour primary rate and 2 cents secondary.

The winter "all-the-year" population of Hull is about 2,000, while the summer population of cottagers makes up a total of nearly 25,000. In addition day-trippers to the number of as many as 100,000, on holidays, visit Nantasket during the summer.

The town's retail lighting rate is 14 cents per kilowatt-hour to all-the-year customers and 17 cents to transient or summer customers. These rates were reduced from 15 and 20 cents since the contract for purchased power was entered into. For power, heating and cooking, with the right to use it at any time of day or night, the customer pays a service charge of $30 per season. Any customer not requiring electricity from 7 p. m. to midnight may use it



Motor, with Flywheel, Driving Flying Horses at Boston Amusement Park.

Battery of 1,000-Candlepower Searchlights for Illuminating Grounds.

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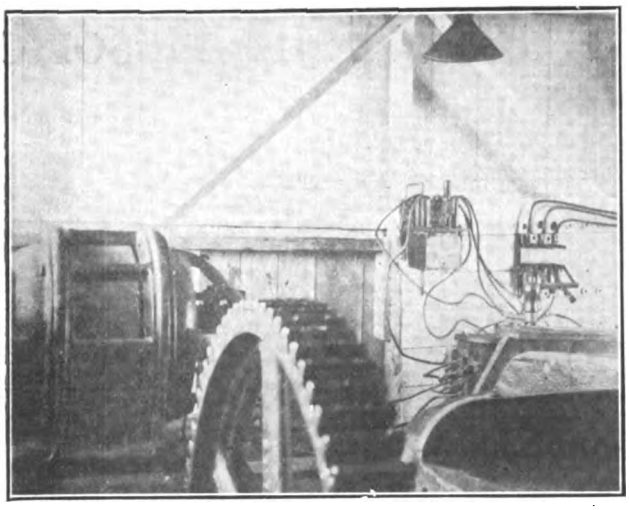
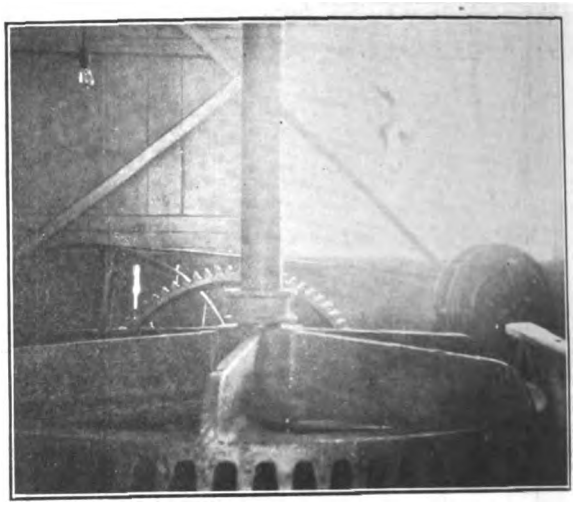


Motor Operating Circular Swing.



Motor Geared to Swing Mechanism.

at all other times at 6 cents per kilowatt-hour, with a $5 minimum per season, or per year. For cooking, on separate meter, the rate is 4 cents for the first 100 kilowatt-hours and 3 cents thereafter, with a $5 per year or per season minimum. All customers except permanent residents pay $10 deposit, which is used to liquidate the bill for the last month of the season, viz.: that for September. There are about 300 year-round customers and 2,200 summer customers, including cottagers and concessionaires on the Metropolitan Park Commission's reservation and on private land. The state is a considerable user of energy for the lighting of the reservation.

The difficulties of conducting a central-station business under such uneven seasonal conditions may be readily appreciated. When the season opens the latter part of May or early in June, every newcomer of the largely shifting summer population demands service at once. From 50 to 100 premises are given service in a day. While in winter two linemen and a working foreman are more than the necessary outside force, in summer twice that number are required, and these are called upon for much overtime work. The emergency help is naturally of the less stable character and has to be paid premium wages. In summer three clerks and a bookkeeper are employed.

The summer peak is about 700 kilowatts, as compared with about 100 kilowatts in winter. On account of the scattered character of the winter population, practically the whole commercial system, and all the street lighting system, has to be maintained, with installed transformer capacity many times in excess of the actual demand.

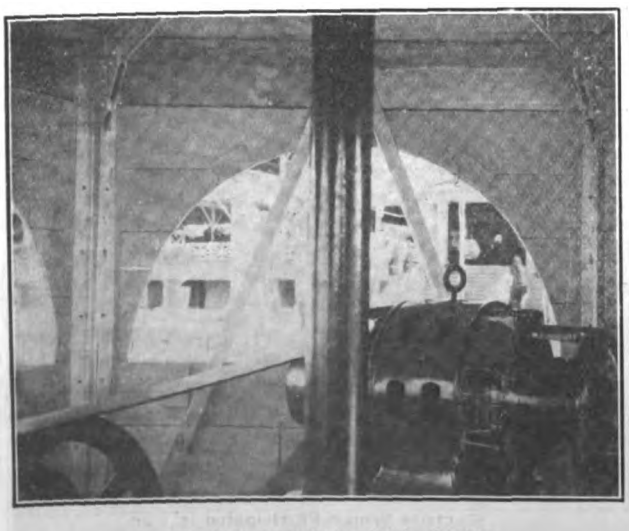
The Hull municipal lighting department, of which A. F. Pope is the manager, sells motors and domestic appliances on order, but carries no line in stock. The practice is to charge about 5 per cent above net price to reimburse the town for cost of handling and carrying the charges. There are over 500 electric flatirons on the lines, most of which were sold through the department. Electric ranges are numerous, the manager selling five during ten days of the present season. The plant's day load during the season is about 200 kilowatts.

The amusement features and their uses is the central theme of this article, the above data being presented to show the peculiar local conditions, which may be typical of other places of the same type. The principal amusement feature at Nantasket is Paragon Park, a sort of Coney Island feature show, consisting of roller coaster, swinging seats, Ferris wheel, slides, restaurants, dancing pavilion, etc. Up to recently an isolated plant was operated to drive the various machines in the park, but this was abandoned and three-phase energy was bought from the Weymouth Light & Power Company, which now supplies the whole community through the Hull distributing system.

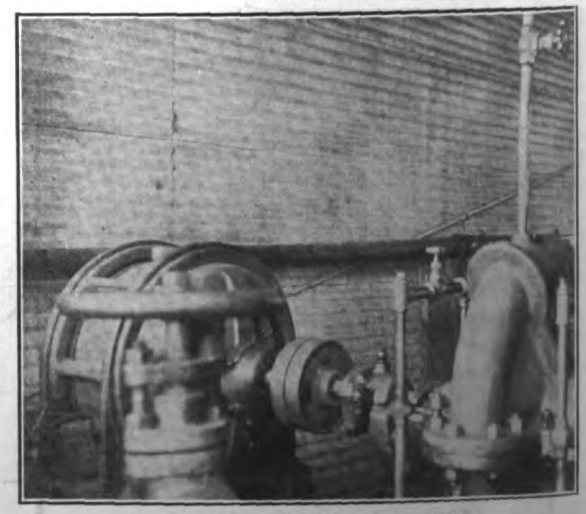
Motors installed in Paragon Park and their application, are as follows:

A 30-horsepower constant-speed motor operating at 850 revolutions per minute, drives a chain elevator which lifts the cars of the roller coaster to their starting point for gravity run.

A circular swing, having seats for 24 persons, is re-



Installation at Paragon Park, Boston.



Motor Direct-Connected to Rotary Pump.

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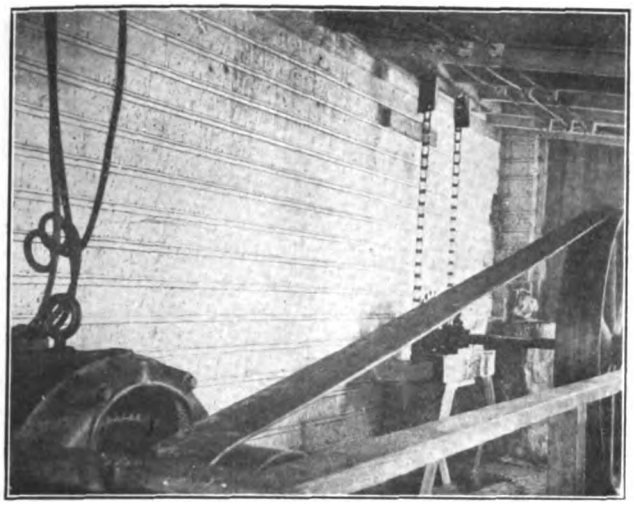


Motor Driving Roller Coaster.

volved on a 70-foot vertical shaft which is bevelled-geared to a 15-horsepower motor operating at 1,200/1,150 revolutions per minute, giving the swing a rotary motion of about 30 revolutions per minute.

A Ferris wheel with 12 double seats, accommodating 24 persons, is rotated by a 10-horsepower motor operating at 1,140 revolutions per minute.

"The Frolic," or circular swing, of another type, is driven by an 11-horsepower motor, 850 revolutions per minute, bevel-geared to the driving shaft.

A merry-go-round is operated by a 10-horsepower motor, 1,160 revolutions per minute, a three-foot iron fly-wheel being attached to the motor driving-shaft to give greater smoothness of motion. This machine has seats for 90 persons, on the various effigies of animals, etc.

Other motors in the park is a small motor operating a dish-washing machine in the restaurant, and a fractional-horsepower motor belted to a corn popper.

The lighting of Paragon Park is symptomatic of the change which all such places are undergoing, from the earlier style multi-incandescent festoons and clusters to the floodlighting and spotlighting effects developed at the Panama-Pacific Exposition. Here the lines of colored lights are being removed, and about 250 searchlights of 1,000 rated candlepower each, in Newhite reflectors, have been installed, on 75-foot towers and other high places on buildings. Interior lighting, too, has changed, and the dancing pavilion and restaurants are being equipped with effective cornice lighting, in which the lamps themselves are not visible.

Water for various uses on the grounds and for fire purposes is provided by means of a pumping station containing 25-horsepower motors connected to rotary pumps, in duplicate.

Outside the grounds of the park, are several independent attractions. There is a feature called "Ye Olde Mill," which consists of a large paddle wheel which circulates water through a continuous channel about 3,000 feet long. Boats are carried through the circuitious course of this canal, borne on by the current produced by the "mill" which is driven by an electric motor. A small dynamo in connection with a 40-horsepower gasoline engine provides 16-candlepower incandescent lighting through the canal and over the entrance.

Another merry-go-round, on the esplanade, is driven by a 15-horsepower motor on municipal service. All the Weymouth service is three-phase, while that supplied by the town is single phase, but change to three-phase is being considered.

The income from the class of service described above is probably larger per kilowatt-hour consumed, and per kilowatt of demand, than from almost any other industry.

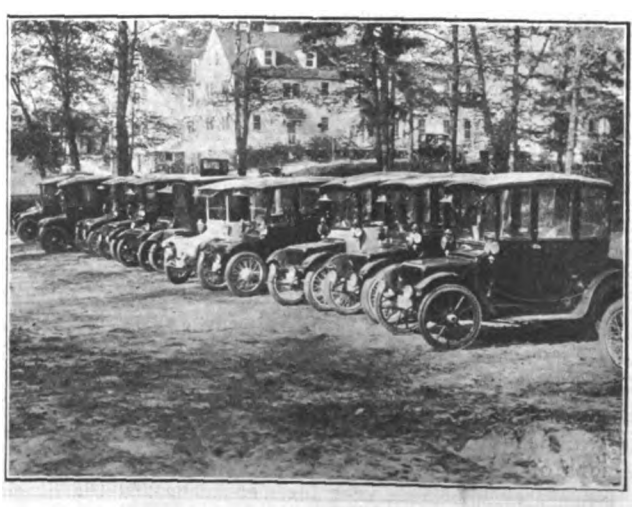
New York Sociability Run of Electric Vehicles a Success.

With 42 cars competing the Sociability Run and secret-time contest for electric pleasure automobiles, held under the auspices of the New York Electric Vehicle Association, on May 19, was pronounced by all those who participated a decidely enjoyable and successful event.

The day was ideal for the run, which was from the Electric Garage at Central Park West and 62nd Street to the Siwanoy Club in Bronxville, a distance of 19 miles. The 42 cars entered, left the garage between 2:30 and 3 o'clock, being driven by their pilots over a previously outlined course to the Siwanoy Club, where they arrived safely between 4 and 4:30.

Only ladies were entered in the secret-time contest, which consisted of an attempt on the part of the contestants to cover the course in, or as nearly as possible in, a previously determined secret time. The prize was won by Mrs. W. H. Jacobus, who drove a Baker brougham, in which were her daughter and a friend, over the course in one hour and 24 minutes, the secret time being one hour, 23 minutes and 30 seconds. At the Siwanoy Club, Mrs. Walter Neumuller, the hostess, poured tea. The average running time for all cars over the course was one hour, 23 minutes and 20 seconds, and the various makes entered were Baker, Rauch and Lang, Detroit and Milburn.

Finish of New York Sociability Run.



Electrics Which Participated in Run.

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Water-Power Bills Now Pending in Congress

A Description and Comparison of the Various Measures Dealing With Water-Power Which Are Now Being Considered by the Federal Congress—Development on Both Navigable Streams and the Public Domain Considered

AT THE recent convention of the National Electric Light Association a paper was presented by Henry J. Pierce, of Seattle, entitled "Federal Water Power Legislation," in which the legislation affecting the development of water power upon navigable streams and on the public domain was reviewed and an analysis given of the various bills now pending in Congress which deal with this subject.

The Navigable Stream Act passed in 1910, and still in force, requires that each separate project to dam navigable streams must be specifically authorized by Act of Congress. This law makes three requirements, any one of which makes investment unsafe and effectually prevents development.

(a) The Government may, at any time, force the grantee to remove his hydroelectric plant and restore conditions on the stream to those existing at the time the grant was issued, and this at the grantee's own expense.

(b) The permit expires at the end of 50 years, and no provision is made for its renewal. Thus the grantee might have his property on his hands at the end of 50 years without the right to operate it.

(c) Congress reserves the right to alter, amend, or repeal the Act with respect to any or all dams, with the express provision that the United States shall incur no liability therefor.

There is no law at present under which authority may be secured from any administrative source to dam a navigable stream. Since the Act was passed in 1910, Congress has only authorized the building of 13 dams. Eleven of these water powers remain undeveloped because capital could not be obtained for their development. The financing of the other two was only made possible because they were adjuncts to existing systems.

A similar situation exists regarding the development of water power on the public domain. There is no law under which a person or corporation desiring to develop water power on streams running through the public domain could secure authority to do so, not revocable at the mere whim of the federal official granting such authority. In 1901 a general act was passed and is still in force. Under this law the Secretaries of the Interior and of Agriculture are authorized to permit the use of Government lands for water-power purposes under general regulations to be fixed by them. The law provides that any permission given by the secretaries may be revoked at any time at their discretion. In 1909 such revocation was exercised in a number of cases. Many permits have been taken out, but few projects have been developed because capital could not be obtained under the hazard of the revocable permit.

During the present Congress legislation has been proposed affecting the development of water power on both navigable streams and the public domain. On January 8, 1916, the House of Representatives passed the Ferris Water Power Bill, which would control development upon the public domain. Upon reaching the Senate, this bill was referred to the Senate Committee on Public Lands, which struck out all except the enacting clause and substituted a new bill known as the Myers Bill. This bill is still pending in the Senate. The more important provisions of these two bills are given below.

On March 8 of this year the Senate passed the Shields Bill, which deals with water-power development upon navigable streams. Upon reaching the House of Representatives the bill was referred to the Committee on Interstate and Foreign Commerce, which struck out all except the enacting clause and substituted a new bill known as the Adamson Bill. This bill is now pending in the House of Representatives. A synopsis of the features of these two bills is also given below. It will be observed that the two Senate bills known as the Shields and the Myers bills are quite similar in their provisions, while the Ferris bill and the Adamson bill are drawn along lines which are essentially different from the ideas provided in the Senate, although similar to each other.

The Shields and Adamson bills have many provisions in common and both thoroughly protect public interest. The principal difference between the two is that the Shields Bill recognizes that there can be no healthy, vigorous water-power development unless the investor can have the assurance that his investment will remain intact and earn a reasonable return.

Shields Bill.

(1) Permits to develop water power in navigable streams are to be given by the Secretary of War to properly qualified applicants who, in his judgment, are best fitted, in the public interest, to develop the water resources. The bill sets forth at length the general terms and stipulations and the Secretary of War is made the administrative authority to carry those terms and stipulations into effect.

(2) Provides for a permit for a period of 50 years, at any time after which the Government may, on a two years' notice, take over the property for itself or for a subsequent grantee by paying the fair value of the property, not including the rights granted by the Government.

(3) Provides for the protection of the public interest as follows:

(*a*) The public service commission of the state in which the water power is located is given supervision of rates and service when the business is intrastate, and the same regulatory authority is conferred upon the Secretary of War when the business is interstate.

(*b*) The Secretary of War is given authority to examine the books of the grantee and to require them to submit sworn statements of every detail of their business transactions.

(*c*) Provision is made for cancellation of the grant in case the grantee fails to comply with the terms.

(*d*) Unlawful trust or monopoly or restraint of trade is forbidden.

(4) Same as Adamson Bill.

(5) Provides that work under a permit must be begun within two years from the date thereof and completed within such time as may be specified by the Secretary of War. Provides for diligent, orderly and reasonable development and continuous operation of the water power, subject to market conditions.

(6) Provides that contracts for the sale of hydroelectric energy may be made for terms extending beyond the 50-year period with the permission of the public service commission having jurisdiction thereof and of the Secretary of War.

(7) Reserves the right to alter, amend or repeal, but provides that if a grantee acting in pursuance of any grant made thereunder has expended his money and established property, such expenditures and property shall be consid-

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ered as property rights of which the grantee shall not be deprived except by due process of law.

Adamson Bill.

(1) Sets forth terms and stipulations in detail but nevertheless requires the prospective power developer to secure a special act from Congress in each case. Such a provision will mean a delay of at least one year in development and in the majority of cases, two years. It will render financing difficult and expensive and the appearance of each special bill will precipitate the same old controversy that is now being waged over the terms of the general bill.

(2) Provides that all rights shall cease at the end of 50 years, whether the Government takes over the property or not, i. e., a grantee under the bill would have no assurance that he could either continue in the operation of the property after the 50-year period or that the Government would make any disposition of it.

(3) Same as Shields Bill.

(4) Makes provisions concerning the navigation interest, which require the grantee:

(*a*) To install at his own expense, locks, booms, sluices, lights, signals, or other structures in aid of navigation purposes.

(*b*) To furnish, free of cost, power for operation of same.

(*c*) To reimburse the United States for the cost of investigation and supervision incidental to the transaction.

(*d*) To pay the United States for benefits accruing from headwater improvements established and maintained by the United States.

(*e*) To pay the United States annual charges for use of any government land used in power development.

(5) Provides that work must be begun within one year and be completed within five years thereafter. Provides for diligent, orderly and reasonable development and continuous operation of the water power, subject to market conditions.

(6) Provides that contracts for the sale of hydroelectric energy shall not extend more than 20 years beyond the 50-year period, with the permission of the public service commission having jurisdiction thereof and of the Secretary of War.

(7) Reserves the right to Congress to alter, amend, or repeal the Act and provides that the grantee shall be entitled to no indemnity for damages occasioned thereby.

(8) Provides that not more than 50 per cent of the output of any plant shall be sold to one consumer and that no power shall be sold through a distributing company without consent of the Secretary of War.

(9) Excludes "intangible values" in the fixing of rates or in the taking over of the property. "Intangible values" include necessary, legitimate and actual expenditures made by the grantee in establishing his business, such as preliminary expenses, engineering and legal expenses, the cost of securing capital, etc.

Ferris Bill.

(1) Authorizes and empowers the Secretary of the Interior to lease lands of the United States for water-power purposes under such terms and conditions as he may prescribe, or, in other words, it authorizes him to give or to withhold a lease and he may withhold it notwithstanding the fact that an applicant may comply with all the other terms of the law. This places in the hands of the Secretary of the Interior, an administrative officer of the Government, enormous power which may be used righteously or unrighteously according as the Secretary desires.

(2) The term of lease is for not more than 50 years, at the end of which all rights lapse unless a new lease is negotiated or unless the Government in its good pleasure takes over the property for itself or for another lessee.

(3) Provides that each lease shall provide for the diligent, orderly and reasonable development and continuous operation of the water power subject to market conditions, but prohibits the sale to any one consumer of electrical energy in excess of 50 per cent of the total output. Regulation of interstate service is vested in the Secretary of the Interior.

(4) Provides that there shall be no physical combination of plants or lines for the generation, distribution and use of power without the consent of the Secretary of the Interior.

(5) Prohibits the delivery or sale of power to a distributing company in the manner already stated in connection with the Adamson Bill.

(6) Provides that no lessee shall create a lien on any power project developed under a lease unless the same be approved by the Secretary of the Interior.

(7) Provides that after 50 years, upon not less than three years' notice, the United States shall have the right to take over the properties which may have been acquired by any lessee, which are dependent in whole or in part for their usefulness on a continuance of the lease.

(8) Provides that on the taking over of the property, only the actual cost of lands and rights of way shall be paid and the reasonable value, which in this case means the depreciated value of the structures.

(9) Excludes as elements of value, on taking over, the value of franchise, good will, profits to be earned on pending contracts and every other intangible element.

(10) Provides that in case the United States does not exercise its right to take over the properties and does not renew the lease to the original lessee, the Secretary of the Interior may give the lease to a new lessee, upon payment by the latter of the value of the properties as already set forth.

(11) Gives the Secretary of the Interior full authority to fix the charges or rentals for use of government lands at such figure as he may think best to name.

(12) Provides that where a state has not provided any regulatory body for the control of rates and service, the Secretary of the Interior shall exercise that function.

(13) Same as Myers Bill.

(14) Same as Myers Bill.

(15) Same as Myers Bill.

Myers Bill.

(1) Authorizes and directs the Secretary of the Interior to issue leases to all who comply with the other terms of the law.

(2) Provides that if, at the end of 50 years, the property is not taken over and no new lease is negotiated, the lessee shall continue in possession under the terms of the original lease until the United States carries into effect such intention as it may have with respect to the property. Under such a provision, there is no lapse of title and no hazard of loss of investment.

(3) Provides that each lease shall provide for the diligent, orderly and reasonable development and continuous operation of the water power subject to market conditions, and provides that the regulation of interstate service be governed by the Interstate Commerce Commission.

(6) Provides that any successor in interest shall be subject to all the terms and conditions of the approval to the extent as though he were the original lessee.

(7) Provides that after 50 years, upon not less than three years' notice, the United States shall have the right to take over the properties which may have been acquired by any lessee, which are dependent in whole or in part for their usefulness on a continuance of the lease, and also provides that the Government shall have the right to take over, on mutual agreement, a severable and complete unit of any such power system.

(8) Provides, on taking over of the property, for the payment of the fair or actual value of the whole property.

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(9) Excludes as elements of value on taking over, the value of the franchise, good will, and profits to be earned on pending contracts.

(10) Provides that in case the United States does not take over the original properties, the original lessee shall have preference right to renewal over and above any new lessee upon such terms and conditions as the law and regulations then in force shall authorize, and also provides that in case the United States does not take over the properties and does not renew the lease, then the old lease shall continue in existence until such time as the Government takes decided action in the matter.

(11) Provides that rentals for the use of government lands shall be based on the value of the land, to be determined by the amount of horsepower development and shall not exceed the sum of 25 cents per developed horsepower per year.

(13) Provides for the examination of books and accounts of lessees and the submission of sworn statements relative to all fiscal matters.

(14) Provides for forfeiture and cancellation through court proceedings for non-compliance by the lessee with the terms of the act.

(15) That leases for development of power by municipalities shall be issued without rental charge and that no charge shall be made where the power development is not in excess of 25 horsepower.

Central Stations in Massachusetts Reduce Manufacturing Cost.

The total kilowatt-hour cost of manufacturing electrical energy by 13 out of 19 of the largest central stations in Massachusetts was reduced, in the year which ended June 30, 1915, below that for the preceding year. The cost for the other six companies showed slight increases.

Due to marked improvements in generating equipment, including the installation of steam turbines of the latest and most efficient type, several companies were able to make substantial reductions in their manufacturing costs. The most remarkable reduction was achieved by the New Bedford Gas & Edison Light Company, which cut its cost from 1.276 cents per kilowatt-hour in 1914, to 0.89 cents in 1915. Though the company generated over two million more kilowatt-hours in the latter year, its coal bill was $3,000, or 7 per cent, less, and total station wages were 6 per cent less.

Other companies showing substantial reductions in kilowatt-hour costs are the Brockton, Haverhill, Cambridge and Pittsfield companies. The latter hitherto generated in part with the use of water power, but in 1915 generated all its output at its steam plant, except for about 72,000 kilowatt-hours purchased from another company, at 1.3 cents. The company's net manufacturing cost should be reduced somewhat from the figures given in the table to allow for $20,000 expense incidental to steam heat sold.

The lessened cost in the case of the Cambridge company is accounted for in large part by the reduced cost of station wages in relation to output. Fuel costs were substantially reduced by the Brockton company, with similar economy in station wages.

The other five companies making up the 19 referred to are not shown in the table because purchasing a portion of this energy supply from hydroelectric or other companies makes a comparison of costs difficult and of less value.

Electricity Supply in England: War Effects.

The Institution of Electrical Engineers discussed in London on April 13 the present position of electricity supply in the United Kingdom and the steps to be taken to improve and strengthen it. The list of nominations for the Institution council for next session includes that of C. P. Sparks, who is forward as president for a second year. Mr. Sparks is chief engineer of the County Electricity Company.

The City of London Electric Lighting Company spent $70,000 more for coal in 1915 than in 1914, an increase of 40 per cent; at the present time the cost is 100 per cent more than it was before the war, and further increases during 1916 are expected. The scarcity of shipping has affected all London electric supply systems in this matter of fuel, as transport by rail has had to be resorted to; in addition the supply of coal available has been inferior and more has consequently been burned. The London Electric Supply Corporation used 90,000 tons, costing $4.74 per ton, in 1915 as against 73,000 tons, costing $3.38 per ton, in 1914; generating expenses increased by 50 per cent due to the war. One company experienced a drop of 20 per cent in current consumed for lighting, owing to the war lighting restrictions, and its loss of such revenue has been $165,000. In another case special arrangements are being made for carrying larger stocks of fuel owing to the uncertainty of supplies.

The County of London Company reports coal costs at 50 per cent above the normal, the cost of freightage alone now being more than the total cost of coal delivered in the bunkers before the war. The Kensington Company, which has a west-end residential area, experienced last year a bigger advance in heating load than ever before. The City of London Company had a reduction of 370 consumers owing to the suspension of many businesses in its area, notably among stock brokers and foreign importing agents. Its lighting sales fell by over a million kilowatt-hours, but power and heating showed a good improvement. Certain smaller stations have been scrapped, bulk supply being resorted to, and mutual interworking between different undertakings has been more advanced by war conditions than by all of the discussion that took place in the years before the war.

Several of the London companies reduced their dividends by one or two per cent; some drew from dividend reserve funds to maintain the previous year's rate of dividend; all are deferring all capital expenditure save what is most urgently necessary; all have raised their charges to condeduction of 20 per cent.

COMPARATIVE KILOWATT-HOUR MANUFACTURING COSTS, MASSACHUSETTS COMPANIES, 1915-1914.

Company	Fuel		Oil		Water		Sta. Wages		Tools		Sta. Repairs		Steam Plant Repairs		Elec. Plant Repairs		Total Mfg. Cost	
	'15	'14	'15	'14	'15	'14	'15	'14	'15	'14	'15	'14	'15	'14	'15	'14	'15	'14
Cambridge El. Lt. Co.	.403	.447	.012	.013	.026	.028	.274	.345	.003	.004	.017	.030	.040	.033	.046	.030	.821	.932
Easthampton Gas Co	.641	.602	.004	.006	.003	.002	.307	.327	.005	.004	.001	.001	.049	.111	.010	.020	1.02	1.073
Edison El. Ill. Co., Boston	.359	.373	.002	.002	.010	.011	.161	.150	.017	.018	.009	.006	.051	.032	.060	.064	.687	.675
Edison Co. of Brockton	.458	.635	.005	.006	.019	.011	.179	.235	.023	.019	.079	.026	.069	.056	.020	.011	.852	.989
Fall River El. Lt. Co.	.390	.441	.005	.006	.016	.013	.124	.135	.011	.014	.011	.018	.024	.014	.015	.045	.596	.686
Haverhill Electric Co	.640	.655	.016	.013	.....	.....	.209	.202	.011	.018	.055	.012	.071	.058	.004	.008	1.006	1.239
Lowell El. Lt. Corp'n	.667	.629	.008	.009	.007	.004	.193	.195	.013	.015	.032	.016	.069	.066	.005	.021	.988	.956
Lynn Gas & El. Co.	.461	.476	.015	.013	.032	.030	.194	.198	.003	.003	.051	.054	.152	.142	.014	.012	.922	.928
Malden Electric Co.	.693	.642	.011	.010	.057	.057	.177	.184	.015	.016	.002	.005	.058	.059	.006	.011	1.019	.984
New Bedford Gas & El. Lt. Co.	.472	.680	.003	.008	.038	.039	.309	.437	.025	.011	.017	.030	.027	.051	.005	.020	.890	1.276
Pittsfield El. Lt. Co.	.816	*	.013	*	.028	*	.351	.416	.009	.007	.017	.013	.062	.075	.008	.002	†1.307	†1.510
Salem Elec. Ltg. Co.	.550	.511	.013	.007	.020	.017	.233	.166	.010	.008	.002	.009	.059	.054	.006	.006	.903	.778
United El. Lt. Co., Springfield	*	*	*	*	*	*	.124	.137	.006	.003	.040	.015	.066	.044	.026	.031	.820	.803
Worcester El. Lt. Co.	.480	.474	.004	.004	004	.001	.108	.104	.003	.001	.018	.035	.046	.062	.014	.017	.680	.698

*Electricity generated partly by water power. †Modified by steam heat sold.

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

RATES FOR ELECTRIC SERVICE.

An Analysis of Rate-Making Given in a Paper Presented Before a Recent Convention of the Minnesota Electrical Association.

By W. C. Beckjord.

Electrical energy cannot be sold in the same way as other commodities, for the reason that it is not subject to the same rules in manufacture. The demand on an electric plant is instantaneous. Telephone messages must wait until the lines are not busy, passengers must wait until another car comes, water can be stored in reservoirs until it is needed, gas can be manufactured at a uniform rate, stored in holders, and pumped into the mains when needed, manufactured articles can be made in dull season, and stored for future demand. There is no efficient or practical way in which large quantities of energy can be stored for commercial purposes, so electricity must be made when sold.

In the early days of electricity Edison sold illumination, not kilowatt-hours. The unjust discrimination this method effected against the man who used one light ten hours, as compared with the one who used ten lights for one hour, soon rendered it obsolete.

The electrolytic meter was the next development in the sale of electrical energy. This was a cumbersome method, and soon gave way to the modern type of meter, and the old method of charging was succeeded by a multiplicity of rates, the end of which has not been reached.

About 25 years ago Hopkinson presented his "readiness-to-serve" method of rates in England. This consisted of a certain fixed charge per month for maximum demand and a low price for current consumed. This rate, while satisfactory perhaps to long-hour users, proved excessive for short-hour users.

The Wright system was devised to give the short-hour users a reasonable rate even though served at a loss, the secondary rate being made high enough to make up the deficit. The system was advanced by Arthur Wright in England about 22 years ago. It consists of a two-rate differential, the primary rate applying to all consumption up to an amount equivalent to a certain daily use of the maximum demand and a low rate per kilowatt-hour for all excess consumption.

The objections to the Wright demand system are the inability of the public to understand it and the possibility of error in determining the maximum demand. It is hard for the average citizen to see why he should pay eight to ten cents for residence lighting, and probably less than two cents for power. The same machines are used to generate the current and it comes over the same wires. The possibility of error in determining the maximum demand has been reduced by the introduction of maximum-demand watt-hour meters. These meters are now on the market and, while they cost about twice as much as the regular type of meter, they undoubtedly settle all disputes as to maximum demand.

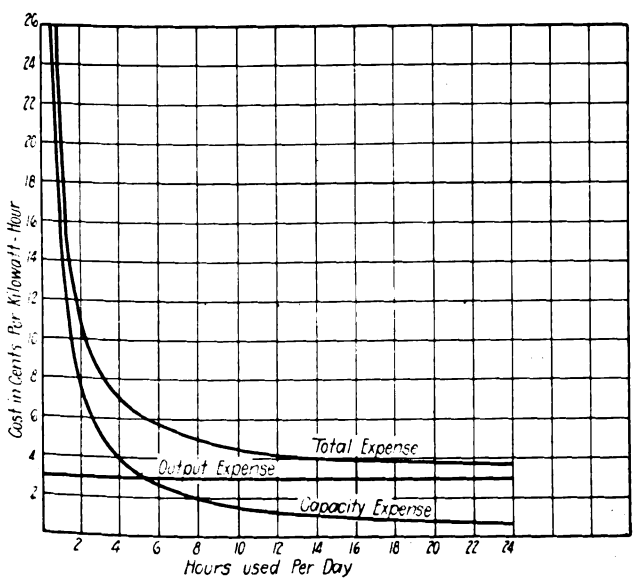
There are three items of expense to be considered in rate-making, those of capacity expense, output expense and consumer expense.

The capacity expense includes all those expenses which would go on regardless of output, such as interest, insurance, depreciation, taxes (except gross-earnings tax), a certain proportion of labor and repair expense, supervision, general expense, and the like.

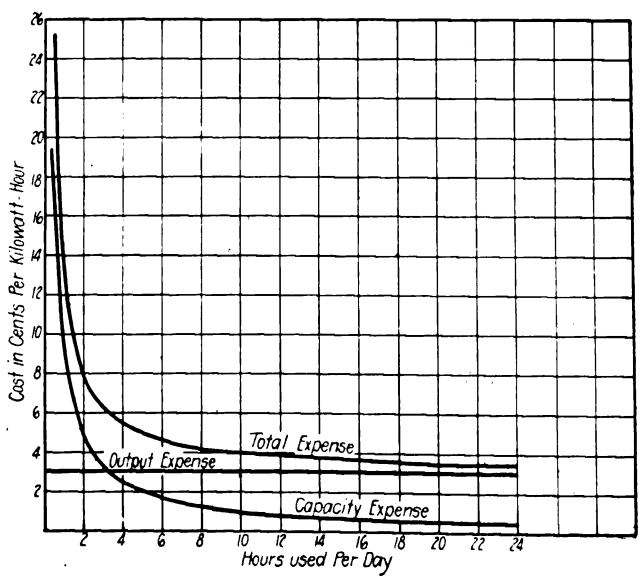
The output expense includes coal and water, some labor and repairs, and gross-earnings tax.

The consumer expense includes expense of billing and collection, meter, some distribution maintenance, new-business expense, inspection and gratuitous work.

As an illustration of these factors in rate-making, assume conditions for a 1,000-kilowatt plant. Let the investment be $300 per kilowatt, a total of $300,000; let the fixed charges and other capacity expense be 20 per cent of that amount, or $60,-



1,000-Kilowatt Plant Capacity, Lighting Load Only.
Peak load of 1,000 kilowatts. Output expense, 3 cents per kilowatt-hour. Fixed charges and capacity expense equal to 20 per cent of $300,000 divided by 1,000, or $60 per kilowatt.



1,000-Kilowatt Plant Capacity, Power and Lighting Load.
Lighting peak load of 1,000 kilowatts. Power peak load of 700 kilowatts. Output expense, 3 cents per kilowatt-hour. Fixed charges and capacity expense equal to 20 per cent of $300,000 divided by 1,700, or $35.33 per kilowatt.

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000; the output expense $0.03 per kilowatt-hour, and the consumer expense $1.00 per month. Costs in cents per kilowatt-hour for the number of hours of peak lighting load of 1,000 kilowatts are given in the following table.

1,000-KILOWATT PLANT CAPACITY.
Lighting Load Peak of 1,000 Kilowatts.

Hours Used per Day	Load Factor in Per Cent	Yearly Output in Kilowatt-Hours	Cents per Kilowatt-Hour: Fixed Charges	Output Cost	Total Cost
0.25	1.04	91,250	65.75	3.00	68.75
0.5	2.08	182,500	32.87	3.00	35.87
1.	4.16	365,000	16.44	3.00	19.44
2.	8.32	730,000	8.22	3.00	11.22
4.	16.64	1,460,000	4.11	3.00	7.11
6.	25.00	2,190,000	2.74	3.00	5.74
8	33.33	2,920,000	2.06	3.00	5.06
10.	41.60	3,650,000	1.64	3.00	4.64
12.	50.00	4,380,000	1.37	3.00	4.37
16.	66.60	5,840,000	1.03	3.00	4.03
20.	83.30	7,300,000	0.82	3.00	3.82
24.	100.00	8,760,000	0.68	3.00	3.68

Now assume a power load of 700 kilowatts in addition to the lighting load. The fixed charges and capacity expense per kilowatt will be reduced to $35.33; that is, $60,000 divided by 1,700 gives $35.33 per kilowatt. Costs in cents per kilowatt-hour are as follows:

1,000-KILOWATT PLANT CAPACITY.
Lighting Load of 1,000 Kilowatts and Power Load of 700 Kilowatts for Given Number of Hours and at Different Times of Day.

Hours Used per Day	Load Factor in Per Cent	Yearly Output in Kilowatt-Hours	Cents per Kilowatt-Hour: Fixed Charges	Output Cost	Total Cost
1	7.08	620,500	9.68	3.00	12.68
2	14.17	1,241,000	4.84	3.00	7.84
4	28.34	2,482,000	2.42	3.00	5.42
6	42.51	3,723,000	1.61	3.00	4.61
8	56.67	4,964,000	1.41	3.00	4.41
10	70.83	6,205,000	0.97	3.00	3.97
12	85.00	7,446,000	0.81	3.00	3.81

Assuming the average residence demand to be 200 watts, an equation to determine the amount of residential consumption to make each customer profitable, would be as follows:

Demand charge, $60 per kilowatt per year.

Output charge, $0.03 per kilowatt-hour.

Consumer charge, $1.00 per month.

Let x = number of kilowatt-hours per month.

Then assume rate to be 10 cents per kilowatt-hour.

$$0.2\times60/12+1.00+0.03x=0.10x$$
$$0.07x=2.00$$
$$x=29 \text{ kilowatt-hours per month.}$$

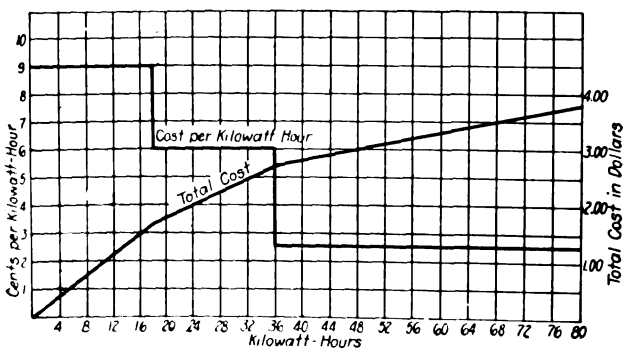
That is, the average bill should be $2.90 per month, in order to meet all expenses.

Making allowance for the diversity of light and power, the fixed charges and capacity expense will be $35.33 per kilowatt.

$$0.2\times35.33/12+1.00+0.03x=0.10x$$
$$0.59+1.00=0.07x$$
$$x=23 \text{ kilowatt-hours per month.}$$

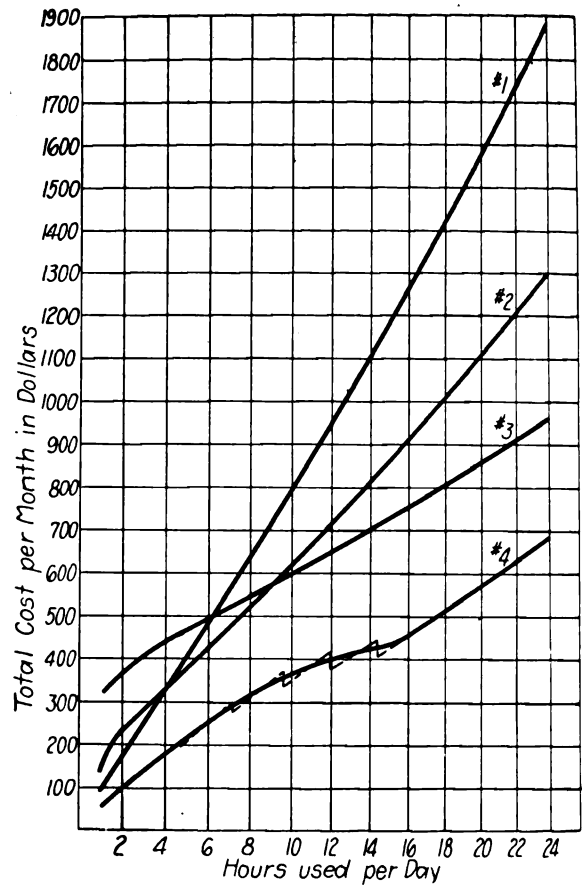
That is, the average bill should be $2.30, in order to meet all expenses, a deduction of 20 per cent.

The accompanying curves show the values obtained under the two conditions of load.



Residential Lighting Rate of the Minneapolis General Electric Company for Six-Room House.

Based on block rates of three kilowatt-hours per active room per month, one curve shows the cost per kilowatt-hour, and the other the total cost to the consumer for monthly consumption.



Comparison of Minneapolis Rates for 100-Kilowatt Maximum Demand.

Rate No. 1.—Six cents per kilowatt-hour for first 200 kilowatt-hours; 5 cents for next 200; 4 cents for next 200, and 3 cents for all over 600.

Rate No. 2.—Six cents per kilowatt-hour for first 52 hours' use of maximum demand; 2.5 cents for all excess, and 25 per cent discount on amount of bill over $250.00 per month.

Rate No. 3.—Demand charges, $3.50 per month for first 10 kilowatts; $2.50 for next 40, and $2.00 for all over 50. Energy charge, 4.5 cents for first 400 kilowatt-hours; 3.5 cents for next 600; 2.5 cents for next 3,000; 1.5 cents for next 6,000, and 1 cent for all excess.

Rate No. 4.—2,300-Volt Schedule.—1.609 cents per kilowatt-hour up to 20-per-cent load-factor; 1.475 cents from 20 to 30-per-cent load-factor; 1.341 cents from 30 to 40 per cent; 1.207 cents from 40 to 50 per cent; 1.1 cents from 50 to 60 per cent, and 1 cent for all over 60 per cent load-factor.

Some rate-makers have considered that each customer should pay by the year for his proportionate kilowatt demand, regardless of consumption, diversity-factor being considered, the rate per kilowatt-hour being determined for each class by dividing the total expense for each class of business by the total kilowatt-hour consumption for that class. In such a rate as this, of course, a certain minimum charge would have to be fixed, in order that the capacity charge be at all times equitably distributed, according to maximum demand.

Different classes of business must command different rates. F. G. Baum, consulting engineer, of San Francisco, Cal., has offered these three considerations in making rates for new business: (1) Some profit must be made for the consumer, in order to get the business. (2) Some profit must be made for the company. (3) Tendency of business taken on must be such as to cause lowering of rates, as volume of business increases. That is, a rate must be made which will be less than isolated-plant costs.

All kilowatt-hours sold need not necessarily give the same amount of profit, for some classes of business cannot afford to pay as much profit as others. Long-hour, off-peak business can profitably be taken on, to earn a lesser rate of return than peak business, for the reason that no one else wants it at those times, and it helps to distribute the fixed charges of the plant over a greater output. It tends to decrease the cost of energy to all the customers.

One cause of the confusion resulting from the different rates for light and power is the fact that the same unit is used to

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measure two entirely different things. The customer cannot grasp the distinction between kilowatt-hours used for light and kilowatt-hours used for power. It has been suggested that power energy be measured in some other form, such as million gallons pumped against a certain head. This method is now used in large city pumping contracts. The rate per kilowatt-hour in these cases is sometimes below a cent, and it is still profitable business, because it is long-hour and off-peak use. The average customer could not understand the distinction, however.

As illustrations of simple and complex rates, curves are shown of the residential lighting rate of the Minneapolis (Minn.) General Electric Company and power rates based on a 100-kilowatt maximum demand.

The high state of efficiency of the electric measuring devices and the fact that electricity follows exact laws makes it a simple proposition to sell electrical energy by the kilowatt-hour. If the costs are separated according to the demands of each class of business and the rate per kilowatt-hour determined according to the load-factor of each class an equitable rate can be determined.

Some classes of business must necessarily bring in a higher rate of return than others in order to meet competition. Lighting service generally brings in a higher rate of return, but the community at large is benefited by low power rates. If there was no power business there would be no community, and therefore no necessity of lighting bills at all.

The tendency of the times is towards simplification of electric rates. It would seem that the easiest rate for a customer to understand would be a block rate, in which a certain number of kilowatt-hours is sold at a certain rate, the next block of a larger number of kilowatt-hours at a lower rate, and so on down. A definite minimum bill should be enforced, depending upon maximum demand. In this way each customer pays his fair share of fixed-capacity expense, and also gets the benefit of the load-factor. Theoretically the three-charge rate is correct, but it is hard for the customer to understand, and a block rate, based on previous experience, with different classes of business, could undoubtedly be worked out to accomplish the same result, and still be perfectly plain to all consumers.

What the Commonwealth Edison Company Did During "Wire-Your-Home" Month.

When the announcement of the "Wire-Your-Home" campaign of the Society for Electrical Development was brought to the attention of the Commonwealth Edison Company of Chicago, plans were made at once for a vigorous campaign. In addition, all members of the two associations of electrical contractors in Chicago were notified and asked to co-operate. Copies of the booklet "Successful House Wiring Plans" were mailed to each member of the two societies, and also to each house-wiring salesman of the Commonwealth Edison Company.

Two thousand booklets entitled "All Houses Are Easily Wired for Electricity" were ordered from the Publications Committee of the National Electric Light Association. Of these, 500 copies were sent to each of the two local electrical contractors' associations and 1000 were given to the wiring salesmen of the Commonwealth Edison Company, for distribution.

A series of advertisements was published in the morning and afternoon papers of Chicago. In these attention was directed to the advantages of electricity in the home, and also to a special premium offer. In some of the advertisements attention was directed to the associations of electrical contractors. Several hundred proofs of these advertisements were distributed among the contractors and the company's house-wiring salesmen to be inclosed with proposals to "prospects."

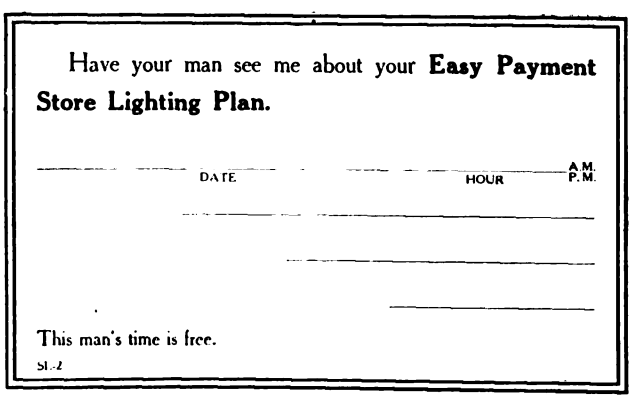
To any owner of a house or apartment building signing a contract for wiring, the Edison Comany gave a premium certificate which entitled him to a choice of an electric grill, boudoir candles or three styles of a reading lamp. Cash prizes of $10, $5 and $2.50 were offered to the three contractors in each of the two associations and to the three salesmen of the Edison Company who secured the largest number of contracts.

In the contract department of the Commonwealth Edison Company a chart was posted on the bulletin board during the campaign. This chart was so arranged that arrow heads representing house-wiring salesmen were moved forward at the end of each week, indicating the record made. This induced not a little rivalry among the house-wiring salesmen of the Edison Company.

During the period of the campaign (March 15-April 15), the total number of house-wiring contracts secured for central-station service from all sources was about 700. Of this business, the number secured by the Edison Company's salesmen was 443, while the electrical contractors turned in about 150. The 443 contracts secured by the Edison salesmen represent the installation of 10,013 lamps. The Edison salesmen secured house-wiring contracts during this campaign at an average rate of about 15 a day. Up to and including May 4, 1916, a total of 192 certificates had been presented at the electric shops and branch stores of the Commonwealth Edison Company. In exchange, 168 reading lamps, 12 electric grills, 11 pairs of boudoir candles and one electric flat-iron had been given out as premiums.

Boston Company Seeks Shop Lighting and Heat Service.

The Boston Edison Company is carrying on a special store-wiring campaign in the Roxbury district. Here are located a large number of small stores and shops using gas for heating tools used in repair work and small manufacturing. The company is mailing five N. E. L. A. store-wiring booklets, interspersed with form letters and circulars. No fixed unit prices are given, but each job is estimated on its own basis, and the contract given to a local contractor, the company recouping itself on the installment plan. In this connection, an electric disk stove, with six-inch top, four heats, long cord and plug, is offered at the special price of $3.95. This stove appeals to barbers for water heating, to tailors and shoe-repair men for glue heating, and to many others.


Have your man see me about your **Easy Payment Store Lighting Plan.**

DATE HOUR A.M. P.M.

This man's time is free.

Mailing Card Used In Store Campaign.

Electric Rates Fixed by Municipalty.

The West Virginia Supreme Court has handed down an interesting decision holding that the Public Service Commission of the state has the power to change a public service rate fixed by a municipality by ordinance before the enactment of the law creating the commission, where the authority to establish such rate was not expressly vested in the municipality by legislative action.

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SECURING BUSINESS IN A TOWN OF 4,000.

Increasing Gross Revenue from $3 to $7 Per Capita in Course of Two Years.

How the central-station revenue in a town of 4,000 inhabitants was increased from $3 to $7 per capita in the course of two years, was interestingly described by R. K. Johnston, manager of the Washita Electric Power Company, Pauls Valley, Okla., in a paper presented before the recent convention of the Gas, Electric and Street Railway Association of Oklahoma.

Mr. Johnston explained that "in getting new business we have had to overcome the prejudice of the people against the former operators, as two plants before the present one had been failures. The first plant had a 75-kilowatt generator and a threshing machine boiler. As the load would come on in the evening the lights would grow dimmer, until finally they would blow the whistle and shut down. After enduring this kind of service for some time, the citizens rose up in arms and cut the company's poles down. This left the town without lights for some eighteen months, when another promoter attempted to develop a water power on the Washita River. He had the misfortune to locate his dams in a bed of quicksand. Just as the people were getting used to electric lights out would go his dam and the town would be in darkness until he had repaired the damages. He had a very overbearing disposition and always pursued the policy of the 'public be damned.' The citizens were again holding mass meetings getting ready to cut down his poles, when he sold the plant to the present owners.

The present company advertised extensively in the papers the advantages of electric lights and electrical appliances and urged its customers to bring all complaints direct to the office. We then went out soliciting house wiring. For thirty days only, we offered an electric iron free with every house wired. Our regular price is $2.00 each for the first three outlets and $1.50 for each additional outlet. We secured some 50 houses that month. I am a firm believer in campaigns for business. Make some special for a limited time, as it gives you something to start talking about and you can press your prospective consumer for immediate action. I have also observed that people whom you could not close with during the campaign, eventually come to you and want their houses wired. In fact we have always wired as many houses the next few months after a special offer as during the time of the campaign. Even if you cannot close the deal then, it gets them to thinking about electricity. I always solicit the tenant houses even if I know there is no chance to get them. It makes the tenants think about electric lights and dissatisfied with their present house. When I leave a tenant I always say to them 'well, when you move, be sure and see that the house is wired. Your landlord will wire before you move in and not afterward.' Local advertising in a general way does not pay in a town of this size, unless it is followed immediately with personal solicitation. We try to co-operate with any special campaign the manufacturers are making and take advantage of the free service they usually offer.

"Liberal free trial of any electrical device is about the only way you can sell them. When we first covered the town with irons we put out over a hundred, and at the end of the thirty days' trial when we sent them a bill, only six of the women called us to come after their irons. We selected the hottest Tuesday morning to go after them and two of these women sent their husbands down to get the irons before the boy returned to the office with them. It is needless to add that eventually the other four irons were taken back by them. We now always install an iron when we set a meter, charging them for it. This keeps our lines well saturated with irons without any extra expense. If an iron comes back we sell it for $2.50.

"From my experience I do not believe in cutting prices on electrical appliances, but believe in maintaining the list price and when necessary giving the customer liberal trial and easy payments. If you get a customer who wants something cheap, sell them a used article at a little above cost.

"Our office is located up town and we try to make it attractive. We have a sample of each utensil displayed on a large table where they can easily be handled by our customers when they come into our office to pay their light bill. Either the bookkeeper or myself are always at hand to explain the various electrical devices, and some of the best leads I get on new business have come either from my bookkeeper or from some of the men on the line. These prospects can usually be closed, if you follow them up promptly.

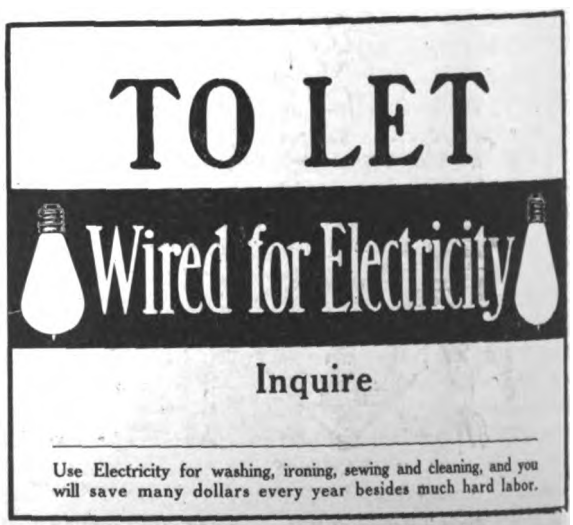
"We now have five electric tailoring irons which we put on a five-cent rate. Each iron is good for from $2.50 to $12.00 a month. To get these irons in I made them a price installed, guaranteeing to take them out without a cent of charge if they were not satisfactory in every way. Not one has been returned. I firmly believe that if we had asked them to take the chance of installing an electric iron, we could not have persuaded them to consider it."

House Electric at Indianapolis.

An effective advertising method was recently employed by the Columbus, Ind., branch of the Central Indiana Lighting Company together with several of the merchants of the city. A modern house near the heart of the business district was rented and fitted with the latest electrical appliances. In order to thoroughly demonstrate the latest type of electrical range, food was cooked on it and served to the visitors. Some of the leading merchants of the city contributed to the furnishings in the home. As a result of the display, the merchants claim they have received a remarkable increase in business, and a number of the electrical ranges were disposed of.

Utility Provides Real-Estate Signs.

Two attractive placards 8.5 by 11 inches, printed in red and black, are used with good effect by the Manchester (N. H.) Traction, Light & Power Company, the progressive and growing New Hampshire central-station company.



Sign Furnished by Central Station.

One of the cards is issued to real-estate owners and agents and points out that the property on which it is placed is wired for electricity and hence is an attractive proposition. The other card specifies the low cost of electric service used in the ordinary domestic operations—washing, sewing, cleaning and ironing.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING OF FIXTURES AND PENDANTS.

By Terrell Croft.

Wire for wiring fixtures should obviously have the best insulation because such conductors always lie close to the metal work of the fixture. They are fished through restricted spaces, pulled around sharp bends and subjected to other abuses; hence, rubber insulation is used. No. 18

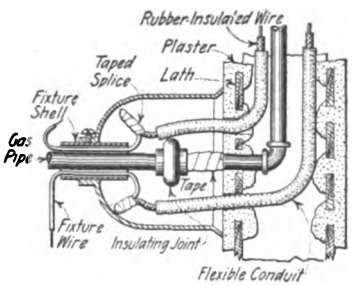

Fig. 1.—Method of Supporting a Combination Bracket Fixture.

wire is the minimum size permissible in wiring fixtures, and most fixtures are wired with this size. Ordinarily, this is necessary in the case of combination gas and electric fixtures, because the space between the gas pipe and the fixture casing, as shown in Fig. 1, is frequently so small that wires larger than No. 18 could not be accommodated. If fixture shells were made large enough to accommodate relatively large wires, for instance No. 14, they would be bulky and unsightly.

Wiring in and adjacent to fixtures should never be permitted to contact with grounded portions of gas pipes because of the possibility of a hole being burnt in the gas pipe by a conductor grounded on it and the gas being ignited by the arc.

Chain fixtures should be wired with stranded conductors as shown in Fig. 2, because if solid wires are used they

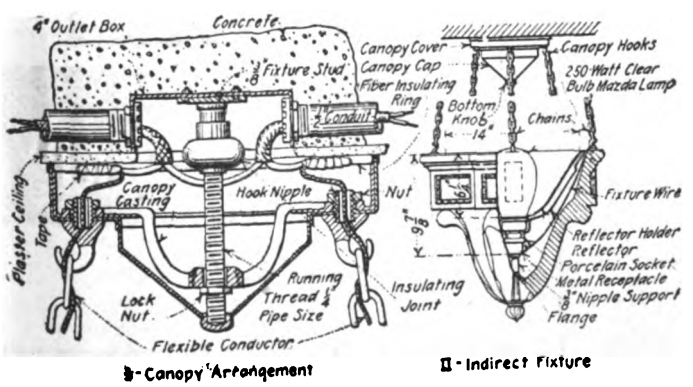

Fig. 2.—Method of Wiring an Indirect Lighting Fixture.

are liable to be weakened and broken off by the swaying of the fixture.

Insulating joints should be interposed as shown in Fig. 3 and other illustrations, in the stem of an electric fixture between the fixture and any grounded metal work or conducting material upon which it may be supported. That is, an insulating joint is always required when a fixture is supported from a grounded object which would ground the metal work of the fixture. Obviously, gas piping and conduit systems are splendidly grounded.

An insulating joint is not required when a fixture is supported from an ungrounded surface or support, as shown in Fig. 6; hence, insulating joints are not required for straight electric fixtures hung from wood ceilings or walls, or from lath and plaster ceilings or walls provided the wiring is done by the knob-and-tube, open work, or wooden-molding methods. If the wiring is in accordance with the conduit method an insulating joint is required, except where the insulation within the fixture is equal to other parts of the system.

The reasons why fixtures should be insulated from ground, that is, the reasons that dictate the use of insulating joints, are these: The electric fixture is probably the weakest member, electrically, in the wiring system. The fixture wire within it has relatively thin insulation and is drawn into cramped places and in some cases past the sharp edges of metal parts composing the fixture. Hence, as might be expected and as experience has shown, contact between the metal of the fixture wire and the metal parts of the fixture is very liable to occur. If the fixture is insulated from ground, the difficulty will be localized to within the fixture. The relative weakness of the fixture-wire insulation is then the real element that dictates the insulation of fixtures from ground. If wire having the same insulation as that on all other parts of the system is used in the fixture, its insulation from ground is not required in straight electric fixtures. That is, if No. 14 rubber-insulated wire like that used in the branch circuits is used for fixture wiring, it is not necessary to insulate the fixture from ground, provided the "live" metal parts of the fixture are thoroughly insulated from the shells and similar "dead" metal parts.

Insulating joints, as shown in a number of the illustrations, may be divided into two general classes:

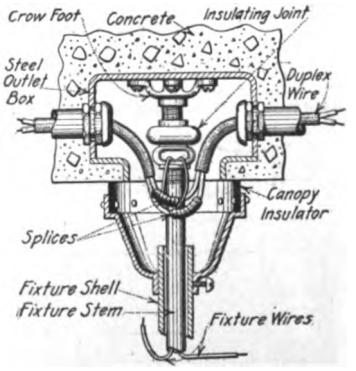

Fig. 3.—Electrolier Outfit in a Concrete Ceiling.

(1) Those for straight electric fixtures, Fig. 3, which are blanked; that is, they have no opening through them.

(2) Those for combination fixtures, Fig. 1, which have a hole through them to admit the gas to the fixture.

Insulating studs, Fig. 9, may be used in conduit installations instead of insulating joints. For example, an insulat-

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ing stud is shown in Fig. 7 and could have been used instead of the insulating joint and crowfoot in the installation indicated in Fig. 3.

Gas pipes above the insulating joint should have an insulating protection as shown in Figs. 1 and 4. This protection may be either a serving of tape (Fig. 1), a piece of flexible tubing (Fig. 4) or a porcelain tube. The flexible tubing, if this material is used, may be split and placed around the pipe and then held in position with tape. Where all of the gas pipe exposed at the outlet is below the insulating joint, as shown at Fig. 5, insulating protection on the pipe is unnecessary.

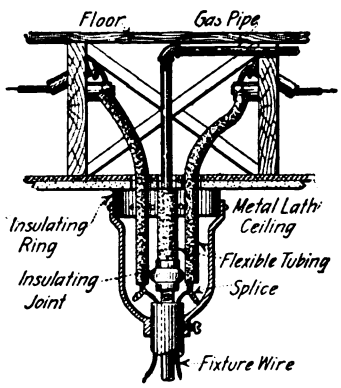

Fig. 4.—Method of Supporting a Combination Fixture on a Metal-Lath Ceiling.

Metallic cements or paints should not be used on the gas-pipe threads of insulating joints because such materials may run down through the hole in the joint and bridge across the insulating material, thereby short-circuiting the joint. For these reasons, white and red lead are unsuitable. An insulating paint or cement—asphaltum, for example—should be employed.

The wiring at bracket outlets is shown in Figs. 1 and 7. Fig. 1 illustrates a knob-and-tube installation, but since there is a gas pipe at the outlet an insulating joint must be used. Fig. 7 shows an outlet box at a conduit-wiring bracket outlet, an insulating joint being used to electrically separate the fixture from the grounded conduit system.

Ceiling-fixture outlet wiring is shown in Fig. 8. The sockets and shade holders, which in this installation comprise the "fixture," are installed in each of the installations from the conduit outlet box by porcelain in lieu of insulating joints.

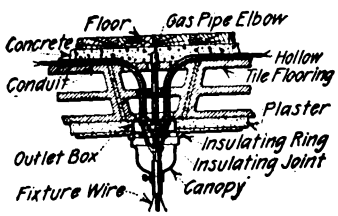

Fig. 5.—Combination Ceiling-Fixture Outlet in a Hollow-Tile Ceiling.

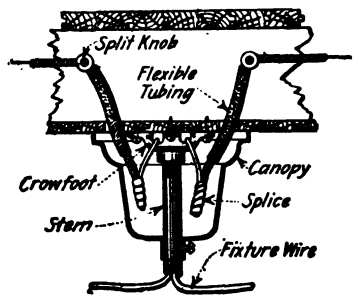

Fig. 6.—Electrolier on a Wooden Ceiling.

Fixture wiring in an exposed conduit installation is shown in Fig. 10. Insulating joints and canopy insulators are required.

The function of a canopy insulator is to prevent the grounding of a fixture through the metal work of the canopy contacting with a conducting grounded surface or object. Obviously, a fixture may be grounded through its canopy as well as through its stem, necessitating in some cases the inclusion of an "insulating joint" between the canopy and the supporting surface as well as in the stem of a fixture. Where conditions demand their installation, it does no good to place one of the insulating joints unless the other is also used.

Canopy insulators should be used as shown in Figs. 3, 4 and 5, where a fixture canopy might ground a fixture.

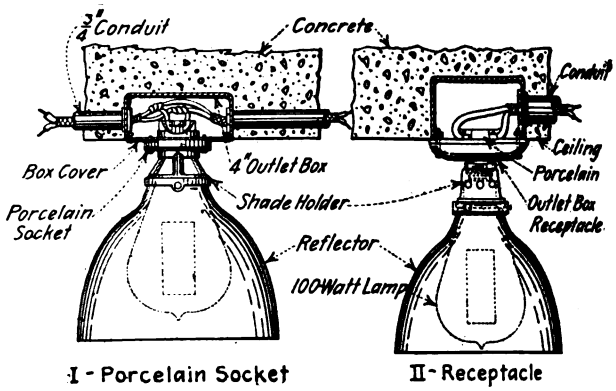

Fig. 8.—Wiring of Ceiling Fixtures.

These insulators are usually formed of a strip of fiber or similar insulating material attached around the circumference of the canopy as shown in Fig. 12. Canopy insulators are not required when the canopy will rest against a plaster-on-wood-lath or on a wood surface, but where the canopy will rest against a plaster-on-metal-lath surface or where it might contact with an outlet box the insulators are required. Canopies are not insulated from ordinary plastered surfaces in fireproof buildings because dry plaster is a fairly good insulator, but where the plaster is on metal lath there is always danger of metallic contact and canopy insulators should be used.

A dry wood block fastened to the supporting surface may be used in lieu of a canopy insulator in certain cases, provided the screws supporting the block do not contact with the metal parts of the fixture. Where a "hickey" is mounted on such a block the screws holding the hickey should not extend through the blocks.

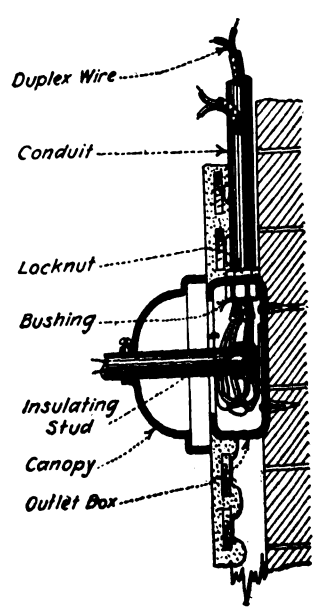

Fig. 7.—Bracket Fixture Installation.

A canopy insulator must extend around the entire circumference of the canopy unless it is necessary to cut away a relatively small portion of it (in open and molding wiring) for the admission of the conductors. The so-

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called "bug" insulators which were formerly used and which insulated the canopy at only a few points around its circumference are no longer acceptable.

In attaching insulators to canopies they may be either secured with small rivets, as shown in Fig. 12, or one of the special forms of canopy insulators may be applied. Fig. 11 illustrates one of these special forms which is very popular in certain sections of the country. The metal of the canopy is deformed with a special punch so that it engages in the holes in the insulating ring. It has the advantage that rivets, which sometimes result in undesirable accidental contacts, are not used.

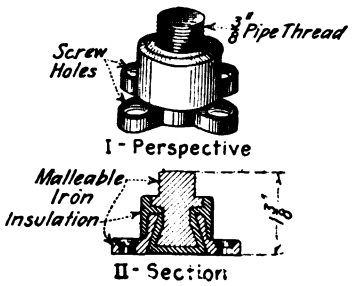

Fig. 9.—Insulating Stud for Fixtures.

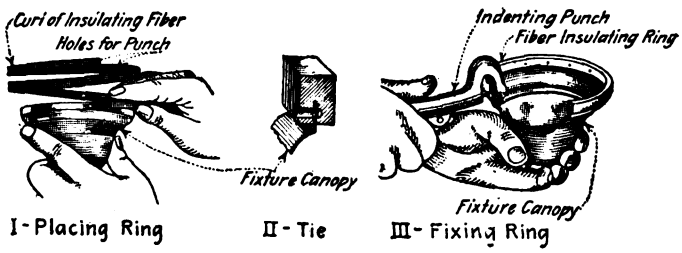

Fig. 11.—Method of Attaching the Bechtold Canopy Insulator.

Where molding wiring or open wiring enters a canopy, the canopy should be cut to provide for its reception, so that there can be no possibility of the sharp edges of the canopy cutting into the insulation on the conductors.

Fixtures should be tested both before and after installation to insure that they contain no grounded or short-circuited conductors. Methods whereby these tests may be readily effected are described in the electrical handbooks. Time and expense is always saved by conducting such tests because, as hereinbefore noted, fixtures are liable to troubles which should always, if possible, be located and cleared before the fixtures are erected and connected to the wiring system.

The key socket is another source of trouble in wiring systems. In spite of the fact that the construction of this device has been greatly improved in late years, it is still a relatively delicate mechanism and may be expected to cause difficulties if it is subject to severe usage. For these reasons, it is advisable not to use key sockets if keyless sockets can be made to serve.

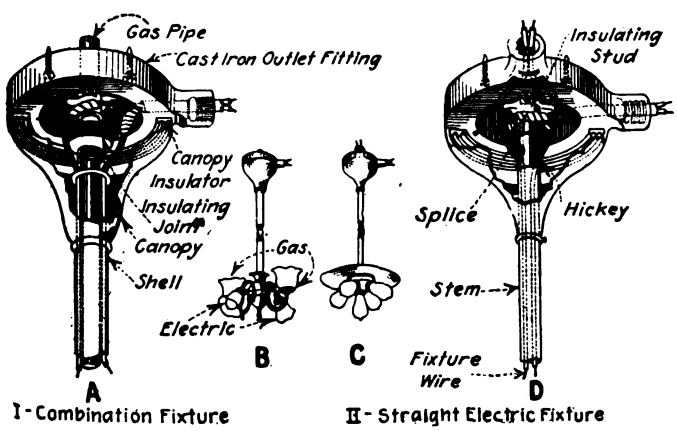

Fig. 10.—Arrangement of Fixtures in Exposed Conduit Wiring.

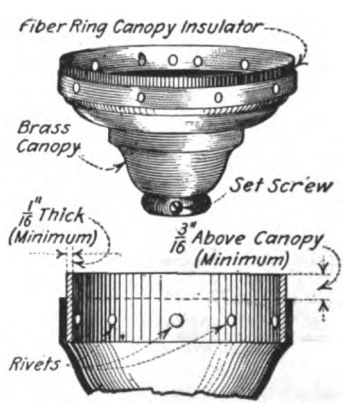

Fig. 12.—Sheet-Fiber Canopy Insulator.

Socket threads are either 1/8-inch or 3/8-inch standard pipe threads. Sockets having 1/8-inch threads may be used on fixtures, while those with a 3/8-inch thread (which have a 13/32-inch-diameter hole) may be used for reinforced lamp cord, hence, for pendants or for portable lamps.

Sockets in places where there may be inflammable gases should be placed in a vapor-tight globe, Fig. 13. Vaporproof globes of different types are shown in Fig. 14. Some of the places in which there are liable to be inflammable gases and in which, therefore, vaporproof globes should be used, are oil-storage rooms, gasoline sheds, oil refineries, paint-storage vaults, etc. The vaporproof globes should be used where inflammable gases *may* exist. It is not necessary that such gases actually exist to justify the installation of the globes.

Where the lamp in a place where there are inflammable gases is to be supported directly against the wall or ceiling, a vaporproof globe of the type suggested in Fig. 14, III, can be used. It can be fastened by screws through the flange directly to the supporting surface.

Where vaporproof globes are to be supported at a considerable distance from the ceiling, as shown in Fig. 13, a pipe support must be provided to prevent the imposition of a stress, due to the weight of the vaporproof globe, on the conductors, which are relatively fragile and are liable to be broken, particularly if the globe were permitted to swing on the conductors. The supporting pipe should be as short as feasible to prevent its being struck accidentally and knocked off. The wires within the pipe connecting to the lamp should be stranded and at least as large as No. 14 gauge in size. They should be served with tape where they come from the pipe and crowfoot to protect them from abrasion. Where corrosive vapors exist, it is advisable to seal the top of the pipe with a waterproof insulating compound to prevent their entry.

The iron-pipe support is sometimes omitted where a vaporproof globe, such as that in Fig. 14, I, is supported by two No. 14 conductors twisted together so that they jointly sustain the weight of the globe. The Factory Mutual Companies' wiring rules suggest that in certain cases this construction is preferable to that involving the use of the pipe hanger.

Weatherproof sockets are made either of porcelain or of an insulating composition. They are provided, as shown in Fig. 15, with rubber-insulated leads molded into them. These leads are ordinarily eight inches long, but may on special order be obtained of any reasonable length. Weatherproof sockets are not provided with keys, because a socket having a key switch in it cannot be "weather-

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proof." The porcelain sockets are the cheaper, but those of composition are better because they are stronger. However, grease and oils have a deleterious effect on the composition materials, rendering their use inadvisable in certain locations.

Sockets in damp or wet places must be of the weatherproof type supported on No. 14 flexible conductors as suggested in Figs. 15 and 16. Some of the places that are ordinarily considered as damp or wet are dye works, tank rooms, pumping rooms and similar places.

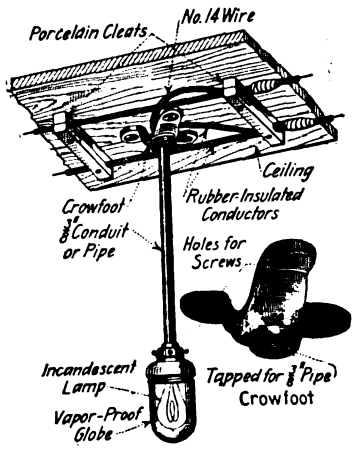

Fig. 13.—Vaporproof Globe Supported on a Pipe Hanger.

Key sockets should not be used in damp places because the moisture enters the mechanism through the key slot. It may condense, filling the socket with water and short-circuiting it.

The wires supporting weatherproof sockets should be soldered directly to the main leads, but supported on independent insulators. The independent support may be a cleat installed especially for holding up the pendant, as shown in Fig. 15, or a split knob, as in Fig. 16.

Key sockets should never be used where inflammable dusts exist, that is, they should not be installed in flour mills, in woodworking shops or in similar places. Keyless sockets should be used instead. Those of the brass-shell type are preferable to the composition or porcelain sockets because they are much less liable to breakage, and should be used unless they will be exposed to moisture or unless inflammable gases exist.

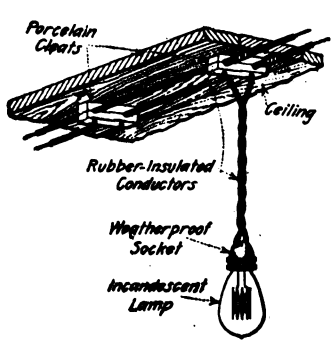

Fig. 15.—Weatherproof Socket Suspended From Cleat.

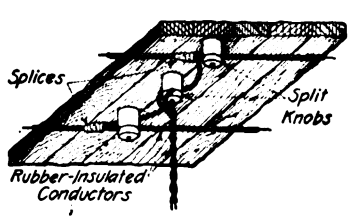

Fig. 16.—Showing How a Split Knob May Constitute an Independent Support.

Sockets not on fixtures should have three-eighths-inch holes so that reinforced lamp cord, or two No. 14 wires, as shown in Fig. 17, may enter the socket.

Electric Motor Breakdowns.

In discussing the hire and maintenance of direct-current motors before the Institution of Electrical Engineers at Leeds (England) H. Joseph gave some breakdown experiences met with at Hawick, a town whose main industries are the manufacture of tweed and hosiery. Typical cases were as follows:

(1) *Commutator Broken Down to Ground.*—On taking off the commutator ring it is found to be charred at one place with a shallow hole burnt nearly through it. The best plan is to dove-tail a piece of mica neatly into the place, having carefully cut away the burnt portion and fitted the new piece, which is held in place with shellac varnish. "Plasmica" and some of the similar materials on the market are very useful for filling up small holes burnt in commutator insulation.

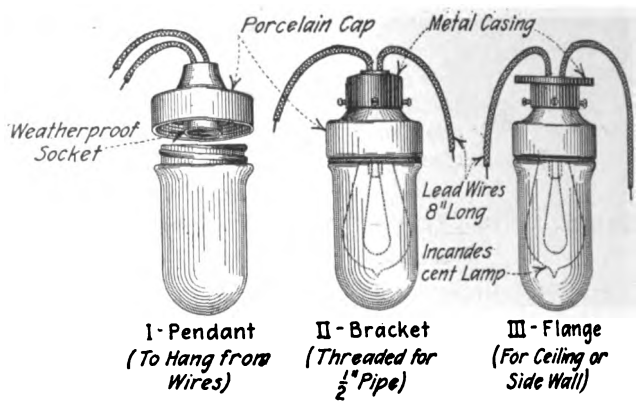

Fig. 14.—Vaporproof Globes of Different Types.

(2). *Bearing Seized, White Metal Run Out and Armature Let Down Onto Pole Pieces.*—Sometimes this leads to the conductor being cut partly through and to a complete rewind being necessary. Especially is this liable to happen if the motor is driving machinery with considerable inertia. More usually some of the bands are cut through and the conductors unharmed. One should never neglect to look to the bearings for the trouble where a band is found coiled up between the armature and the pole-pieces for no apparent reason.

(3). *A Short-Circuited Coil.*—A temporary repair sufficient to keep a motor running at a moderate load till shutting-down time can often be effected by simply cutting out the faulty coil and bridging across adjacent commutator bars, always provided that the armature is a parallel-wound one. It is inadvisable to let a motor run too long in this condition as the trouble is apt to spread.

In one or two instances the spaces between the radial bars have been found to be filled up tight with grease and fluff from the wool, and this has broken down and short-circuited the coils, necessitating a rewind.

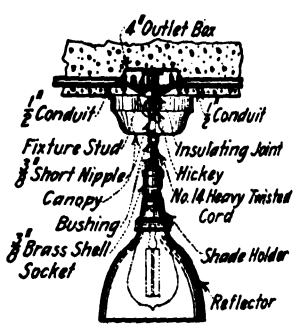

Fig. 17.—Showing Pendant Wired With No. 14 Conductors.

Fairly often troubles occur on a badly designed brushgear through the springs failing to follow up adequately the wear on the brush, causing the latter to chatter and come out.

Field coils suffer not infrequently through an accumulation of oil in the motor case rotting either the bottoms of the lower fields themselves, or the field connections.

Breakdowns have occurred to field coils through the ferrule insulation perishing through the combined effect of heat and age. These troubles often show themselves when a motor has been moved, the insulation cracking and the winding grounding through the ferrule to the core.

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Tacoma Drafts New Ordinance for Electrical Workers and Inspectors.

The City Council of Tacoma, Wash., is considering an ordinance regulating the installation and repairing of electric wiring, which provides for licensing and registering electricians and the appointment of electrical inspectors and assistants. According to the terms of the ordinance, only a licensed electrician can be employed on work, and a written permit must be obtained for all installations, including electric signs. The license fee for any electrican will be $1, and for firms $50, per year, the latter being required to take out surety bond of $1,000. The council has authority to revoke any license, and violations of the ordinance will be punishable by fine or imprisonment.

Pole-Setting Derrick Devised by Boston Edison Foreman.

A simple but very efficient derrick for handling poles on the job has been devised by Arthur S. Blanchard, team foreman of the Boston Edison Company's maintenance department.

It is set up in the rear of one of the two-ton electric trucks used for line work and consists of a 6 by 6-inch spruce upright 17 feet long, notched to fit between the tailboard and end of the truck. A 6 by 4-inch cross-arm is bolted across the two rear uprights of the covered truck, to steady the derrick, which is also guyed to the front uprights of the truck.

The whole equipment is readily placed and removed in five minutes.

Pole-Setting Derrick.

Recently four heavy 40-foot chestnut poles were picked up, carried 200 feet and dropped into the holes within 25 minutes, with a gang of three men. The only muscular exertion required is to steady and steer the pole into place, the lifting being done by the electrically operated winch mounted on the truck.

Among the Contractors.

Herbrick & Lawrence, of Nashville, Tenn., were awarded the contract for electric wiring in the $200,000 addition to the Hume-Fogg High School, at $3,927.50.

Goodrich & Seward, of Mountain Home, Ark., have formed the Ozark Electric Works in that city and will do a general electrical contracting and supply business.

The Williston (N. D.) Electric Construction Company has taken temporary quarters in the Brownell and later will occupy space in a new building to be erected at Main Street and Broadway.

The Edward Joy Company, of Syracuse, N. Y., has been awarded the contract for the electric wiring in the building being erected at the Northern New York Institute for Deaf Mutes, at Malone.

The George Weidermann Electric Company, Jersey City, N. J., has been awarded a contract for electric work in the new building of the National Grocery Company, Montgomery Street, that city.

The A. C. Electric Company, Milwaukee, Wis., has the contract for rewiring the Davidson Hotel which will be consolidated with the new Medford Hotel in Milwaukee. The electrical work will cost about $7,200.

The Schenhor-Alidor Electric Company, of Mobile, Ala., has been reorganized with R. Baerman as president and H. Baerman, vice-president and general manager. Paul Carrie will be manager of the construction department.

An electric supply shop has been opened in Billings, Mont., by John Hayden and F. E. Everett, both formerly connected with the Montana Power Company. The firm will carry a complete line of electrical supplies and equipment, and will carry on a general electrical contracting and repair business.

The Bailey Electric Company, of Bloomington, Ill., had the contract for all of the electrical work for the new high school in that city. The school is of fireproof construction throughout and the electrical installation is up-to-date conduit work. This firm also furnished practically all of the fixtures. The contract price is understood to be in the neighborhood of $10,000. The total cost of this school building complete will be about $500,000.

Russell & Company, 444 Columbus Avenue, New York City, have the contract for two large residences in New York, one at 735 Park Avenue, and one at 109 East Ninety first Street. The electric work will include wiring in rigid conduit for lights and power, intercommunicating telephones and annunciators. Switchboards and panelboards will be placed in fireproof cabinets. Electric plate warmers are included in the contracts.

WINDINGS OF ALTERNATING-CURRENT MOTORS.

Beginning with the issue of June 17 we shall publish a series of articles dealing with the practical aspects of alternating-current motor windings, by Justin Lebovici. The series will be divided into several parts dealing respectively with single-phase windings, polyphase closed windings, polyphase open windings, and special motor windings. There will also be a discussion of the mechanical construction of windings. These articles are all written from a practical standpoint, insofar as the subject matter will permit, and are intended to aid those dealing with the repair and installation of alternating-current motors in solving present-day problems. Particular attention is given to the relations existing between windings and such requirements as voltage, output, speed, frequency, etc. The forthcoming series is supplementary to the preliminary articles dealing with the principles of alternating-current motors which started in our issue of April 22.

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DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

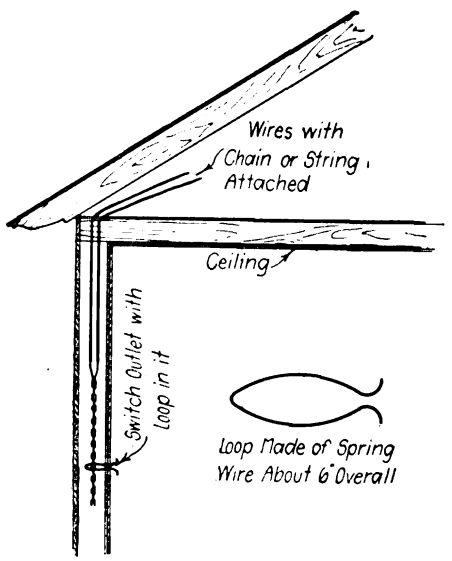
Fastening BX Cable Straps to Concrete.

To avoid drilling two holes for each strap to fasten BX cable to concrete walls or ceilings, drill only one hole for a screw in the center of the strap for fastening it to the concrete and draw the free ends of the strap around the BX, putting a bolt through the original holes. This saves considerable time and labor.

D. J. Harley.

Spring Loop for Use in Wiring Old Houses.

In wiring old houses I find that I can save much time by using the loop illustrated in the sketch. For instance, if a man is alone on a job and has five or six switches to drop wires for, he can bore the switch holes before going upstairs to work from above. Then when ready to drop the switch wires, these can be dropped all at one time,



Use of Spring Loop in Fishing Wires.

saving a great deal of running up and down for each switch loop and saving the time of fishing each one separately.

This small loop is made of spring wire bent in the shape shown. It is squeezed together to insert in the hole made in the wall. After being inserted it spreads out, leaving a loop two or three inches in diameter to drop the wires into. I use a small flashlight while I am upstairs so that I can spot the loop and drop the switch wires right into it. Most commonly I use a chain or cord on the wires as shown. On coming downstairs each loop can be pulled out and used again.

V. F. Vroman.

Conveniences for Wireman's Tool Bag.

A piece of casing 10 or 12 inches long, inclosed at one end, I find to be excellent for keeping hacksaw blades in. A stopper can be made of wood. Using this will save a great deal of time, by not having to hunt around in the tool bag for the blades.

A shaving-soap box, such as comes with shaving sticks, makes a splendid thing to keep matches in, as the nickel finish makes it easy and quick to find in the tool bag.

Clarence W. Young.

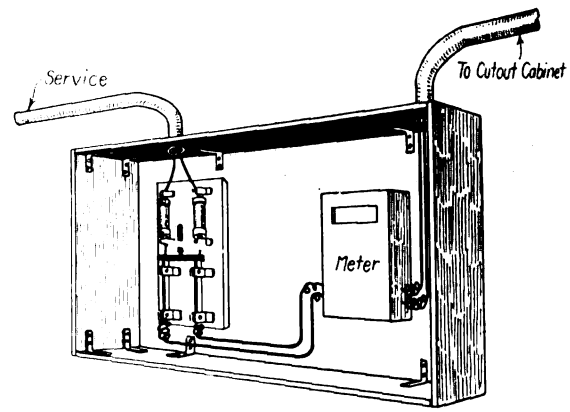
Grease Cup for Soldering Paste.

A convenient way to keep soldering paste is an old grease cup that may be removed from a junked machine. Clean it with benzine or gasoline and when dry put the paste into it, screwing it out as needed. It can be carried in the tool sack among heavy tools without being crushed like a box or collapsible tube.

Howard H. Douglas.

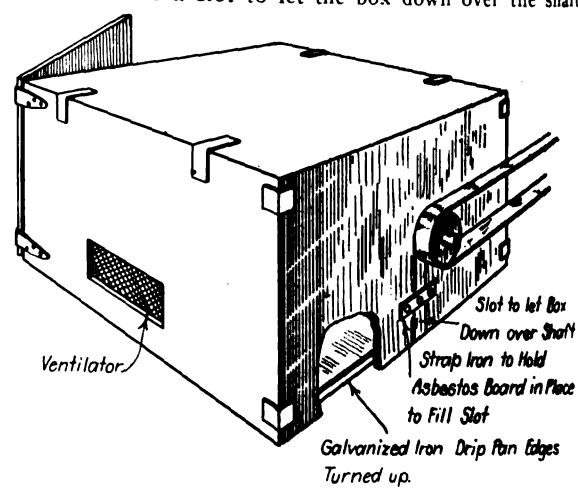
Cabinets Made of Asbestos Lumber.

A good serviceable cabinet for service switch and meter may be made of asbestos lumber and small angle corner pieces. The asbestos lumber comes in sheets 3.5 by 4 feet and 0.25 inch thick. The front door may be hinged



Service Cabinet Made of Asbestos Lumber.

at the top so as to close by gravity. Covers for motors may also be made of this material. I have used it for 500-volt direct-current railway motors and its use has been accepted by underwriters' inspectors. Put a galvanized pan under the motor to catch oil and arrange the door of the box so that the commutator and brushes are easily accessible. On opposite sides of the box cut ventilating holes and cover these holes with one-fourth-inch mesh screen. The side of the box that passes over the pulley end must have a slot to let the box down over the shaft.



Motor Housing Made of Asbestos Lumber.

After it is in place, one or two pieces of strap iron should be used to hold in place the portion cut out for this slot. Other boxes can be made of this material in a similar manner.

J. B. Story.

To Make Bearing Scrapers.

A simple tool for scraping bearings can be made from a small three-cornered file. An old file no longer useful for any other purpose will do. Grind all the sides smooth so as to leave sharp cutting edges. Now do the same to an old half-round file. These scrapers I have found to be very handy.

Frederick A. Grohsmeyer.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

SELLING ELECTRIC WASHING MACHINES ON THE INSTALLMENT PLAN.

Suggestions Regarding Terms to Be Offered and Methods of Collection in Securing Business on This Plan.

By J. S. Vogel.

Every season there is some new phase in the electrical supply business that can profitably be put into practice by any dealer who takes the time to study the new methods as used by others in the same line of business.

A large number of live dealers throughout the country are selling electric washers and vacuum cleaners on the installment plan. However, many dealers think that selling on the installment plan requires a considerable amount of surplus cash. But this is not the case. In fact, if the dealer can buy and pay for two electric washers, he can buy and sell a hundred without an additional investment, and this article will tell how it can be done.

Another big mistake made by many electrical dealers is that they try to sell high-priced articles only to those who can afford to pay cash for the article at the time of purchase. They do not realize that for every customer who can pay cash for a $100 machine there are a dozen who would be willing to buy on the installment plan.

In every community there are many families who would appreciate doing their washing by electricity, but they do not feel that they can dig down into their pockets and pay out $100 at one time without greatly inconveniencing themselves. Perhaps some of the very customers you have been trying to sell an electric washer on the cash basis would be glad to buy the washer if you offered to sell it with an initial payment of anywhere from $5 to $25 and the balance at the rate of $5 per month. This class of customers, as a rule, does not want to ask the dealer to sell a machine on the installment basis, but if the offer came from the dealer they would be very apt to accept the proposition, even if asked to pay $5 more than the cash price. And there should be a slight increase in price when a machine is sold on the installment basis, for otherwise there would be no incentive for paying cash.

Suppose an electric washer costs about $65 and is sold for $100. If the machine was sold for $15 down and the balance in monthly installments of $5, it means an investment of $50.

To simply sell a machine on this basis and then take the customer's word for it that he will pay $5 a month until the entire amount was paid is poor business. There would be no protection, no real hold on the customer or machine, in the event he could not keep up his payments. The method that should be used when making a sale on the installment plan is to secure yourself by a note from the purchaser and a mortgage on the machine, giving the customer a bill of sale when the last payment is made. Some dealers take a single note for the entire amount and then credit the customer with the monthly payments as they are made. This is a fairly good method, but there is an even better one. Instead of taking a single note for the entire payments due, it is better to take a series of notes, one for every month, so that every time a payment is made the note due that month can be returned.

There is another great advantage to this method. If the customer is reliable, and he should be, then the notes and mortgage can be taken to the local bank and money borrowed on them, or the notes can be sold to the bank at a slight discount. In this event, the customer can make the monthly payments directly to the bank. This process can be repeated a hundred times, if that many machines can be sold on the installment plan, and no greater investment will be required than the money paid for machines at the time of the original purchase. The wide-awake dealer protects himself fully when a machine is on the installment plan, and, if fully protected by notes and mortgage, no trouble will be had in getting the cash from the local banker.

It can be readily seen that it does not require a large investment in order to sell a hundred machines on this plan. As installment sales are becoming more and more popular every day, it is to the dealer's advantage to seek prospective buyers who can afford to buy machines on this basis—and that means practically every family where electricity is used in the home.

In every community there are hundreds of householders that should be doing their washing by electricity. It requires a little pluck and hustling to make these sales, but some dealer is sure to get this business sooner or later, and it is pretty safe to say that the first man in the field will reap the biggest rewards. He will have so great an advantage over the other fellow that it will be hard for any dealer to overcome the publicity and prestige gained by the dealer, after once he has a good start.

The secret of financial success is in doing those things that will increase business and leave a sure profit. Book accounts are hard to turn into cash, as many dealers have found to their sorrow. But when the dealer has a customer's note or notes, backed up by a mortgage on the article sold, it is almost as good as cash. Some customers may object to giving from 10 to 20 notes for $5, plus the mortgage, in payment for a washer, but these are very few and usually can be made to see the dealer's side of the transaction. He can explain to the customer that if it were not for the notes and mortgage, sales could not be made on time payments. This will usually do away with any objection a customer might have. It is a particularly good excuse to give to the man who claims to be absolutely honest and is good for several times the amount of the total purchase price of the machine.

Installment selling means a big profit to the dealer, but he must set a standard by which he is absolutely protected. And he must live up to this standard. If one customer is favored, others are apt to hear about it and will ask for the same terms. If one sort of an agreement is made with one customer and another with the next one, there will be no set standard by which to govern sales.

The electrical dealer who makes the biggest success of his business is the one who is not afraid to demand his rights—and fully protecting himself is not only his right, but his duty, both to himself and to the wholesalers and manufacturers who sell goods on credit—on their confidence in his business judgment, honesty and integrity.

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Business Hints for the Electrical Dealer

Selling Campaign for Fans Should Be Instituted—Taking Advantage of Advertising Opportunities—The Small-Fan Business—A Revolving Fan Display—Fan Solicitors—Charging for Temporary Use of Equipment

By G. D. Crain, Jr.

NOW that the fan season is opening up, the dealer ought to endeavor to lay out in his own mind a real campaign for the sale of these goods. In most stores each individual sales effort is made without reference to all of the other work which is being or is to be done, and the result is that the general effect is disjointed. When each effort dovetails into something else, and when the whole proposition is carefully worked out in advance, the dealer and his salesmen know what it is they are trying to do—and they come much nearer doing it.

For example, such things as newspaper advertising, window display, personal solicitation and circular work should all be considered ahead of time. The windows ought to reinforce the newspaper ads, and the men inside the store ought to be informed regarding the advertising that is going out, so that they can hammer on those points in their own work.

Weather conditions will govern sales of fans to a large extent, but at the same time the dealer should have in mind selling a certain number and getting a certain volume of fan business. This will give everybody in the store something to shoot at, and there is nothing more conducive to enthusiasm than the effort of all of the boys, inside and on the street, to build business up to the quota which has been indicated in advance.

Signs on the Wagons.

One of the leading electrical dealers of an Ohio Valley city has emulated the department stores by placing signs on his delivery wagons and motor cars announcing the features of his business. In other words, if he is conducting a special sale he makes a point of using his wagons, which are "circulating" all the time, to help in getting this store news before the public. This is a form of advertising which is not expensive, and whatever help it gives to the work of interesting customers in the sale is that much velvet, from an advertising standpoint.

Right now he has the sides of his wagons covered with cloth banners describing his line of fans and giving prices. He has also taken care to put his telephone numbers on these signs, so that those who happen to be interested at the time can immediately make a note of the number and call up for a fan. This is a small detail, but it is by watching all of the little things that sales work is made successful.

The Small-Fan Business.

The fact that popular-priced fans have been brought out is going to widen the fan market considerably this year. A large number of people have never regarded themselves as logical prospects for electric fans, because they have considered them too expensive for ordinary homes. Until a few years ago the prices were probably out of the reach of people of limited incomes, but now the dealer can fit the fan to the pocketbook of any customer.

It has been noted that a good many electrical stores are "playing up" the lower-priced goods, the object being not only to get the interest of those who would not consider a fan costing a larger amount, but to get people into the store.

"It's a well-known fact," said a dealer who explained this system, "that after you get the customer interested in buying a fan, by means of quoting a low price, he may see something better that he will like, and will be glad to pay the higher price for it. Hence the popular-priced lines are valuable in attracting trade, as well as opening up additional markets."

The advent of the cheap fan is also likely to help in justifying the purchase of a larger number of fans by individuals. The man who formerly had one fan, which he used at his office, will be able to afford another for the home. The employer who placed a few fans "where they would do the most good" can now be persuaded to install others, so as to take care of the requirements of everybody. From all standpoints, the low-priced fan is calculated to develop business.

A Revolving Fan Display.

In order to show his line to the best advantage, a dealer who is "plunging" on fans this season has been using in his window a revolving table which carries representatives of nearly every type and price of fan in his stock. The fans are shown in tiers on this table, and this arrangement enables a much larger number to be displayed than could be shown to advantage in any other way. As the table moves slowly around, the customer sees fans of different sizes and prices, and can get a line on the entire stock, whereas without such a device a comparatively limited showing would have to be made.

In this connection, the point of showing goods with price-cards attached is worth emphasizing, though it may have been referred to heretofore in this department. Merchants are more and more appreciating the fact that the price is an essential feature of the information which the customer must have before he is going to buy, and more people are scared off by lack of a price than by its quotation. So in displaying fans, as well as other electrical goods, be sure to quote a price.

The dealer referred to above has a window which is just about three times as large and attractive as the one which he had available last year, his store-front having recently been remodeled along modern lines. It's a safe bet that his sales are going to show the good effect of these improved facilities for the display of goods.

Outside Solicitors for Fans.

Right now, early in the season, is a good time to consider using outside men to solicit fan business.

Comparatively few dealers have used salesmen for this purpose, relying on their general advertising and the demand which is automatically created by the arrival of hot weather to result in calls. But at the same time it is true that the salesman can pick up business which would get away otherwise, for the personal solicitation supplies the impulse which is lacking in many instances.

Big business on fans is now available, because of the growing use which is being made of them. Hotels, moving-picture shows, stores and the like are all prospects, and even though they may have been equipped to some extent heretofore, it is practically certain that there will be some new equipment to be purchased, or repairs to be made on the old. And getting started on the repair business will be a good lead to future fan business, in any event, not to mention constituting a profitable item of current trade.

Outside solicitors have been able to pay their way in

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selling everything electrical from lamps and fixture to automobile charging equipment, and there is no reason why they should not be able to develop business on fans, especially if they are put out early enough in the season to anticipate the demand, rather than to move with it.

To Charge or Not to Charge?

The electrical dealer, more than any other merchant, has a good opportunity to let some of his profits get away from him by reason of the tendency of customers to demand temporary use of equipment while their own is being repaired. The question which is constantly being met with is, "Should I charge for the temporary use of this fan or battery or motor?"

If a good customer, who is on the books regularly, and does a lot of business with you, sends a fan to be repaired, and in the meantime wants the use of another, it would probably be good policy to let him have it, and say nothing about a charge. Technically speaking, of course, the customer is getting the benefit of the use of goods in which the dealer's money is invested, and it would be perfectly legitimate to charge for it. In order to keep the customer satisfied, however, most dealers would furnish the fan without any charge, and this would be good business.

On the other hand, this should not be regarded as the standard practise in such cases, but only an exception to the rule. If a customer who is not in the habit of dealing with you sends in a fan for repair, and wants the use of another temporarily, the logical thing would be to explain the rates for rental, and find out whether it is wanted under those conditions. If the other plan were used, the generosity of the dealer would be abused in many cases, and fans would either come back in a damaged condition or not at all. If the dealer made a habit of replacing fans which are to be repaired with others in good condition, unscrupulous persons would decide to "swap," and might depart for other locations without taking the trouble to claim the fans left for repair.

The general question of keeping the customer going by means of a temporary installation while repair work is going on is important, and generally speaking the service should be charged for. The automobilist whose battery is being repaired doesn't want to lose the use of his car, and he will consider it good service to be able to get a battery from the dealer, even if a charge is made, for the amount involved is a small item compared with the proposition of having to lay his car up pending the repair of his own equipment. In industrial work, where the customer needs a temporary motor, it must be drayed to and from his factory, the connections made and other expense assumed, and the only safe thing to do is to make a charge covering these various items of expense.

"I charge whenever I have a legitimate opportunity," said a leading dealer, "and even then I have trouble making a margin. There are so many places to add to overhead by doing things for nothing that I have decided that it's poor policy to encourage free service. Sometimes an exception to the rule is made, but the rule is generally applied, nevertheless."

Details of Kalispell Appliance Campaign.

The recent seven-day appliance campaign conducted at Kalispell under the supervision of A. F. Douglas, new-business manager of the Northern Idaho & Montana Power Company, which resulted in the sale of 272 appliances, was the most successful of its kind ever held in that community. The appliances disposed of were 125 flatirons, 100 utility grills, 28 percolators, 6 disk stoves and 13 other lamp-socket devices.

The cost of conducting the campaign at Kalispell, including commissions, advertising, etc., was less that 10 per cent of the estimated annual revenue from the use of the appliances.

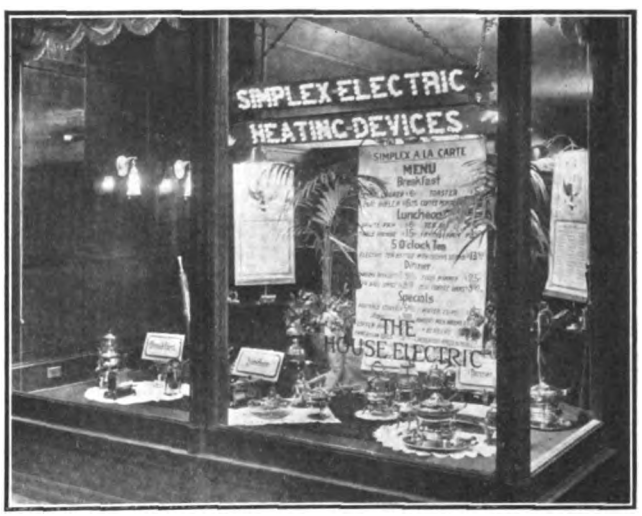
A Method of Merchandizing Sewing-Machine Motors.

By connecting up the starting pedal of a Sew-E-Z sewing-machine motor so that it could be operated by passers-by who stopped to look at the display in the window, the Tafel Electric Company, Louisville, Ky., greatly stimulated interest in the motor attachment, and made numerous sales. The motor was attached to the machine in the usual manner and the wires connected to plugs placed in two of the air vents in the base of the show window. The extension from here dropped to the sidewalk, where the pedal lay close to the wall, incidentally just at the side of a fire plug which protected it from chance damage. A sign on the window said, "Try It Yourself," and a white arrow pointed to the pedal on the sidewalk. For purposes of the demonstration, a sewing machine was loaned by a local dealer and a band of cloth put in position under the needle arm of the machine. Upholsterer's tacks kept it running true, and the action of the machine, which was not threaded, caused it to revolve readily. The motor attachment retails for $15, and many cash sales were made during the two weeks the display was in, while numerous other sales were made on the basis of $16.50 in installments, $1.50 down and $1.50 monthly.

Window Display Features the Electrical Menu.

An out-of-the-ordinary window display, with a novel basic idea, is that shown in the accompanying illustration, and which was exhibited by the Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., in its "House Electric."

The display was arranged to show the electrical devices used in the preparation of food, those that can be used in the different meals of the day being grouped together.



An Attractive Window Display Showing Electrical Devices That Are Suited for Preparing the Three Meals for the Day.

In the background was the "menu," which listed and priced the various devices. Besides drawing attention the display was of an educational nature, since it served to show the number of electrical conveniences that can be utilized in this manner.

Boston Edison Company Features Summer Conveniences.

In anticipation of the warm season, the Edison Company of Boston is "playing up" hot weather devices which are conducive to comfort and convenience. Among these are the electric fan, flatiron, percolator and toaster. Advertisements calling attention to these appliances and to the company's house-wiring plan appeared the past week.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent. —R. D., Washington, D. C.

No. 348.—Electric Japanning Oven.—In an electrically heated japanning oven what kind of heating units is it best to use? How much wattage should be supplied to an oven of small size? What kind of thermometer should be used to check the temperature?—J. S. C., Fort Wayne, Ind.

No. 349.—Rate Regulation in Michigan.—Is there in force in the State of Michigan a law or other regulatory measure which governs the rate which may be charged by electrical service companies for electric service?—F. A. B., St. Joseph, Mich.

No. 350.—Power Supply for Traveling Crane.—In the case of traveling cranes where either direct current or alternating can be purchased, which kind of power supply would be better adapted for the purpose?—C. J. E., Toledo, O.

Answers.

No. 339.—Telephones on Power Lines.—What precautions should be taken in installing telephones whose line is on the same poles with 11,000-volt power lines? What special precautions should be taken for safety? Would it be practical and would the service be satisfactory if a grounded circuit were used instead of a metallic circuit for the telephone line? —R. F. C., Minersville, Cal.

When a telephone circuit is installed on a transmission line, considerable inductive disturbance may be anticipated unless special precautions are taken to prevent. In many cases also, the induced potentials will be dangerously high. Where the potential of the transmission line is very large (45,000 volts and upwards) and the energy transmitted is considerable, the best practice consists in installing the telephone circuit on a separate line at some distance from the structures carrying the transmission circuits. For the case in question, where the voltage is 11,000, the conditions from an inductive disturbance standpoint and also from a safety consideration can be taken care of without separate construction.

To reduce the inductive disturbances, as well as the resultant induced potential, the telephone circuit should be transposed very frequently, preferably every three or four poles. In some cases it has been found necessary to transpose at every other pole, but, unless the line is very long, this is usually not required. Considerable help can also be secured by arranging the telephone circuit symmetrically with regard to the power wires. For example, if there are two three-phase circuits, one on each side of the poles, a symmetrical arrangement consists in carrying the telephone circuit on brackets below the power wires, one telephone wire being supported on each side of the pole. If there is but one three-phase circuit in a triangular arrangement with one wire on top of the pole, the situation is already symmetrical, but in some cases the three wires of a single three-phase circuit are carried on a single arm with one wire on one side of the pole and the remaining wires on the other. If this condition exists, the arrangement should be changed every five or six poles so that in the total length there will be as much of the line where one wire is on the right-hand side of the pole, as there is where the single wire is on the left-hand side of the poles.

Transposing the power line is also of some assistance. In the case of a three-phase circuit this is accomplished by carrying wire No. 1 to pin position No. 2, wire 2 to pin position 3 and wire 3 to pin position 1. These transpositions should, however, be located symmetrically with regard to the length of the line, i. e., wire 1 should be on pin position 1 for one-third, one-sixth, or one-ninth, etc., of the entire distance. If the total length is short, three transpositions would probably be sufficient, but if the line is more than five or six miles long, six transpositions would probably be needed.

In any case, the telephone circuit should be as far from the power circuits as practicable, and the wires should not be separated any further than necessary to keep them clear of swinging crosses. The inductive disturbance under any given condition will be roughly proportional to the separation of the two telephone wires, so that the maximum disturbance will arise in the case of one wire and a ground return. For this reason grounded circuits are usually entirely out of the question. If transpositions are properly installed and the telephone circuit is not too close to the power wires, the resultant potential between the two sides of the circuit should be small, but there is likely to be a considerable potential between the wires and ground, particularly in the case of three-phase power circuits having star-connected transformers with grounded neutrals at each end of the line. The use of this construction should be avoided, if possible, since the third harmonics are in phase with each other and under these conditions would set up considerable induced voltage between the telephone circuit and the earth. If it is necessary to ground the power line using star-connected transformers, the ground should be confined, if practicable, to one end, using non-grounded transformers at the other end.

If the potential between the telephone circuit and earth is found to be dangerously high after the foregoing precautions have been taken, the installation of specially insulated repeating coils at each telephone terminal should be considered. These are commercially available and are frequently used for such purposes. If they are employed, some form of lightning protection should also be placed in the circuit between the repeating coil and the exposed section of line. Such protection usually consists of a spark gap with a ground connection. The use of repeating coils is to be recommended even where under normal conditions the induced voltage is low, for the reason that under conditions of extreme unbalance, such as may result from the breaking of one of the power wires, the potentials may rise to dangerously high values. In any case, the repeating coils, if used, should be placed at a point in the telephone circuit between the telephone terminal and the power line, so that none of the telephone circuit on the power-line side of the repeating coil is liable to be handled by persons other than qualified employees, such as linemen.—H. S. P., New York, N. Y.

No. 341.—Controller for Bascule Bridge.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

It is true that the introduction of automatic control features for the motor operating a bascule bridge is impracticable, providing that the equipment consists only of the usual rheostatic controller with or without limit switches for the main circuit and weight-operated brakes with solenoid release. The load of the motor varies with weather conditions and also owing to variation of friction. The load in turn influences the speed of the motor, which by itself varies with the temperature of the windings according to the number of times per hour the motor is operating. If the motor was cut out at a fixed point while raising and at another fixed point while lowering and the brakes applied, both operations by means of limit switches,

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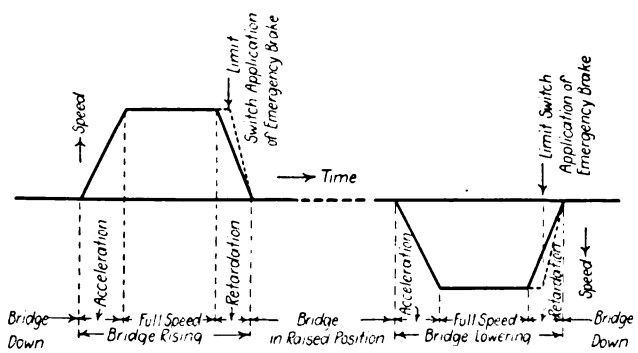
the bridge might overrun or stop short, depending on whether the energy stored in the rotating and moving masses is more than friction and brake resistance combined or not.

There are two ways to overcome the difficulties, one which is half automatic, though it is only a safety appliance, and another absolutely automatic; both have been used widely with complete success. The safety devices aim only towards avoiding accidents from overrunning due to negligence or want of observation of the operator. Herewith is shown in full lines a time-speed diagram for the full cycle of operation. The operator has to manipulate the controller in accordance with this program or time-table within a certain margin in order to bring the bridge to rest at proper levels.

The most important point from the safety standpoint is the cutout of the motor current, where the retardation period begins. One safety device concerns itself only with this period. Should the driver neglect to cut off the current early enough, and run on with controller in full-speed position, a limit switch, which is installed somewhat beyond the desired point of cutoff, will be tripped by the bridge gear and interrupt the main circuit and simultaneously a solenoid circuit, which will release the emergency brake, the weight of which has to be powerful enough to bring the bridge to rest without overrun, even under the most onerous conditions of load. The dotted lines show the retardation in case the emergency brake is tripped. Apart from a complex procedure in case the limit switch is tripped, this system has the drawback of controlling only the retardation period and is therefore not absolutely foolproof, because an overspeed during the remaining part of the cycle,



No. 341.—Time-Speed Diagram for Bridge Control.

due to any cause, will put too much strain on the emergency brake, which will not be able to stop the bridge in time to prevent overrun.

Another safety device in connection with the above, an overspeed safety device, will make the bridge safe against accidents resulting from overspeed. The principle of this safety device, not to be mixed up with the mechanical, overspeed centrifugal safety devices, which only control the full-speed period, lies in generating a constant electromotive force by the motion of the bridge from 10 per cent of full speed to full speed, which will hold the trip of the emergency brake weight, as long as the voltage does not vary, say, more than 75 per cent. The driver is thereby forced to adhere to the operating program very closely. The apparatus, which is the subject of a patent, consists of a separately excited or series-wound direct-current generator, the field of which is inversely proportional to the desired speed of the hoist, so that at full speed the field is only about 10 per cent of that at start. The magnetic circuit of this small generator must be practically without saturation.

The disadvantage common to both these safety appliances is the skill still required of the operator. This is obviated by the use of the more costly and more complicated Ward Leonard controller system, which in operation is simplicity itself, however. This consists in supplying the hoisting motor throughout the full cycle of operation with a voltage directly proportional to the speed, so that the motor and bridge is forced to come to rest at zero voltage or a little below zero or a negative voltage. To obtain this object the motor armature must be connected direct to the terminals of a separately excited generator, the field of which is controlled in line with the time-speed diagram. The equipment consists chiefly of the hoisting motor, the motor-generator, a potentiometer generator-field controller, and the operating switch which is connected to the operating lever. The operator has merely to put this lever into one or the other position to raise or lower the bridge at will. This system positively makes overrunning impossible. The application of this control system, which the writer has carried through successfully in many cases, requires a specialist since the apparatus has to be designed for each individual case.—J. J. W., Pittsburgh, Pa.

No. 347.—Wiring for Polyphase Motors.—(1) There are to be 15 to 20 five-horsepower motors (each 440 volts, three phase) in a manufacturing department supplied from one feeder in conduit. All of these motors are in a space 35 by 24 feet. It is difficult to find space to locate fuse cabinets directly at the point where the branch circuit for each motor is tapped onto the feeder. Would the Code permit locating the motor fuses near to the motors and the use of one or two steel cabinets for terminal boxes where all the branch circuits may be tapped onto the feeder? (2) Where several large motors from 20 to 75 horsepower are supplied from one feeder, can the starting fuses be located near the motor instead of where the branch circuit taps on?—R. B., Jackson, Mich.

(1) The Code specifies that fuses must be placed at every point where a change in size of wire is made, Rule 23*b*. In practice it is not always possible to adhere strictly to this without entailing hardships, and various inspection bureaus allow more or less latitude in this respect. A literal interpretation of this rule in the case of service taps taken from a pole line would mean the installation of fuses on the pole, or the continuation of the heavy feeder wires to the cutout placed in a more convenient location; both are impractical, for in the first instance the fuses would be inaccessible, and in the second instance cutouts of specified capacity are not designed to accommodate the heavy feeder wires referred to. It, therefore, becomes necessary to interpose between the cutout and the feeder, an unprotected length of wire; the allowable length of this wire varies with different inspection bureaus from 12 inches up, or as a particular case may require. It is sometimes demanded that extraordinary mechanical protection be given this, by incasing it in a nonmetallic flexible conduit, using only high-voltage insulation, or by installing higher-current-carrying-capacity wires than would ordinarily be necessary.

A new practice employed within the past few years on alternating-current industrial work, is to omit fuses entirely on all squirrel-cage induction motors, relying on automatic oil switches with overload protections. Several large recent installations have been sanctioned in writing by inspection bureaus concerned, and have proved satisfactory.

(2) The fuses may be located at any point in the circuit, provided their capacity is not greater than that of the wire they are to protect. In connection with starting of induction motors the sizes of rubber-covered wires required may be calculated in accordance with the table of weatherproof insulators, as explained in Rule 8*c*.—M. K., Clifton, N. J.

Electricity a Species of Manufacturing.

In a case brought by the Society for Establishing Useful Manufactures, Paterson, N. J., against the city for the abolishment of the tax imposed upon its hydroelectric power plant, the State Supreme Court has rendered a decision in favor of the society, holding that the production of electric energy is a species of manufacturing and within the charter power of the organization.

The society was founded in 1791 by special legislative act, and all its lands, goods, etc., were declared to be free and exempt from all taxes, whether for state or county uses. The city, however, in 1914 imposed an assessment for taxes upon the society's hydroelectric power plant and steam power plant, which furnish electric power to mills along the Passaic River.

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NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Electrically Driven Window-Display Novelty.

The electrically driven window-display figure illustrated herewith was recently developed by the Mechanical Advertising Company, Boston, Mass. The figure is placed in the window to the left of the goods displayed. The right arm is actuated by a cam and lever mechanism which causes it to rap sharply on the window pane at intervals, attracting the attention of the passerby. The head of the figure then turns to the left and the left hand is raised and points toward the goods which are on sale.

The mechanism is in the box upon which the figure stands, and is driven by a small high-speed motor, manufactured by the Robbins & Myers Company, Springfield, O. The outfit is not sold, but is leased to dealers who wish to use it in their windows. The height of the figure is 27 inches and it weighs about 16 pounds complete.

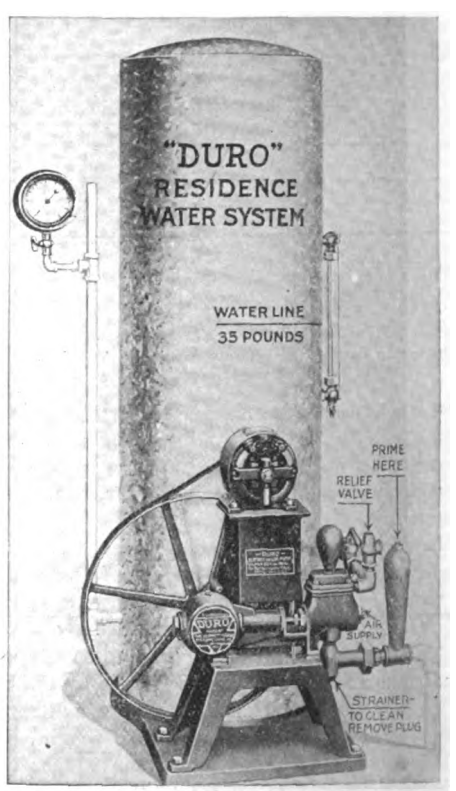
Electrically Operated Window-Display Figure.

Duro Electrically Driven Residence Water System.

The Duro residence water system made by the Burnett-Larsh Manufacturing Company, Dayton, O., consists of a single or duplex, double-acting pump, with motor, and a tank. It is used for automatically pumping soft or rain water from cistern to bathroom, kitchen, and laundry, under pressure, and was developed to fill the demand for an absolutely reliable, small outfit for residence service to take the place of water-motor pumps and water lifts. The price of the outfit is practically the same as a water-motor pump or water lift and it is said it can be used to advantage at extremely low cost in even the smallest homes.

This outfit is practically noiseless in operation. The pump is belt driven by a Westinghouse motor—direct current, or single-phase alternating current with heavy-duty overload starting, designed especially for pump service. There are four sizes of pumps used with capacities of 100, 160, 200, and 360 gallons per hour, requiring one-twelfth one-eighth, one-sixth, and one-fourth-horsepower motors, respectively. The tanks furnished are either black or galvanized and have capacities from 40 gallons up. The vertical suction lift of the pump is 22 feet.

The system is entirely automatic, the pump starting when the pressure in the tank falls to 22 pounds and stopping at a maximum pressure of 35 pounds, by means of an automatic electric switch. In order to provide the necessary air pressure, an air pumping device is furnished. The pump is also equipped with a suction strainer to prevent pipe scale, dirt, and other foreign matter from getting into the pump and fouling the valves.



Automatic Residence Electric Pumping Equipment.

The outfit is furnished mounted on a heavy cast-iron container base. Connections from pump to tank, and between pump, switch, and motor, are already made. It is only necessary to connect the suction to the cistern, the service pipe to house fixtures, and the wires to the light service. Then by turning a switch the system is put in operation and will thereafter automatically furnish all the water necessary.

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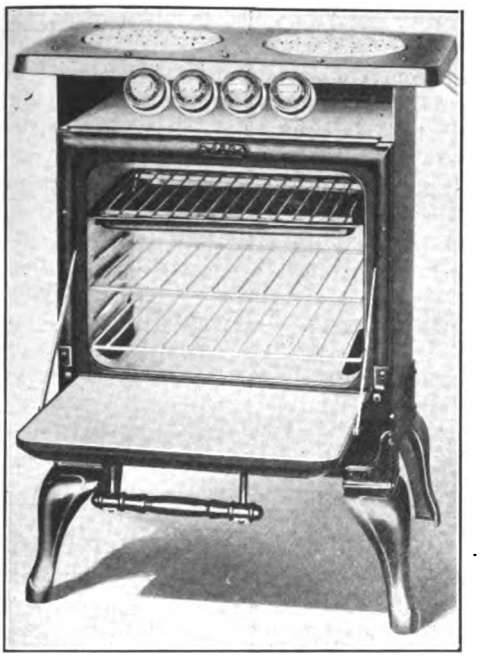

Low-Priced Electric Range.

A Low-Priced Westinghouse Electric Range.

In the new line of electric ranges now being placed on the market by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., there is one that deserves special attention, because its low price puts it within reach of the family of small means. This range, known as the type No. 406, retails for $35 and is equal in appearance to some of the more expensive ranges manufactured by the same company.

Same Range With High Back.

The new range is made of stamped parts throughout except the switch-support casting and the castings for holding the heaters. The oven has two heaters, is equipped with racks and broiling pans, and is large enough to do ordinary baking. Sides and top are lined with two layers of asbestos separated by dead-air spacing, while the bottom and door are packed with mineral wool. This heat insulation is, of course, not as good as that on the more expensive ranges. There is no thermometer or automatic control feature.

The range top has two eight-inch heaters, each of 1,000 watts capacity, placed a sufficient distance apart to allow the use of ordinary cooking utensils without crowding.

The finish is a high-grade black enamel, very attractive in appearance, which protects the surface from rust. The ovens are treated with a special aluminum finish baked on at high temperature which not only prevents rusting, but by reflecting the heat, increases the efficiency of the oven.

The range measures 31.5 by 16 inches and is 31.5 inches high. The oven is 16 by 12 inches, and 11.5 inches deep. A special high back, as shown in one of the illustrations, can be furnished at slight extra cost.

New Hubbell Reflectors.

As the result of a long and carefully conducted study, a new line of steel reflectors has been placed on the market by Harvey Hubbell, Incorporated, Bridgeport, Conn. These reflectors have been designed in strict conformity with scientific tests to provide the contour necessary for obtaining maximum efficiency. They are made in three different forms giving a focusing, distributing or intensive light distribution. In the accompanying illustrations these three forms are shown.

Three New Reflectors—Focusing, Distributing and Intensive Types.

A simple and yet comprehensive means of identifying these reflectors has been devised by the firm. It consists of three letters followed by a number; for example, HAF-60 designates a focusing reflector for use with 60-watt lamps; the *H* designates that the standard Hubbell contractile holder is provided, *A* designates the use of aluminum finish on the inside, *F* the focusing character of light distribution used and 60 shows the wattage of the lamps with which these reflectors produce maximum efficiency.

The distributing type of reflector is intended primarily for giving general illumination in factories or warehouses.

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Intensive reflectors are designed for lighting to a higher intensity areas of medium size. Focusing reflectors are recommended for high-intensity illumination of localized character, such as for special machine work or bench work where small articles are assembled or vices used.

All of these reflectors are directly equipped with the standard Hubbell contractile collar holder which makes unnecessary the use of a separate shade holder. Reflectors are made of a strong, uniformly spun steel which is given a green finish on the outside and aluminum on the inside. They are of pleasing appearance and do not detract from the finish in practically any type of commercial or industrial building. They are made for use with lamps ranging from 10 to 100 watts.

Harding Pole-Concreting Process.

Long experience in the construction and maintenance of wood pole lines has shown that the greatest depreciation of the pole occurs at and close to the ground line because at this point the pole is exposed to alternate moisture and drying and therefore easily becomes subject to decay. Many poles become seriously weakened at this point and this requires either replacing the pole or using some such scheme as the so-called stub method for reinforcing it.

To overcome these difficulties a process for reinforcing the pole by means of a concrete sleeve has been developed. This sleeve is itself reinforced with steel rods both longitudinally and circumferentially. The process is readily applied and is suitable for any pole line where cement and suitable crushed stone, sand or gravel are available at reasonable prices.

The first step in the process is to remove the earth around the pole to about four feet or more in depth. The decayed portion of the pole is removed and the exposed section of the pole treated with a preservative compound. The reinforcing rods are then put in place as shown in Fig. 1. The mold is then placed about the reinforcement as in Fig. 2. The concrete can now be poured in; after it has properly set, the form is removed and the joint between the concrete and pole is sealed at the top with a special waterproof compound that prevents moisture from entering that would cause the pole to decay and the concrete to crack from freezing in cold weather. The finished reinforcement is shown in Fig. 3. To apply this reinforcement requires no great skill, and a large number of poles can be treated in one day.

This process can be applied to poles of any height and diameter whose preservation is warranted at a moderate cost. The concrete reinforcing can be made of any desired strength for different sizes of poles by adding additional steel rods and thickening the concrete sleeve. The latter serves not merely for renewing the strength of the pole but it also affords protection to the pole against grass fires and against mechanical injury from collisions with wagon wheels. This process will lengthen the life of a pole very materially and it has been stated that in many cases a pole so treated should last twice as long as a new pole. This process, although developed particularly for use on poles that have already been in service some time, is also well adapted to the reinforcement of the poles when they are being set, which makes it possible to use poles of the less expensive woods. The process has been developed by the Harding Pole Concreting Company, Spokane, Wash.

Semi-Automatic Nut-Burring Machine.

There has recently been developed a semi-automatic burring machine for removing the rough edges or burr from all standard sizes of square and hexagon hot-pressed nuts. It is being manufactured by the National Machine Company, Tiffin, O. It is operated by a direct-connected, adjustable-speed, direct-current Westinghouse motor having a two-to-one speed ratio, with a maximum speed of 1,160 revolutions per minute.

With this machine it is only necessary for the operator to place the nuts in the slot and push them forward. The raising and lowering of the spindle and the placing of the nuts under the cutters are handled automatically. This arrangement prevents all possibility of accident incident to feeding nuts under a rapidly revolving cutter.

An injector automatically moves the nut to be burred under the cutting head and the operation is performed on the downward movement of the head. The head then rises and the operator moves the row of nuts forward, the next incoming nut ejecting the finished nut.

This machine gives an output of from two to four times that of hand machines, and a much more uniform finish is secured as all of the burr is removed. A new type of burring head is used which effectually cuts off all the fine as the cutters are gradually lowered by a cam feed.

Safety reliefs are provided upon the vertical movement of the burring spindle and on the nut injector.

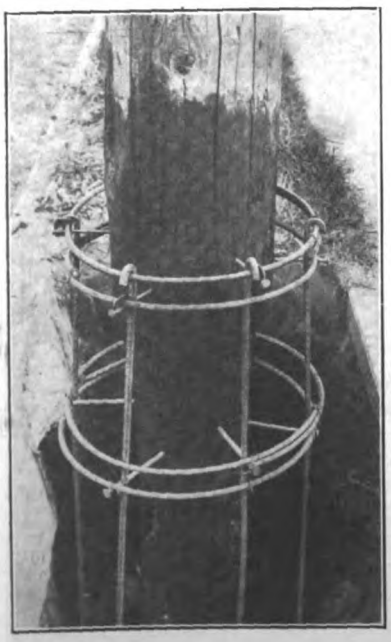

Fig. 1.—Steel Reinforcing Rods in Place.

Fig. 2.—Form Ready for Pouring Concrete.

Fig. 3.—Concrete Pole Reinforcement Complete.

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Automatic Lighting and Ignition Switches.

The usual method of protecting the automobile battery against grounds or short-circuits is to install a fuse on each circuit. The blowing of the fuse, however, always occasions

Automatic Switch for Automobile Use.

a certain amount of annoyance and inconvenience to the motorist. Generally the fuses blow as a result of a momentary accidental ground, occurring while some repair or adjustment is made to the electrical equipment. It is then necessary to locate the blown fuse, which is not always an easy matter, and insert a new fuse. Often where a new fuse is not available the clips will be bridged by a piece of copper wire or other bit of metal, which will not afford any protection to the battery.

Fuses on the automobile are rendered unnecessary by means of the new automatic lighting switch, brought out by the Hartman Electrical Manufacturing Company, Mansfield, O. Combined with the lighting switch is a small automatic circuit-breaker, which instantly breaks the circuit when a ground occurs and positively indicates this by throwing out a small button on the face plate. To close this circuit again it is only necessary to push the button in, and if it remains in this position, it is a certain indication that normal conditions have been restored. In other words, it performs the function of the fuse, but without inconvenience and expense attached to replacing a blown fuse. The lights are controlled by means of a key, which can be removed with the lights burning, thus preventing any tampering with the same during the owner's absence.

A similar type of switch is made for the ignition circuit, this switch being designed to prevent the draining of the battery should the driver fail to throw the switch off when the engine is stopped.

View in One of the Assembling Rooms of The Trumbull Electric Manufacturing Company's Factory.

The care and detailed attention required in the manufacture of switches is not generally appreciated by electrical men. Not only must each part be made of high-grade material and of proper size, but in assembling the different parts great care must be exercised to see that not only does the switch work freely, but that the blades and clips fit perfectly in order to prevent heating and energy losses. The Trumbull Electric Manufacturing Company has long been one of the leading switch manufacturers and has given the matter of proper assembling particular attention. The illustration above gives some idea of one of the assembling rooms in the Trumbull factory at Plainville, Conn. At the left in this room are numerous finishing benches at which young men are putting the finishing touches on switches already almost completely assembled. After putting on the handles, the switches are tested for alinement of blades, clips and hinges, then screws and nuts are tightened, screw holes filled in, compound put in the back, and the switches made ready for shipment. In the rear part of the room the type C switches are assembled. At the right can be seen some of the machines used for finishing special switches, of which a considerable number are made to special drawings and specifications. On the truck in the middle foreground is a 2,500-ampere switch. The piles of slate in the lower right corner constitute only part of the supply needed for one day's switch assembly.

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INDUSTRY ACTIVITIES

Crocker-Wheeler Company, Ampere, N. J., has issued a folder on its nine-inch alternating-current fan.

The MacGillis & Gibbs Company, Milwaukee, Wis., is distributing a mailing folder dealing with its service facilities for supplying white cedar poles.

General Electric Company.—Construction is progressing rapidly on the large warehouse building on Bryant Street, San Francisco, Cal., which has been leased by the General Electric Company.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has issued Bulletin No. 15-14, on bowl, flaring and concentrated types of steel reflectors, and Circular No. 163, on Hubbell quick-catch sockets.

Electric Machinery Company, Minneapolis, Minn., has issued Bulletin No. 210, a 12-page folder, illustrating its types of alternating-current generators and motors, motor-generator sets, frequency changers and switchboards.

Standard Underground Cable Company, of Pittsburgh, Pa., has recently opened a new branch office at 704 Wilkins Building, Washington, D. C. Edward Kerschner, formerly connected with the company's branch office in Philadelphia, Pa., is in charge of the new office.

James G. Biddle, Philadelphia, Pa., is distributing a mailing card describing Frahm vibrating-reed tachometers, which are intended for permanent attachment to motors, generators, steam turbines, centrifugal pumps and other machines that run at speeds between 900 and 8,000 revolutions per minute.

U. S. Expansion Bolt Company, New York City, has announced that the United States Circuit Court of Appeals has rendered a decision that the company's two-part malleable lag shields and one-part screw anchors are not infringements on other patents and that the decree against the company for unfair competition be reversed for want of jurisdiction.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently introduced a new grade of insulating transformer oil called Lectroseal. This oil has its chief application as an insulating and cooling medium for use with all classes of oil-insulated distributing and power transformers. It is also used with such apparatus as induction-type feeder regulators and electrolytic lighting arresters. It is a pure mineral oil, obtained by the fractional distillation of petroleum, and is free from moisture, acid, alkali and sulphur compounds. As an insulating medium it has a high dielectric strength. The average breakdown test is said to be 40,000 volts on a 0.15-inch gap between spheres 0.5-inch in diameter. As a cooling medium, it is claimed that this is particularly well adapted, the viscosity being very low (approximately 36 at 40 degrees Centigrade, Saybolt method). Consequently, the oil will circulate rapidly and transfer the heat quickly from the transformer or other apparatus to the walls of the tank. If water should accidentally enter a transformer tank it should sink to the bottom of the tank as quickly as possible, as a small percentage of water thoroughly mixed with the oil reduces its dielectric strength very rapidly. Various grades of oil differ greatly as to their ability to separate from water with which they have been mechanically mixed, but Lectroseal oil, it is claimed, possesses this quality in a marked degree. The other characteristics claimed for Lectroseal oil, such as freedom from deposit, satisfactory flash and fire point, low rate of evaporation and light color, would indicate that this is practically ideal for the purpose for which it is intended.

W. R. Ostrander & Company announces the removal on June 12 of their New York City salesrooms, general offices and warehouse to 371 Broadway, where increased floor space will permit a more complete line of electrical supplies and specialties.

The Borden Company, Warren, O., announces the appointment of W. A. Phillis as advertising manager in charge of the publicity of "Beaver" pipe-cutters and die stocks. Mr. Phillis formerly was connected with the advertising department of the National Tube Company, Pittsburgh, Pa.

Carrier Engineering Corporation, 39 Cortlandt Street, New York City, has issued Bulletin No. 100 entitled "Carrier Humidifying Apparatus." This bulletin explains such details as air supply, fixing the amount of water vapor, heating, cooling, securing various humidities from one apparatus, etc. A detailed description of the Carrier humidifier is given.

Despatch Manufacturing Company, Minneapolis, Minn., is installing in a Minneapolis bakery three electric ovens having a capacity of 600 loaves of bread. They are of the heat-storage type. It is claimed that this will be the largest complete electric bakery in the world. Electricity will be used in every possible application to the operation of the bakery. The building will be heated by electricity and electric vehicles will be used for delivery purposes. The Minneapolis General Electric Company has made a special rate for furnishing energy for the operation of these ovens, which by the Despatch method of heat storage makes the cost of operating this bakery less than would be possible by the use of any other fuel.

Western Electric Company, New York City, has issued and is now distributing a new and unusually complete catalog of telephone apparatus and supplies. This catalog embraces a section devoted to miniature reproductions of sales helps for those engaged in the resale of Western Electric telephones, Inter-phones and other telephone apparatus, and service helps for telephone companies wishing to stimulate a desire for telephone service and so increase the number of their subscribers. These helps include newspaper advertising, printing plates, display cards, lantern slides, booklets, etc., and are all furnished free of any charge. Following this co-operative service section there will be found listings of everything that is needed by telephone companies for the inside and outside plant—telephones, switchboards, power plants, cable, line-construction tools and materials and miscellaneous telephone apparatus. The listings include all types of equipment that are in common use. It is in the telephone section that the catalog becomes much more than a mere tabulation of apparatus and supplies. It is in reality a telephone text book, in that it enables the buyer of central-office and subscriber-station apparatus to select exactly what he needs. This is made possible by unusually complete descriptions, circuit diagrams and directions for use. The Inter-phone section of the catalog has been similarly put together. Another feature that will be of considerable assistance to the buyer of apparatus is the uniform basic discount that applies to the list prices shown in the catalog. This will enable the customer to prepare fairly accurate esitmates with a minimum of figuring. The uniform basic discount plan was first tried out in the Western Electric Year Book and its unqualified success in the electrical supply field presages the same measure of success in the telephone catalog.

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PERSONAL AND BIOGRAPHICAL

MR. HENRY L. DOHERTY, head of Henry L. Doherty & Company, of New York City, was one of the principal speakers at a luncheon of the Illinois Manufacturers' Association in Chicago May 23. Mr. Doherty spoke on "Governmental Attitude Toward Public Utilities," and said in part: "We are passing through a period of great prosperity, but it is abnormal and must eventually go back to normal conditions. This possible change is due largely to the attitude of government in general to public utilities, used in the broader sense. Governmental attitude is always a reflection of the mind of the people and this is, I regret to say, generally antagonistic. Unfortunately, the people seem to labor under the belief that the only return a corporation is entitled to is its interest rate. In consequence, nothing in the line of improvement has been done for several years by railroads, interurban lines or electric and gas companies. Moreover, these utilities will not do anything until they are more certain of governmental attitude. One consequence is that many people travel over country roads in buggies at a cost of 15 to 20 cents a mile, though, were conditions different, they might make the same distance by rail for three cents. The public belief that an interest return is all that a corporation is entitled to has prevented the electrification of railroads and their terminals. Drastic regulation of railroads and other public utilities will always have a depressing effect on general business conditions."

H. L. Doherty.

MR. CHARLES L. EDGAR, president of the Edison Electric Illuminating Company of Boston, and MESSRS. E. V. R. THAYER and PHILIP STOCKTON have been elected directors of the New England Power Company.

MR. J. S. JACOBSON, manager of Chicago branch office of the Trumbull Electric Manufacturing Company, of Plainville, Conn., has resigned. He plans to take a rest for about four weeks, after which his new connections will be announced.

MR. J. F. OWENS, superintendent of the Muskogee (Okla.) Gas & Electric Company, was recently elected vice-president of the Muskogee Rotary Club.

MR. GRATTAN KEARNS, who has been associate editor of *The Jovian*, the official organ of the Jovian Order, for the past four years, returned to the editorial staff of the St. Louis *Post-Dispatch* on June 1.

MR. GEORGE A. DAIGLE, for five years superintendent of the Middlesboro plant of the Kentucky Utilities Company, has resigned to enter business in that city. His successor has not been named.

MR. H. W. TRUMBOWER, assistant professor of political economy at the University of Wisconsin, was recently appointed a member of the Wisconsin Railroad Commission, and succeeds MR. HALFORD ERICKSON, who has resigned. Mr. Trumbower, who was born in 1882, is a graduate of Lehigh University.

MR. M. R. BUMP, who last fall resigned as chief engineer of the Doherty Operating Company to take the position of vice-president and general manager of the Picher Lead Company, of Joplin, Mo., has resigned the latter position and July 1 will resume his former position with the Doherty organization. MR. F. J. DERGE, who succeeded Mr. Bump as chief engineer of the Doherty company, has been appointed assistant to MR. FRANK R. COATES, president and general manager of Toledo Railways & Light Company.

MR. A. W. DUNHAM, who has been acting as manufacturers' agent at Fond du Lac, Wis., during the past two years, has purchased the patent rights and equipment for manufacturing Sun-Ray heating pads from the P. & B. Manufacturing Company, of Milwaukee, Wis., and assisted in the organization of the Sun-Ray Manufacturing Company at Oshkosh, Wis. He is secretary and treasurer of the company and has the active management of the manufacture and sales of its products. Mr. Dunham is an active Jovian, connected with many professional and civic activities, and is one of the most popular men in the industry.

MR. H. W. WISWELL has accepted a position with the St. Louis office of Fairbanks Morse & Company as special electrical representative. Mr. Wiswell has had a wide and varied experience in the electrical field, having been connected with the St. Louis office of the Westinghouse Electric & Manufacturing Company for ten years, part of the time as manager of their detail and supply division. Prior to that time he was with the General Electric Company at both Lynn and Schnectady for four years, the New York & Ohio Company for one year, the Warren Electrical Specialty Company (Peerless) for four years, the Commercial Electrical Supply Company for two years, the Western Electrical Construction Company for two years, and the Union Electric Light & Power Company, St. Louis, for two years.

PROF. GEORGE C. SHAAD, who was appointed the Kansas representative on the Industrial Preparedness Committee of the Naval Consulting Board by the American Institute of Electrical Engineers, addressed the Kansas City (Mo.) Section, May 31, on the work of the engineers. Professor Shaad was born in Stratford, N. Y., in 1878, and was graduated from Pennsylvania State College in 1900, receiving the degree of electrical engineer in 1905. Following his graduation he was in the employ of the General Electric Company, at Schenectady, N. Y., for two years, after which he became instructor in electrical engineering at the University of Wisconsin, from 1904 to 1906, being associate professor. In 1906 he joined the faculty of Massachusetts Institute of Technology as assistant professor of electrical engineering, becoming associate professor in 1907. In 1909 Professor Shaad accepted the chair of electrical engineering at the University of Kansas, his present incumbency. Besides being a member of the American Institute of Electrical Engineers, he is a member of the National Electric Light Association, American Electric Railway Association, Illuminating Engineering Society, Society for the Promotion of Engineering Education, Kansas Engineering Society and other organizations.

G. C. Shaad.

OBITUARY.

MR. WILLIAM J. ACKERLY, commercial superintendent of the New York district of the Western Union Telegraph Company, died at his home in White Plains, N. Y., at the age of 70. He entered the service of the company 55 years ago as a messenger boy.

LEBARON C. COLT, vice-president and general manager of the National India Rubber Company, of Bristol, R. I., died May 25 in Bristol as the result of an automobile accident. He was born in 1877 and was graduated from Brown University in 1899. He became general manager of the company in 1904 and did much to promote the growth of his company's business and the rubber industry.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

RUMFORD, ME.—Preliminary construction of the new power station of the Rumford Falls Power Company has been commenced by the H. P. Cummings Construction Company.

VINALHAVEN, ME.—The petitions of the Island Electric Company to furnish service to this town and North Haven, and to issue $60,000 in stock and $60,000 in six-per-cent gold bonds for the purpose of buying the holdings of the Vinalhaven Electric Company, were heard by the Public Utilities Commission at Augusta, May 23, without opposition.

WESTBROOK, ME.—The Public Utilities Commission, after an extended hearing, has approved the purchase of the holdings of Westbrook Electric Company by the Cumberland County Power & Light Company. Certain people of Westbrook desired to purchase the company in the interests of the town of Westbrook at a price which covered only the physical value, contending that the town should pay nothing for the rights, privileges and franchises because these had originally been given by the town to the company. The commission, however, decided that the owners of the Westbrook Company had a right to be rewarded for their risk and business enterprise and hence that the company could be sold in the open market.

ST. JOHNSBURG, VT.—The Essex Storage & Electric Company has applied to the Public Service Commission for a charter, setting forth its plans for extensive hydroelectric developments. It proposes to construct a 2,000-kilowatt station at a dam in Victory, and desires to acquire two other water powers, at East St. Johnsbury and at Summerfield, and construct 700-horsepower and 935-horsepower stations, total costs being $230,000.

ACTON, MASS.—The American Woolen Company has been authorized to supply this city and Maynard with electrical energy for light and power.

BOSTON, MASS.—A new building, of three to four stories, 212 by 105 feet, is to be erected here for the Western Electric Company, at a cost of over $250,000. The company will use the property to combine its sales department and warehouse, now in two localities. George F. Shepard, Boston, is the architect.

NEWBURYPORT, MASS.—The Newburyport (Mass.) Gas & Electric Company, which recently came under interests represented by Philip Cabot, of Boston, is now building a new generating station on tidewater near Newburyport, the estimated cost being $240,000. The former management made no systematic campaign for power business, but it is expected that a power load will be developed so that the total will be 3,000 to 4,000 kilowatts.

NORTON, MASS.—The Norton (Mass.) Power & Electric Company has petitioned the Massachusetts Gas and Electric Light Commission for authority to issue $8,000 additional stock to enable it to buy the plant and franchises of the Norton Electric Light & Power Company.

SHIRLEY, MASS.—The Shirley Electric Company has begun construction of a 22,000-volt, three-phase transmission line to connect Shirley with Pepperell, about 10 miles. The work is being done by the Cushing-Whitaker Company. The Shirley Company recently purchased the distribution systems of the Nashua River Paper Company and of the town of Pepperell. A brick substation about 30 by 28 feet will be erected at Pepperell, and transmission lines will reach two mills and a state institution. Energy will be procured from the Connecticut River Transmission Company, or its successor, the New England Power Company.

ROCKVILLE, CONN.—Plans for the white-way system to be installed here have been completed, and work will be started soon.

GREEN ISLAND, N. Y.—The Village Trustees are preparing a list of equipment in the municipal electric-lighting plant which will be dismantled and sold.

NEWBURGH, N. Y.—The Central Hudson Gas & Electric Company probably will be authorized to extend the ornamental lighting system in Front Street.

NEW YORK, N. Y.—The Public Service Commission has adopted an order authorizing the issue of $472,000 in bonds by the Kings County Lighting Company. The bonds are to mature on July 1, 1954, and are redeemable on or after January 1, 1940, at 105 per cent and accrued interest. They are to bear interest at 5 per cent per annum and are payable under the company's general mortgage of $5,000,000, made to the Central Trust Company as trustee on July 1, 1904. It is provided in the order that the bonds must be sold to net not less than 95 per cent of par plus accrued interest. The proceeds must be applied as follows: For construction, completion, extension or improvement of facilities of plant, $311,454.57; for reimbursement of amounts expended from income or other treasury funds for construction, completion, etc., of plant, $134,545.43. The remaining $26,000 is allowed for the expenses of the sale of the bonds, payment of mortgage tax, etc.

SEWARD, N. Y.—The Seward Electric Lighting & Power Company has been incorporated with a capital of $50,000 by F. W. Gordon, T. J. Walen, M. R. Lawrence, and others.

WALDEN, N. Y.—The Town Board has granted a franchise permitting the Walkill Valley Light & Power Company to extend its transmission lines along the Pin Bush and Walden road.

WEST SENECA, N. Y.—The Town Board has given a contract for supplying energy to Lighting District No. 3 to the Depew and Lancaster Light, Power & Conduit Company, of Lancaster, N. Y.

BAYONNE, N. J.—The Vacuum Oil Company has had plans prepared for a new power house at its local plant. L. V. Van Leuven is engineer.

BAYONNE CITY, N. J.—Plans, showing the approximate cost of a conduit system to be owned by the city and in which shall be placed all telegraph, telephone and other wires, have been presented by City Engineer Clarkson to the Bayonne City Commissioners.

HACKETTSTOWN, N. J.—E. W. Lathrop, Philadelphia, Pa., has acquired the plant and equipment of the Hackettstown Electric Company, and will operate the property commencing July 1.

JERSEY CITY, N. J.—The City Commission has awarded a contract to the Public Service Electric Company for the installation of an arc-lamp street-lighting system on Grove Street; 2,000-candlepower lighting units will be used.

NEWARK, N. J.—The Board of Public Utility Commissioners has granted the Public Service Gas Company permission to issue stock for $1,000,000 for improvements and extensions.

PLAINFIELD, N. J.—The American Motor Corporation will build an electric power plant in connection with its new manufacturing plant on West Front Street.

TRENTON, N. J.—The State Hospital will build a new boiler and pump house addition. George S. Drew, Trenton, is the architect.

CATASAUQUA, PA.—At a recent election, voters decided to borrow $50,000 for the establishment of municipal electric-lighting plant.

JOHNSTOWN, PA.—The Dale Light, Heat & Power Company is contemplating a number of plant extensions and improvements.

MT. WOLF, PA.—A contract has been let by the Borough Council to the Edison Electric Light & Power Company to furnish energy and to establish a system of 20 lamps here.

PHILADELPHIA, PA.—R. C. Ballinger & Company have been awarded the contract for a power house at Ninth and Brown Streets for the Powers-Weightman-Rosengarten Company.

PHILADELPHIA, PA.—The Hogg Construction Company, 1634 Sansom Street, has the contract to construct a power house for the Summerdale Dyeing and Finishing Works, near Pennypack Creek and Frankford Avenue. The estimated cost is $9,500.

UNIONTOWN, PA.—Plans for a new street-lighting system are being prepared by Councilman J. A. Strickler, City Engineer E. E. Porter and O. J. Shaefer, of the West Penn Electric Company. The present arc lamps are to be replaced by nitrogen-filled lamps.

YORK HAVEN, PA.—The York Haven Water & Power Company, which supplies power to the Harrisburg Light & Power Company, Edison Light & Power Company, of York, Middletown and Bainbridge, already has a dam, 6,000 feet long with a maximum height of 22 feet, across the west channel of the Susquehanna, extending from the shore to a large island in the river. In order to conserve the water wasted away through the east channel of the stream and to increase the flow of water over the main dam in low water stages, the company is planning to build the low dam from the island to the east shore of the Susquehanna.

HAVANA, FLA.—Bonds in the sum of $20,000 have been voted to construct an electric-lighting plant and water works.

TARPON SPRINGS, FLA.—The city is planning to construct an electric-lighting system.

NORTH CENTRAL STATES.

ATHENS, O.—A boulevard lighting system for the streets in the downtown section of the city will be installed by DeMolet & Cornwell, of Athens, to whom the contract has just been awarded. The single-lamp type of light will be used, 200-candlepower lamps mounted on iron posts 75 feet apart being selected.

BALTIC, O.—The Village Council has granted a franchise to the Sugar Creek Light, Heat & Power Company to establish an electric-lighting system in Baltic.

CINCINNATI, O.—A branch exchange building, the construction and equipment of which will cost $90,000, will be constructed by the Cincinnati & Suburban Bell Telephone Company. Contracts have been let for some of the construction work.

CINCINNATI, O.—The wiring in the Cincinnati city hall, which was installed some years ago, is in bad condition, City Electrician Kleine has discovered in making an inspection, and it will probably be necessary to install new wiring throughout. An estimate of the cost will be made shortly, and the work will probably be authorized.

WEST ALEXANDRIA, O.—The Twin Valley Light & Power Company has been incorporated with a capital of $20,000 by A. M. Fudge, J. E. Flora and others.

YOUNGSTOWN, O.—At a meeting of the board of directors of the Mahoning and Shenango Railway & Light Company arrangements were made to provide funds for extensive improvements which are being carried out or about to begin on the various parts of the company's system. These include extensions of the power transmission facilities and track reconstruction.

CHICAGO, ILL.—Ordinances have been passed by the City Council authorizing the traction company to build street-car lines in Canal Street from Kinzie Street to Archer Avenue and in Lake Park Avenue from Forty-seventh to Fifty-fifth Street.

MARKESAN, WIS.—About $1,500 has been subscribed for the installation of a white-way system in the business district.

WESTBY, WIS.—Plans are being considered here for the installation of an ornamental street-lighting system.

BARNESVILLE, MINN.—A transmission line connecting the municipal electric-lighting plant with the Otter Tail Power Company's plant at Fergus Falls if plans now being considered by the City Council are adopted. The company probably will purchase the lighting system now owned by the city.

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LEWISTON, MINN.—The local electric-lighting plant, owned by the Lewiston Telephone Company, has been sold to the Consumers Power Company. A transmission line probably will be erected from Mankato and energy supplied from the company's plant there.

PILLAGER, MINN.—The Cuyuna Range Power Company has started building its proposed dam here. The dam will be a counterpart of the first dam built by the company on the Crow Wing River and will double the company's plant capacity. A large part of the generating equipment has already been received at the power site.

COIN, IOWA.—The local electric-lighting plant has been purchased by the Continental Gas & Electric Company, which owns the plant at Shenandoah and other towns in this vicinity. The plant here was purchased from a local corporation in which C. S. Butchel held the controlling interest, and the change will take effect June 15.

COLUMBUS JUNCTION, IOWA.—The Louisa County Power Company has been incorporated with a capital of $25,000 by R. L. Van Meter, of Sigourney, and A. J. Lundquist of Columbus Junction, to furnish electric service in this community.

MOUNT AYR, IOWA.—An option on the Mount Ayr Light & Power Company has been obtained by the David Fisher Company, of Davenport. If the plant is purchased the latter company proposes to rebuild the power plant and extend the transmission system to Diagonal, Tingley and other towns.

CONCORDIA, MO.—The Concordia Light & Power Company has been incorporated by W. S. McCall, R. W. Morrison and H. C. Loehr with a capital of $15,000 to supply electrical energy for light and power and to buy and sell electrical appliances.

KANSAS CITY, MO.—P. J. Kealy, president of the Kansas City Railways Company, speaking to the electric light committee of the Commercial Club, which is investigating the question of rates, explained that the public utilities commission makes rates, and that it would therefore be improper, as well as otherwise irregular, for the Kansas City Light & Power Company to take any action of its own motion. The commission is now considering a readjustment of rates in Kansas City, and it is possible that rates for lighting will be lowered and rates for power increased. Plans are now being made for the location of a new power plant by the Kansas City Light & Power Company, and it is said that the company will put $2,500,000 into such a plant in the next year or so.

KIRKWOOD, MO.—The United Railways Company, of St. Louis, will erect a substation in this community, which is a suburb of St. Louis.

LA MONTE, MO.—The La Monte Light & Power Company has been incorporated by W. S. McCall, W. S. Morrison and H. C. Loehr with a capital of $6,000 to supply electrical energy for light and power and to buy and sell electrical appliances.

HUTCHINSON, KANS.—The Kansas Public Utilities Commission has approved the issuance of $90,000 in bonds by the Hutchinson Interurban Railway Company. Of this amount, $65,000 will go toward the retirement of an outstanding bond issue, and the rest will be used for the improvement of equipment.

OAK, NEB.—The Meyer Hydro-Electric Power Company is preparing to furnish electrical energy for light and power in the towns of Rankin and Belvidere. Bonds have been issued for the installation of an electric-lighting system in Belvidere.

HOWARD, S. D.—Bonds in the sum of $25,000 have been issued for the purchase of the local electric-lighting plant and for improvements thereto.

MAPLETON, N. D.—Plans have been prepared for an electric-lighting plant for this city, and bids will be received until June 12 by the city clerk for the construction and equipment of the plant.

SOUTH CENTRAL STATES.

BENTON, TENN.—The Tennessee Power Company will build a transmission line to this city. A company is to be formed to build a substation to cost about $2,000.

CHATTANOOGA, TENN.—Charles L. Hall, Theodore F. King and Frank Spurlock plan the construction of a hydroelectric plant at Green's Lake, near Rossville, Ga., which is just across the state line. It is believed that 100,000 horsepower can be developed.

CHATTANOOGA, TENN.—The boom in mineral development in Eastern Tennessee has necessitated several additional electric installations of considerable size. Both for the purpose of giving additional power immediately and also to serve as an emergency source of energy later, the Tennessee Power Company, of Chattanooga, is installing a steam plant at Parksville on the Ocoee River. Two 7,500-kilowatt Curtiss turbines are to be used there, and three boilers to operate them have already been supplied. The hydroelectric station being built at the Great Falls of the Caney Fork will be completed November 1 and will add 20,000-kilowatts to the capacity. As an illustration of the demand on this company, the railway and commercial service of the Nashville Railway & Light Company, which ordinarily receives its energy almost entirely from the power company's lines, is now operated entirely by its steam plant. The Aluminum Company of America is installing a steam plant with three 1,500-kilowatt units.

KNOXVILLE, TENN.—The Knoxville Railway & Light Company has made a new contract with the Mountain View Council by which that suburb will obtain better terms, service being on the basis of ten lighting units at the former cost of seven.

LEWISBURG, TENN.—The Lewisburg Light & Power Company has sold its plant to the Public Light & Power Company, of Chattanooga, and T. E. Scott has been appointed local manager. The latter company plants to build a transmission line connecting Lewisburg with its other systems.

LIBERTY, TENN.—The Water Roller Mill Company will build an electric-lighting plant. The contract for the dam has already been awarded and the work will be rushed to completion.

MANCHESTER, TENN.—The Public Light & Power Company will build an entirely new plant, to be operated by water power. In the meantime it has installed a 1,500-kilowatt steam plant. It is planned to supply a number of neighboring towns with light and power.

NASHVILLE, TENN.—H. H. Corson, manager of the local branch of the General Electric Company, is one of the principal stockholders in a company which will erect an office building to cost about $75,000. Included in the electrical equipment will be 100 ceiling fans, to be installed in every room and corridor, a vacuum cleaning system and electric elevators.

WAYNESBORO, MISS.—The Waynesboro electric-lighting plant, including all real estate holdings, franchises, privileges and accounts, will be sold at public auction to the highest bidder for cash at the court house here June 15 by the receiver, W. M. McAlister. This plant is only about two years old. It is equipped with both water and steam power, and originally cost about $12,000.

RUSSELLVILLE, ARK.—A. Brewster, principal owner of the electric-lighting and water, which also supplies energy for lighting Dardanelle, has announced that the property has recently been sold to the Arkansas Light & Water Company, of Arkadelphia, for approximately $250,000. The deal was made some time ago, but has just been approved by the Chancery Court.

BALLINGER, TEX.—The Interstate Electric Corporation plans to make improvements to its electric power plant here to cost about $100,000. Besides installing new machinery, it will construct transmission lines to the nearby towns of Winters, Rowena and Miles.

CRISP, TEX.—A transmission line from Ennis to Crisp has been completed by the Texas Power & Light Company and electric service is now being furnished to this city.

DALLAS, TEX.—The North Texas Fre-Pay Fan Company will build and operate an electric light, power and heating plant here. E. H. Thornhill is at the head of the project.

GRANGER, TEX.—The local electric-lighting plant has been sold to the Texas Power & Light Company. The plant will be dismantled and service furnished by means of the company's transmission line running from Waco to Taylor by way of Granger.

MALONE, TEX.—The Texas Power & Light Company has completed arrangements to build a transmission line from Mertens to Malone and Irene. Energy will be furnished from the company's main transmission line. A branch line from Hammels Branch to Mertens is already in operation.

McKINNEY, TEX.—The City Council is preparing to install a new electric-lighting system for the business district.

WYLIE, TEX.—The Texas Power & Light Company has purchased the local electric-lighting plant and will extend its transmission line from Murphy, Tex., to serve this community.

WESTERN STATES.

AUGUSTA, MONT.—The County Commissioners of Lewis and Clark County have been petitioned by the town of Augusta for electric-lighting and water systems.

HARDIN, MONT.—It is reported the Hardin Electric Light & Power Company plans enlarging its plant and giving 24-hour service. To this end E. B. Goldsberry, manager, is seeking new business to justify the proposed improvement. The company is trying to get customers to install ranges and other electrical equipment, and is offering to furnish energy at the rate of 4 cents per kilowatt. Electric ranges are being installed at cost.

HARLOWTON, MONT.—The Montana Power Company has obtained an option on the local electric-lighting plant and will operate here soon, it is understood from local officials of the present concern. The company will build a substation here and take power from their transmission line now running into the Twodot substation of the Milwaukee railroad, furnishing 24-hour service.

BURNS, WYO.—W. C. Costin is negotiating for the installation of an electric-lighting plant here.

CHLORIDE, ARIZ.—The County Supervisors have granted Robert Roe a franchise to construct and operate an electric-lighting plant to serve the town of Chloride and vicinity.

PHOENIX, ARIZ.—Petitions are being circulated to have the City Commission order an election to vote on issuing $600,000 bonds, the proceeds to be used in constructing municipal electric-lighting and gas plants.

CALDWELL, IDAHO.—The Council has signed a contract with the Electric Investment Company for the installation of a new lighting system, to include 23 nitrogen filled 400-candlepower and 71 250-candlepower street lamps.

COEUR D'ALENE, IDAHO.—The light and water committee of the City Council

DATES AHEAD.

American Institute of Chemical Engineers. Semi-annual meeting, Cleveland, O., June 14-17. Secretary, J. C. Olsen, Cooper Union, New York City.

Illinois Electrical Contractors' Association. Annual convention, Rockford, Ill., June 16-17. Secretary, M. N. Blumenthal, 179 West Washington Street, Chicago, Ill.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Rochester*, June 20-24. Secretary, Herbert Silvester, Rochester, Mich.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 22-23. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

Electrical Contractors' Association of Pennsylvania. Annual convention, Wilkes-Barre, Pa., June 21-22. Secretary, M. G. Sellers, 1518 Sansom Street, Philadelphia, Pa.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md. August 22-25. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Secretary, C. A. Littlefield, Irving Place and Fifteenth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

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recommends that immediate steps be taken toward the construction of a new light and water plant to be owned and operated by the municipality or the purchase of the plants furnishing light and water to the city at present.

GILMORE, IDAHO.—Plans are being made by mining operators in this vicinity for the use of electric power. The Gilmore Tunnel & Transportation Company will install a new power plant to develop 250 to 300 horsepower, and the Pittsburgh-Idaho Mining Company will also install a plant. Construction work on both plants will be commenced soon.

WALLACE, IDAHO.—The City Council has authorized the installation of a system of incandescent lighting throughout the city outside of the district now lighted by the cluster system. Work will be started as soon as the material can be secured.

NORTH YAKIMA, WASH.—The County Commissioners are considering the construction of an electric-lighting and water plant. O. E. Brashears, county engineer, and others are making investigations looking toward this project.

PALOUSE, WASH.—According to N. C. Osborne, of the Washington Water Power Company, the company will install a new street-lighting system providing its franchise is extended for pumping water for the city water supply.

WATERVILLE, WASH.—The Bell Telephone Company plans rebuilding its telephone lines between Waterville and Pateros, and between Holson and Oroville. The construction of a new crossing near Chelan Falls on the Columbia River is contemplated. The preliminary work will be in charge of H. A. Stimmel, toll engineer, Spokane.

BISHOP, CAL.—The State Railroad Commission has authorized the Bishop Light & Power Company to issue $4,500 in bonds, the proceeds to reimburse the treasury for expenditures for plant extensions and betterments.

FRESNO, CAL.—The Pacific Telephone & Telegraph Company has authorized the expenditure of $36,000 on improvements in this vicinity, including new lines from Dos Palos to Mendota, Fresno to Kerman and Fresno to Jamison. All the work is to be completed within eight months.

LAKEPORT, CAL.—The directors of the Mt. Konocti Light & Power Company held their annual meeting here a few days ago. The company is now extending its power line to Saratoga Springs and up Middle Creek to Lymans, and is also planning on extending the line to Blue Lakes and Laurel Dell.

LOS ANGELES, CAL.—The Board of Public Works has been instructed by the City Council to advertise for bids for lighting the streets of the city for six months beginning July 1.

MONTEREY, CAL.—The Pacific Telephone & Telegraph Company has announced plans for considerable improvement work in this county, including the replacing of the present poles between here and Santa Barbara with larger ones.

OROVILLE, CAL.—The Great Western Power Company is making survey on the Feather River between Belden and Intake with a view to locating a site for a new power plant.

POMONA, CAL.—The City Council has adopted a resolution ordering that centrifugally cast reinforced concrete posts and wiring equipment for street-lighting purposes be installed on Alvarado Street, Columbia and Lincoln Avenues and certain other streets.

PORTERVILLE, CAL.—Engineers arrived here a few days ago to begin work on a survey of a proposed system of interurban electric lines, to be built through the mining section and into new orchard areas, subsidiary to the Southern Pacific Railroad.

QUINCY, CAL.—The Great Western Power Company has announced plans for the construction of a second power house on the Feather River in the near future.

SAN FRANCISCO, CAL.—Paul McKee, assistant to the president of the California-Oregon Power Company with W. M. Sheppard, commercial agent, has completed a two weeks' inspection tour of the Trinity Center line in Northern California and reports the work progressing rapidly. The Westinghouse Electric & Manufacturing Company was awarded the contract for 3,000 high-tension insulators, and the Peirson-Roeding Company was awarded the contract for the same number of high-tension pins to be used on the company's Trinity Center line. The work on the Lkamath dam has been progressing rapidly, and they expect to have one 10,000-kilowatt unit in operation about the first of November.

SKAGWAY, ALASKA.—According to reports, a new system of telephones is being installed in Skagway and Whitehorse by the White Pass & Yukon Railway Company. The old grounded system will be replaced by a metallic system.

CANADA.

CHICCUTIMI, QUE.—The Ha Ha Baie Sulphite Company, of Chiccutimi, has awarded the contract for the construction of its new paper pulp plant at Bagotville to the J. G. White Engineering Company, of New York City, under the direction and design of H. S. Ferguson, of New York City. This plant will embody the latest improvements in design and the initial installation will have a capacity of 120 tons of sulphite pulp per day. J. E. A. Dubuc will be at the head of the newly formed enterprise.

MONTREAL, QUE.—It is stated that with the completion of the new dam of the Laurentide Power Company, at Grand Mere, on the Ste. Maurice River, the company will have a total of 180,000 horsepower at its disposal. When the doubling of the paper and pulp plant of the Laurentide Company is completed that plant will require about 50,000 horsepower for its operations, leaving 130,000 horsepower in excess of the requirements of the company. This entire surplus of power will be taken by the Shawinigan Water & Power Company, with which the Laurentide Power Company has a contract for all power above that taken by the latter company.

ORILLIA, ONT.—The proposition to dispose of the local electric power franchise and equity in the new dam at Swift Rapids on Severn River to the Hydro-Electric Commission of Ontario, was not approved at a recent election. The city will make an expenditure of $80,000 to provide machinery in the new power house at Swift Rapids. Two 1,600-horsepower units will be installed this summer. Provision has been made for the installation of additional units, 6,000 horsepower being the ultimate capacity of the plant.

Proposals

LAMP STANDARDS.—Sealed proposals wil be received at Room 509, District Building, Washington, D. C., June 15, for furnishing and delivering six bronze lamp posts. Purchasing Officer, Room 320, District Building, Washington, D. C.

POWER PLANT.—Sealed proposals will be received by the board of managers of the New Jersey State Hospital, Trenton, N. J., until June 16 for furnishing and erecting electrical equipment for the addition to the new boiler house. Scott Scammell, secretary.

POWER PLANT EQUIPMENT.—The Money Creek Light & Power Company, Houston, Minn., John L. Carlson, secretary and treasurer, which is constructing an electric power plant, will receive bids until June 20 for generating units, water wheels, switchboards, pole-line material for seven-mile transmission line and city distribution system, and other electrical apparatus.

ELECTRIC LIGHTING EQUIPMENT.—Sealed proposals will be received until June 21 by the South Park Commissioners, Fifty-Seventh Street and Cottage Grove Avenue, Chicago, Ill., for the delivery of lead-covered cable and rubber-covered wire, and for electrical apparatus and transformers for use in lighting Michigan Avenue. Specifications may be obtained at the above office. A deposit of five per cent of total bid must accompany each proposal. J. F. Neil, secretary South Park Commissioners.

Financial Notes

The $25,000 electric-light bonds, which were recently issued by the city of Alamogordo, N. M., have been sold to John M. Wyatt, of El Paso, Tex.

The Cleveland Electric Illuminating has been authorized by the Public Utilities Commission to issue $1,000,000 in bonds, the proceeds to be used for plant improvements.

Stockholders of Toronto Railways Company have ratified an increase of $3,000,000 in the capital stock of the company. The price and the date and terms of the new issue will be announced in a short time.

The Central Maine Power Company has petitioned the Public Utilities Commission for authority to issue seven-per-cent capital stock to the amount of $1,740,000 to be exchanged for present outstanding six-per-cent bonds.

The Public Service Company of Northern Illinois announces that it will pay off at the Illinois Trust Company, of Chicago, or the Chase National Bank, of New York, the $3,500,000 six-per-cent collateral-trust notes due July 1, 1916.

By the filing of a trust deed, running to the Minneapolis Trust Company, the Iowa River Light & Power Company, of Eldora, Iowa, is preparing to issue $350,000 in six-per-cent bonds maturing at the rate of $10,000 per year beginning May 1, 1921, for five years and the remainder due May 1, 1936. The company operates a power station at Eldora and distributing stations at other smaller Central Iowa towns.

The New Hampshire Public Service Commission has authorized the Milford Light & Power Company to issue 375 shares of 7 per cent preferred stock, to take up a similar number of shares previously issued without authority of the Commission. The latter says the company acted in good faith, under a misapprehension, and that justice and the public good require that the company be allowed to issue the stock.

Negotiations are in progress for the consolidation of the Salt Lake & Ogden Railway, the Salt Lake & Utah Railway, and the Ogden, Logan & Idaho Railway Company, three Utah electric railways operating about 213 miles of lines. Some time ago the same operating officials were appointed for these three roads. The three companies have a total of $9,500,000 stock and $15,000,000 bonds. The consolidation would give the new company control of a continuous line of electric railway from Preston, Idaho, to Payson, Utah. Engineering surveys and audits of the companies are now being made for bankers who are considering the consolidation of the three companies.

Earnings of the United Light & Railways Company of Grand Rapids, Mich., for the 12 months ending with April are by $50,000 the largest recorded in the history of the company. The largest percentage increase was also shown during this period. The gross earnings of the subsidiary companies were $6,565,554.77, an increase of 6.8 per cent. The net earnings were $2,623,797.40, an increase of 10.4 per cent, and the net profit, $1,228,048.97, an increase of 17.9 per cent. Gross earnings for the parent company totaled $1,780,334.99, an increase of 16.2 per cent, and the net earnings, $1,104,947.15, an increase of 18.6 per cent. Surplus earnings above dividend charges aggregated $525,793.15, an increase of 29.5 per cent. The company's figures for the month of April this year show a considerable increase over the same month last year.

The Pennsylvania Utilities has filed a certificate at Belvidere, N. J., showing a mortgage of $1,250,000 to the Philadelphia

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 5.	May 29.
Amer. Tel. & Tel. (New York)	129½	129¾
Commonwealth Edison (Chicago)	141	141¾
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery common (Philadelphia)	64½	63
Electric Storage Battery preferred (Philadelphia)	64½	63
General Electric (New York)	169½	170½
Kings County Electric (New York)	130	130
Massachusetts Electric common (Boston)	6	—
Massachusetts Electric preferred (Boston)	34	—
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	122	122
New England Telephone (Boston)	134	132
Philadelphia Electric (Philadelphia)	27¾	27¾
Postal Telegraph and Cables common (New York)	80½	83½
Postal Telegraph and Cables preferred (New York)	68	68
Western Union (New York)	94⅝	96
Westinghouse common (New York)	61¼	62
Westinghouse preferred (New York)	70	70

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Fidelity Company. The mortgage covers the property of the Phillipsburg (N. J.) Light & Power Company, and the Columbia (N. J.) Water Power Company.

The Public Service Electric Company, of New Jersey, has issued a financial report showing an increase of 12.8 per cent, or about $370,000, in business for the month of April, 1916, as compared with the corresponding month of last year. The statement also shows an increase of nearly 14 per cent, or about $1,600,000, for the first four months, ending April 30, of the present year, as compared with the corresponding months in 1915. The gross increase over April, 1915, in total business is $369,992.42; percentage of increase, 12.8; balance available, after payment of operating expenses, fixed charges, etc., $350,037.77. Increase in surplus available for dividends over corresponding month, 1915, $84,322.84.

Petitions have been filed with the Second District Public Service Commission by the Long Island Lighting Company, of Northport, for authority to purchase the entire capital stock of the Suffolk Gas & Electric Light Company, and to merge the same with the Long Island Lighting Company, and to issue an additional $200,000, par value, of capital stock of the latter company, and for authority to purchase the entire capital stock of the South Shore Gas Company, and to merge it with the Long Island Lighting Company, and to issue an additional $63,300, par value, of the capital stock of the Long Island Lighting Company. A petition has also been filed with the Commission by the Long Island Lighting Company, the Huntington Lighting Company, the Huntington Light & Power Company and the Huntington Gas Company for approval of the purchase and transfer to the Long Island Lighting Company of all the property and assets of the two latter companies, and for authority to issue therefor $120,000, par value, of capital stock, and $206,000, par value, of first-mortgage five-per-cent 25-year bonds of the Long Island Lighting Company, under a mortgage heretofore approved by the Commission, and for approval of a supplemental indenture of mortgage.

Dividends.

	Term.	Rate.	Payable.
Allis-Chalmers, pf	Q	1.5 %	July 15
Allis-Chalmers, pf. (extra)	—	1.5 %	July 15
Ark. Val. Ry., Lt. & Pw., pf.	Q	1.75%	June 15
Brazilian Trac., Lt. & Pw., pf.	No.	1.5 %	July 1
Canadian General Elec.	Q	1.75%	July 1
Chicago Tel.	Q	2 %	June 30
Elec. Properties, pf.	Q	1.5 %	June 10
Mackay Cos., pf.	Q	1 %	July 1
Mackay Cos., com.	Q	1.25%	July 1
Muskogee Gas & El., pf.	Q	1.75%	June 15
Penn. Water & Pw.	No.	1 %	July 1
Southern Utilities, pf.	Q	1.75%	July 1
Twin Cy. Rap. Tran., com.	Q	1.5 %	July 1
Twin Cy. Rap. Tran., pf.	Q	1.75%	July 1
Va. Ry. & Pw., pf.	S	3 %	July 20
Utd. Lt. & Rys., 1st pf.	Q	1.5 %	July 15

Reports of Earnings.

AUGUSTA-AIKEN RAILWAY & ELECTRIC CORPORATION.

	1916	1915
April gross	$ 65,453	$ 54,487
Net after taxes	35,379	27,298
Balance after underlying charges	19,084	10,811
Surplus after all charges	6,351	
Twelve months' gross	715,013	671,478
Net after taxes	373,595	353,473
Balance after underlying charges	176,520	155,357
Surplus after all charges	15,146	

UNITED LIGHT & RAILWAYS.

United Light & Railways Company reports for the 12 months ended April 30 as follows:

	1916	1915
Gross of subsidiaries	$6,565,555	$6,147,166
Net of subsidiaries	2,623,797	2,377,174
Net profit of subsidiaries	1,228,049	1,041,963
Gross income United Light & Railways	1,780,335	1,531,456
Net income after expenses, interest and amortization	1,104,947	931,758
Balance after preferred dividends	525,793	405,715

New Incorporations

CINCINNATI, O.—Ohio Gas & Electric Company has increased its capital from $1,000 to $1,500,000.

CHICAGO, ILL.—Duplex Lighting System. Capital, $5,000. Incorporators: E. C. White, Fred Plate and Harry Edwards.

LOCKHART, TEX.—Clear Fork Storage Battery Company. Capital, $10,000. Incorporators: A. A. Borchert, O. Borchert and A. E. Lawrence.

COLVILLE, WASH.—The Stevens County Power & Light Company has filed amended articles of incorporation increasing its capital to $200,000.

PROVIDENCE, R. I.—Telegraphone Sales Company has reduced its capital from $1,000,000 to $50,000. The concern deals in all kinds of electrical instruments.

ST. LOUIS, MO.—Ziegler & Peters Electric Company. Capital, $2,000. Manufacture electric fixtures, etc. Incorporators: E. C. Ziegler, J. W. Peters and L. G. Peters.

NEW YORK, N. Y.—Goodson Igniter & Electric Company. Capital, $10,000. Incorporators: S. A. Potter, Sidney Diamant and J. F. Potter, all of 60 West 129th Street, New York City.

KNOXVILLE, TENN.—Safety Automobile Light Company. Capital, $25,000. Manufacture automobile lamps. Incorporators: J. G. Buchanan, Joseph Dougherty, B. D. Gibbs and others.

BUFFALO, N. Y.—L. C. Specialty Company. Capital, $50,000. Manufacture electrical supplies and specialties. Incorporators: B. J. Crawford, Gowanda, N. Y.; D. Cary and R. Cary, Buffalo.

NEW YORK, N. Y.—Charles B. Foley, Inc. Capital, $75,000. To develop inventions relating to electric induction furnaces, etc. Incorporators: W. F. Hubley and J. L. Schermerhorn, of 145 Miller Street, Newark, N. J., and Albert Stetson, 170 Broadway, New York City.

Electrical Patents Issued May 30, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,184,714. Alarm Apparatus for Automatic Sprinkler Systems. A. Blauvelt, Chicago, Ill. For systems having automatic valve mechanism.

1,184,723. Piano-Player Exhaust and Regulating Mechanism. M. Clark, assignor to Melville Clark Piano Co., Chicago, Ill. Mounting, connections, etc., of electric motor driving pumper.

1,184,738. Switchboard Apparatus. A. E. F. Gilson, assignor to Western Electric Co., New York, N. Y. Plunger switch-key for telephone system.

1,184,741. Telephone-Exchange System. C. L. Goodrum, assignor to Western Electric Co. In automatic systems, meter magnet prevented from operation on connection of "free" line.

1,184,742. Telephone-Exchange System. C. L. Goodrum, assignor to Western Electric Co. Automatic system has call register magnets operated when connection made.

1,184,745. System of Electrical Distribution for Projector Arc-Lighting. J. H. Hallberg, New York, N. Y. Generator circuits can be connected to give constant current or constant potential.

1,184,747. Lighting Fixture. M. Herskovitz, Chicago, Ill. Lamp socket has upper shade support and support for inverted bowl below bulb.

1,184,760. Pocket Flash-Light. A. S. Lyhne, Bridgeport, Conn., assignor of one-half to Interstate Novelty Co., New York, N. Y. Form of pistol with lamp at muzzle, battery in stock and switch operated by trigger.

1,184,782. Electric Welder. W. A. Smith, assignor to Detroit Electric Welder Co., Detroit, Mich. Structure of work holders in butt welder.

1,184,783. Means for Observing and Signaling Between Ships in Fog. J. Buckner Speed, assignor to Western Electic Co. Electromagnetically operated shutters control projection of light from ship near surface of water.

1,184,805. Dynamoelectric Machine. W. G. Wright, New Duluth, Minn. Details of inductor, disk machine.

1,184,818. Dry Cell. J. W. Brown, assignor to National Carbon Co., Cleveland, O. Filling mixture containing superbaked coke.

1,184,824. Steadying Device for Vertical Arc-Lamps. R. B. Chillas, assignor to National Carbon Co., Cleveland, O. Rings about upper and lower electrodes are interconnected.

1,184,826. Apparatus for Interrupting Electric Circuits. W. Cooper, assignor to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Direct-current circuit opened on predetermined quick current change.

1,184,834. Metering Switch. G. C. Dill, assignor to Westinghouse Electric & Mfg. Co. For connecting ammeter in various phases of polyphase circuit.

1,184,836. Electric Locomotive. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Arrangement of trucks and brake rigging.

1,184,843. Signaling by Electromagnetic Waves. R. A. Fessenden, assignor to S. M. Kinter, Pittsburgh, Pa., and H. M. Barrett, Bloomfield, N. J. Method of neutralizing disturbing influences on receiver.

1,184,844. Electric Circuit-Interrupter. C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg Co. Modification of No. 1,184,826.

1,184,845. Electric Circuit-Interrupter. C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Circuit-breaker tripped on overload or in anticipation of predetermined quick change.

1,184,846. Circuit-Interrupter Device. C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Circuit-breaker tripped on quick change of current.

1,184,848. Intermittent Operating Mechanism. E. F. Geiger, Duluth, Minn. Electromechanical step-by-step motion.

1,184,854. Process for Making Battery-Depolarizing Material. M. E. Holmes, assignor to National Carbon Co., Cleveland, O. Preparation of manganese peroxid.

1,184,858. Engine-Starting Device. C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Interconnection of starting and igniting systems.

1,184,864. Electric Current Controller. C. Monninger, Macomb, Ill. Details of rheostat.

1,184,866 and 1,184,867. Starting Mechanism for Gas Engines. J. P. Nikonow, assignor to Westinghouse Electric & Mfg. Co. Control of motor and gearing.

1,184,899. Mouthpiece for Telephone Transmitters. H. F. Vandervolt, Loveland, O. Speaking tube fitted in opening in transmitter normally closed by lid.

1,184,905. Lamp-Shade Holder. A. E. Wiedenhoeft, Chicago, Ill., assignor of one-half to H. A. Best, Chicago, Ill. Secured to socket.

1,184,909. Burglar-Proof Lock. J. Ziemienik, St. Clairsville, O. Comprises battery and bell circuit which is closed when lock tampered with.

1,184,917. Lamp Attachment for Show-Cases. R. B. Benjamin, assignor to Benjamin Electric Mfg. Co., Chicago, Ill. Mounting for lamps in trough-like metal shield.

1,184,924. Dimming Device for Automobile Lamps. L. F. Chaney, Springfield, O. Special structure of rheostat.

1,184,932. Automatic Telephone System. A. H. Dyson, assignor to Kellogg Switch-Board & Supply Co., Chicago, Ill. Arrangement of circuits and step-by-step automatic switches.

1,184,933 and 1,184,934. Telephone System. A. H. Dyson, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Combined manual and automatic.

1,184,935. Film-Controlled Mechanism for Motion-Picture and Sound-Reproducing Means. C. W. Ebeling, Elm Grove, W. Va. Machines connected by clutch electromagnetically controlled by film.

1,184,937. Apparatus for Welding Electric Conductors. A. H. Fargo, Poughkeepsie, N. Y. Clamping tool for holding conductors while being soldered.

1,184,949. Heater for Dental Vulcanizers. W. A. Gwynn, St. Louis, Mo. Has heating members adjustable toward and away from utensil to be heated.

1,184,952. Lighting Fixture. S. Hipkins, Martins Ferry, O. Suspension of glass globe.

1,184,955. Testing System for Electric Circuits. H. L. Hoffmann, St. Louis, Mo., and J. O. Doolittle, Emporia, Kans. For testing for open lines.

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1,184,963. Insulator Pin. M. G. Kennedy, Philadelphia, Pa. Has wooden cap with metal base fitting.

1,184,966. Lamp Socket. G. C. Knauff, Chicago, Ill. Very simple structure of shell and spring-pressed central contact.

1,184,993. Battery Plate. G. H. Rabenalt, assignor to Gould Storage Battery Co., New York, N. Y. Structure of lead grid.

1,185,005. Process of Treatment of Anode Slimes and Similar Materials. F. C. Ryan, Hammond, Ind., assignor of one-half to U. S. Metals Refining Co., Chrome, N. J. Method of treating mineral-bearing material, containing arsenic, selenium, gold, silver, copper and the like.

1,185,010. Electric Heater for Carbureters. W. S. Seederly, Columbiana, O., assignor of one-half to F. H. Grove, Columbiana, O. Specially constructed for attachment to carbureter.

1,185,024. Expediting and Safeguarding Railway Traffic. H. A. Thompson, Manchester, England. Block-signal system operates if train short-circuits resistance between rails.

1,185,030. Igniter for Internal Combustion Engines. E. G. Wayman, assignor to Wayman-Aiken Electric & Mfg. Co., Wilkinsburg, Pa. Details of make-and-break device.

1,185,031. Train-Stopping Mechanism. J. F. Webb, assignor to International Signal Co., New York, N. Y. Operation of brake valve by ramp electrically controlled through track circuit.

1,185,037. Circuit-Closer for Trolley Signals. W. D. Wright, assignor to Electric Railway Signal Co., Kittery, Me. Trolley-operated.

1,185,040. Mounting for Incandescent Lamps. R. F. Armstrong, assignor to Western Electric Co. For telephone switchboards, etc.; jack behind aperture receives lamp.

1,185,053. Controller and Like Handle. F. Brostrom, assignor of one-half to J. M. Yount, San Francisco, Cal. Means for securing handle to shaft.

1,185,058. Separator. R. N. Chamberlain, assignor to Gould Storage Co., New York, N. Y. Wood separator for storage batteries has rubber faced ribs.

1,185,081. Heating Appliance. E. F. Fisher, Springfield, Mass. Air blower for gas heater has circuit of driving motor thermally controlled.

1,185,085. Elevator Signal. R. H. Gaylord, assignor to R. H. Gaylord Co., Los Angeles, Cal. Telephone transmitter in car successively connected with receivers at different landings.

1,185,086. Lock-Out for Party Lines or Extension Telephones. C. L. Goodrum, assignor to Western Electric Co. Arrangement comprising common relay at junction of party lines and individual relay for each line.

1,185,087. Lock-Out for Party Lines or Extension Telephones. C. L. Goodrum, assignor to Western Electric Co. Arrangement of cut-out and cut-in relays.

1,185,119. Lineman's Shoe. H. E. Marshall, Highland Park, Mich. Resists high-tension electric currents.

1,185,123. Electric-Switch Apparatus. F. D. Morris, Creston, Iowa. Details of knife switch.

1,185,130. Trolley Harp. J. K. Park, Atlantic City, N. J. Structural details.

1,185,135. Dust-Separating and Steam-Generating Apparatus. H. J. Seaman, Catasauqua, Pa. Highly charged wires in discharge tubes of rotary Portland cement kilns separate the dust from the hot gases.

1,185,136. Apparatus for Burning Cement and Recovering the Resulting Dust. H. J. Seaman, Catasauqua, Pa. Modification of above.

1,185,141. Knife Switch. H. F. Starrett, Chicago, Ill. Structural details.

1,185,144. Tank Alarm. J. J. Stukel, Laurium, Mich. For notifying driver of condition of gasoline in tank.

1,185,151. Electrical System for Autovehicles. R. Varley, assignor to Varley Duplex Magnet Co., Jersey City, N. J. Special adjustment of system having engine-driven generator delivering direct current for lighting and alternating current for ignition.

1,185,168. Means for Connecting Electrical Appliances to Conduit Outlet Boxes. C. H. Bissell and J. J. Dossert, assignors to Crouse-Hinds Co., Syracuse, N. Y. Details of structure for clamping switch, etc., to box.

1,185,177. Electrode-Making Machine. S. L. Casella, assignor to Conrad Hubert, New York, N. Y. Molding device for applying depolarizer to electrode.

1,185,184. Coin-Controlled Electrically Operated Lock. R. L. Dickson, Indianapolis, Ind. Bolt withdrawn by coin-controlled electromagnetic means.

1,185,197. Electrical Starter. E. V. Hartford, Deal, N. J. Mounting and gearing of motor for starting automobile engines.

1,185,211. Circuit-Closer for Gas Alarms. A. D. Legge, New York, N. Y. Circuit closed by bimetallic switch to which heat is imparted by gas-absorbing mass.

1,185,218. Potential Starter. A. J. Loguin, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Low-voltage conditions gradually release latch holding switch open, preventing closing until low-voltage conditions have existed certain time.

1,185,227. Electrical Resistance. G. Mascarini and A. Contardi, Milan, Italy. Rheostat has homogeneous resistance element of iron sulfid.

1,185,240. Electrical Relay. A. Peterson, assignor to Kemp & Lauritzen, Copenhagen, Denmark. Relay contacts in gaseous medium and in circuit with induction causing discharge between contacts after relay lets go.

1,185,251. Timbre Control in Electrically Operated Musical Instruments. M. L. Severy and G. B. Sinclair, assignor to Choralcelo Co., Boston, Mass. Sonorous body percussively actuated and electromagnetically actuated to produce ground tones of different pitch.

1,185,267. Fan Apparatus. R. Vuilleumier, New Rochelle, N. Y., assignor to Safety Car Heating & Lighting Co. Ceiling fan has rotary air deflector causing outwardly deflected air currents to rotate about fan axis.

1,185,269. Automatic Speed-Limit Control. G. J. Willett, Milwaukee, Wis. Electrically operated engine stop.

1,185,288. Duplex Driving Mechanism. C. W. E. Clark, Brookline, Mass. Steam turbine automatically connected to aid drive when speed of motor-driven generator falls below certain limit.

1,185,300. Device for Starting Internal-Combustion Engines. A. P. Foster, assignors to Westinghouse Electric & Mfg. Co. Gearing of motor to flywheel.

1,185,304. Controller and Air-Brake Handle. C. Gietz, New York, N. Y. Has removable split bushing for removably securing handle to post.

1,185,306. Fire-Alarm System. G. Groves, Parry Sound, Ontario, Canada. Arrangement of selector switches for interconnecting number of alarm circuits each including a magneto and a central station.

1,185,330. Light Fixture. J. T. Johnson, Atlanta, Ga. Shade holder; flange of shade has recesses permitting passage of supporting lugs and engaging portions are corrugated.

1,185,331. Telephony. M. L. Johnson, Chicago, Ill., assignor to F. B. Cook Co., Chicago, Ill. Exchange system comprising speech-recording and record-reproducing devices.

1,185,332. Electric Relay. C. P. G. Joubart, assignor to Societe d Electricite de Paris, Paris, France. Time relay.

1,185,363. Secret Branch or Private Exchange Switchboard. R. M. Beard, New York, N. Y. Arrangement of cord circuits.

1,185,366. Dynamoelectric Machine. J. Burke, assignor to Burke Electric Co., Erie, Pa. Arrangement of stator laminae is such as to produce substantially uniform magnetic reluctance.

1,185,369, 1,185,370 and 1,185,371. Relay. F. B. Cook, assignor to F. B. Cook Co., Chicago, Ill. Structural details of three different forms of relays.

1,185,372, 1,185,373, 1,185,374, 1,185,375 and 1,185,376. Telephony. E. R. Corwin, assignor to F. B. Cook Co., Chicago, Ill. Various automatic and combined automatic and manual exchange systems.

1,185,379. Starting and Regulating of the Speed of Dynamoelectric Machines. F. Cumont, Paris, France. Electric regenerative system.

1,185,394. Process of Melting Scrap Metal. A. E. Greene, assignor to American Smelting & Engineering Co., St. Louis, Mo. Process of making steel in electric furnace.

1,185,395. Process of Melting Steel Scrap. A. E. Greene, Chicago, Ill. Method of minimizing power consumption in electric furnace.

1,185,397. Combined Process of Refining Metal and Reducing Ore. A. E. Greene, Chicago, Ill. Treating of phosphorus-containing pig iron in electric furnace.

1,185,396. Process of Refining Ferro Metals. A. E. Greene, Chicago, Ill. Method of reducing oxid ore of metal having affinity for carbon direct to decarbonized metal in electric furnace.

1,185,407. Electrolytic Cell. H. C. Jenkins, London, England. Has number of bells at top and floor with series of ridges, valleys and grooves corresponding to number of bells.

1,185,408. Switch. H. Jones, Fort William, Ontario, Can. Special clockwork-driven intermittent contactor.

1,185,418. Method of and Means for Transforming Current. F. W. Lyle, assignor to General Electric Co., Schenectady, N. Y. Impresses alternations of one polarity only on transformer which has secondary opened during alternations of other polarity.

1,185,419. Rectifying Device. R. W. Lyle, assignor to General Electric Co., Schenectady, N. Y. Combination of a symmetric rectifier and commutator device.

1,185,436. Trolley Retriever. G. B. Reaben, Hattiesburg, Miss. Details of spring-drum device, centrifugally governed.

1,185,461. Induction Motor. E. F. W. Alexanderson, assignor to General Electric Co. Has high and low resistance secondaries carrying greater or less current respectively according to polar arrangements of primary magnetic fields.

1,185,472. Telephony. S. G. Brown, London, England. Telephonic relay system.

1,185,477. Interchangeable Driving Mechanism for Cotton Machinery. J. F. Cannon, Concord, N. C. Gearing and location of electrically operated driving elements.

1,185,479. Transmitter for Signaling by Electromagnetic Waves. F. J. Chambers, assignor to Automatic Telephone Mfg. Co., Liverpool, England. For obtaining rapidly quenched sparks.

1,185,485. Arrangement for Starting and Regulating Direct-Current Electric Motors. F. Cumont, assignor to Societe dite S. T. A. R., Paris, France. Field-excitation system.

1,185,500. Method of Regenerating Mercury Catalysis. N. Grunstein, assignor to the firm of Chemische Fabrik Friesheim Elektron, Frankfort-on-the-Main, Germany. Sludge is transformed into metallic mercury by electrolysis in an alkaline solution.

1,185,510. Telephone System. A. E. Keith, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of selector switches for trunk lines.

1,185,521. Automatic Common-Battery Telephone System. T. G. Martin, assignor to First Trust and Savings Bank, Chicago, Ill. Relates to the "connector."

1,185,522. Telephone-Exchange System. T. G. Martin, assignor to First Trust and Savings Bank. Automatic, comprising two-way trunk line.

1,185,544. Supervisory Alarm System. G. I. Rockwood, Worcester, Mass. For fire sprinkler systems.

1,185,569. Relay. A. A. Ziegler, Boston, Mass. Details of special structures.

1,185,579. Electric Switch. F. Barr, New York, N. Y. Details of structure for lamp socket.

1,185,589. Traffic Controlling Apparatus. A. C. T. Day, New Rochelle, N. Y. Block system of train stop and speed control for railways utilizing high-potential oscillating current.

1,185,609. Flow Meter and Recorder. E. S. Cole, New York, N. Y. Vibratory movement of mechanism under variations in pressure transmitted magnetically to recorder.

PATENTS EXPIRED.

The following United States electrical patents expired on June 6, 1916:

626,296. Device for Steering Motor-Driven Vehicles. E. H. Pennington, Walton-upon-Thames, England.

626,298. Coin-Controlled Electric Meter. S. L. Phillips and G. G. Tilden, Washington, D. C.

626,331. Process of Producing Neutral Chromate of Lead. C. Luckow, Cologne-Deutz, Germany.

626,361. Method of and Apparatus for Electroplating. A. A. Blackman, New York, N. Y.

626,364. Automatic Fire-Alarm System. T. G. Callum and J. W. Fritch, Washington, D. C.

626,377 and 626,378. Electric Rail-Bond. S. H. Harrington, New York, N. Y.

626,382. Auxiliary Electric Alarm for Telephone Call Bells. M. M. Humphrey, Siloam Springs, Ark.

626,460. Filament for Incandescent Lamps and Process of Manufacturing Same. T. A. Edison, Llewellyn Park, N. Y.

626,462 and 626,463. Telephone System. W. D. Gharky, Philadelphia, Pa.

626,294. Electrical Signaling. S. de Jager, Paterson, N. J.

626,496. Electric Motor or Dynamoelectric Machine. R. Lundell, New York, N. Y.

626,501. Magazine Target Gun. J. L. McCullough, New York, N. Y.

626,592. Insulator. J. A. Carpenter, Oxville, and C. F. Tonn, Bluffs, Ill.

626,606. Telegraph Receiver or Relay. J. Gallegoe, San Jose de Guatemala, Guatemala.

626,624. Circuit and Apparatus for Bridging Telephones. C. T. Mason, Sumter, S. C.

626,629. Telephone. G. F. Payne and A. K. Keller, Philadelphia, Pa.

626,635. Process of Reducing Aluminum from Its Compounds. G. Schwahn, St. Louis, Mo.

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ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

COLLECTING ACCOUNTS.

The importance to the electrical contractor of the prompt collection of accounts is perhaps greater than to the average man in other lines of business. Delinquent accounts tie up the resoures of the contractor and make it essential that he have greater financial resources than would be otherwise necessary. Moreover, the loss of interest upon the money which is thus tied up and unavailable for carrying on other business is a direct loss. The difficulties of collection are well known and when the contractor has not carefully studied the best methods of managing this end of the business he is likely to let accounts run for longer periods than are advantageous. It is often harder for the contractor to collect the debts which are owing to him than it is to get the orders represented thereby.

There are two points of prime importance to be considered in this connection. One is the method to be used to secure prompt payments and the other is the careful scrutiny of the credit of customers before orders are accepted. The reputation for acceptable credit involves two points; first, the ability to pay, and second, the willingness to make the payment when it becomes due. Many individuals and firms who are not lacking in the first requisite will delay payments as long as possible, and thus largely detract from the desirability of their contracts and from the profits of the contractor. Consequently great care should be exercised by the electrical contractor in extending credits and full investigation should be made of the reputation of every one applying for business relations upon any other than cash terms.

Deferred payments represent an expense both in the direct cost of collection and repeated sending of bills, and in the loss of interest upon the face value of the account. Any method which will speed up collections will consequently effect a double saving. One method for doing this which has worked out very satisfactorily for a number of contractors is to allow discounts for prompt payment. Such a discount is partially paid for by the saving as compared with a deferred payment and the remainder may well be covered by an appropriate advance in contract prices. When such prices are offered it should be with a definite statement of the discount for prompt payment, so that any comparison with others may be made upon the basis of net prices. Emphasis should be placed upon the necessity of payment within a definite period to secure the specified discount, and insistence should be made upon full payment in cases where this period is overrun. This method deserves a trial by any electrical contractors who have found their collections to constitute a chronic difficulty.

ELECTROLYTIC HYPOCHLORITE FOR LAUNDRIES.

The use of chemicals, many of which have deleterious effects upon articles of clothing, has become common in laundries, the object being to facilitate washing processes and to bleach uncolored fabrics to a pure white. The use of such chemicals is not relished by the average patron of the laundry and it tends to discourage the patronage of a certain class of customers. Also it represents an outlay for material which is a very appreciable item of expense. Any means of attaining the same object by a cheaper and better process should consequently be welcomed by laundries generally.

An article upon other pages of this issue describes an installation in the Model Laundry at Nashville, Tenn., in which an electrolytic process has been applied which both cleanses and sterilizes the fabrics which are subjected to this process. The electrolysis of salt water causes the formation of sodium hypochlorite, a substance which has distinct disinfecting and antiseptic properties. A small quantity of chlorine is also liberated and a bleaching effect is obtained. A very small quantity of these materials is sufficient to effect the desired purpose and the current need be applied to the solution for but a short time. The germicidal action is a distinct benefit where clothing and other fabrics from all sources are passed through the laundering process together.

The use of electrical power in the laundry has been making steady progress, but its usual application is in driving motors and heating irons and mangles. The extension of its use for electrolysis represents another application which improves the laundering process, reduces its cost, and adds to the load of the central station. There should be many opportunities for introducing this process in other cities with benefit to all concerned.

A notable application of this process on the British hospital ship *Aquitania* has recently been reported. In that case ordinary sea water is used as an electrolyte and the resulting product is applied not only in the laundry, but also in the swimming bath, for different disinfecting purposes about the ship and for surgical use. It is also applied for the purification of drinking water, one part in one million sufficing in this case.

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REDUCING THE PEAK LOADS.

In the operation of each of the electrical utilities there is a certain period of the day when the load reaches a maximum. In the case of the electric central station this maximum is usually encountered shortly after dusk, when the greatest demand for lighting comes on, and it is this maximum load that determines the necessary capacity of the generating equipment and the distributing lines and apparatus of the power company. In the case of electric street railways there is a similar period of maximum traffic when the demand for cars and power is the greatest and when the largest number of employees is required. In the telephone business, similarly, the largest number of switchboard operators is demanded by the amount of traffic during the busiest hour of the day, and the switchboards must be designed to meet this period of most dense traffic.

Anything that can be done to improve the load-factor and give a better distribution of the demand for service will relieve the troubles of the operating manager and reduce the necessary investment for equipment. One way in which this could be accomplished, to a slight degree at least, would be in altering the hours of labor of a portion of the community, since this would result in a better distribution of the demand. In this way the overlapping peaks of individual demand would be to some extent avoided and the diversity-factor improved. This would be especially noticeable in electric transportation. At the present time in most cities there is great congestion in the late afternoon, owing to the fact that so many persons stop work and go home at nearly the same hour. In the operation of a telephone exchange there would be a similar, although a less marked improvement. In the case of electric lighting and power there would be a similar improvement, although it is difficult to determine in advance its extent.

For some years past there has been an agitation for making better use of daylight hours by a change in the standard of time. This usually takes the form of a proposal to set the clocks forward one hour. From the standpoint of the electric utilities, and probably also from the standpoint of the entire community, it would be more rational and also more convenient to make no change in the standard of time, but to encourage such individuals, companies and other working units for whom it may be feasible, to make a change in their working hours. This would not only have the advantages mentioned above, but it would also relieve congestion in lunch rooms and many other places of business.

While there are some lines of business whose time of operation may be fixed by law or regulations, such as banking, post offices, etc., these are few in number, and in some cases the hours are already short, so that a change in time would affect them but little. In other lines of business, such as merchandising in retail stores, the hours are not now uniform, and it is best that they should not be so. Some retail stores close at 5:30 p. m., some at 6 p. m., while others remain open even later, suiting their hours to the convenience of their patrons. In the case of factories and large offices, there is usually no need for uniformity with other concerns, and the diversity of hours would not only avoid some of the difficulties in congestion and peak loads, but would provide better opportunities for shopping by employees and better distribution of the business for merchants.

In the summer time, all except night workers have daylight throughout the working period anyhow, so that the movement which has been revitalized by the action of certain European governments represents little or no gain in this direction, and for the reasons above stated it would be better to have only a portion of the community, rather than all, advance their daily schedule by the prescribed hour.

SUMMER DIFFERENTIAL RATE SUSTAINED IN MASSACHUSETTS.

In a decision noted last week in our news columns in the case of Petitioners vs. Vineyard Lighting Company in re Rates, the Massachusetts Gas and Electric Light Commission presented some highly interesting comments upon the justification of a differential between summer and winter charges for service. Attention may be called to the willingness of the Commission to allow the company to retain in its residence lighting prices the outstanding feature of a 60 per cent reduction from October to May inclusive from the demand rates in force in the summer season.

The Vineyard Company supplies service on an island off the southern coast of the state, in which the far greater portion of the load which sets the limits of station and system capacity is that incurred by summer residents. The company is well managed, and in the past two years an exhaustive study of its revenue, rates and expenses has led to the virtual elimination of the meter system of charging for lighting customers. The cost of meters and of their reading has been eliminated by the adoption of a demand rate of $1 per month for a 25-watt unit, $1.80 for two, $2.40 for three and $0.60 per month for each additional unit, with a minimum season charge of $9.00 before connection is made. At the hearings the petitioners argued that a meter rate is the only fair one, and the company vigorously defended the demand system of charging. As the abstract of the decision shows, the board recognized that "the company's investment has been made virtually entirely to provide for the brief summer business when the largest demand is made for the shortest possible use of electricity for the year. Moreover, the maximum demands of all the customers are coincident." If the plant were operated for the summer season only, the decision states, the company could not dispense with any of the investment which it now has.

Here, in a nutshell, is one of the clearest expressions we have seen of the fundamentals of a rate situation—a complete appreciation of the truth that the price of a service must in a large measure be based upon its cost. The company had analyzed its busi-

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ness sufficiently to determine the estimated relative cost of its summer and winter service, but the decision does not attempt to discuss these costs quantitatively, the board apparently being satisfied that the preponderating influence of the summer load is in this case so overwhelming as to leave little or no doubt as to the equity under present conditions of permitting the differential between summer and winter rates to stand, except in the cases of the large commercial users of electric lights represented by the hotels, churches, stores and bowling alleys. For such customers the choice of a meter rate is recommended, but the allowed retention of the demand system of charging, with the heavy discount included for the all-year resident, represents a most gratifying illustration of the Commission's appreciation of the relations between price and overhead charges which exist in the case of this exceptionally situated company.

THE NEW RUSSIAN LOAN.

The announcement this week that a loan of $50,000,000 to the Government of Russia has been negotiated in this country should be of considerable interest to electrical manufacturers. The terms of this loan are considered to be somewhat unique. A syndicate of New York bankers will furnish the money, which will be kept in the United States to be used as a Russian credit balance. The reciprocal part of the arrangement is the agreement of the Russian Government to establish credit in Petrograd at the disposal of the American syndicate at a favorable rate of exchange and if this is not otherwise utilized it may be used to purchase Russian Government bonds at a discount at any time within three years.

The negotiation of this loan will help to establish desirable commercial relations between this country and Russia and to improve the banking facilities already existing. The importance of these features to the electrical manufacturers of this country lies in the possibilities of developing large trade in electrical machinery and supplies in Russia, especially after the close of the war. How great these possibilities are is pointed out in an article upon other pages of this issue. This article shows that Russia's needs in electrical lines are great, that in the past they have been largely supplied by Germany, and that at no time and at no place outside of this country has there been so great an opportunity for Americans to extend their trade and especially in this particular branch. While American manufacturers may find little encouragement in seeking such trade at the present moment, it behooves them to lay their plans and make their arrangements now for the prosecution of such trade after the close of the European war, when many of the activities which derive their present impulse from that source will experience a slackening. The firms who make their preparations now and who persistently and adequately follow them up are those who may expect to reap the profits in the future.

BILLING BUSINESS AND RESIDENCE SERVICE TOGETHER.

Many electric light and power companies have made a practice of combining the consumption of a residence customer with the consumption of the same individual's business premises in one bill, and giving that individual the benefit of a single rate for the total consumption. In the case of wholesale or block rates, this often means a substantial reduction under the amount which would be billed for the two premises as separate consumers. There is little justification for this practice. It is usually adopted for the purpose of currying favor with the customer in question. The cost of service to two detached premises is the same under common ownership as where there is separate ownership, and meters must be supplied and read in duplicate, so that conditions are not of the kind that justifies any discount or wholesale rates.

Where public utility commissions have made rulings as to such conditions, they have been almost uniformly against regarding two premises of the kind indicated as a single customer, since otherwise discrimination would be exercised against other consumers whose conditions of service are the same.

When, on the contrary, business and residential service are supplied to the same building or to adjacent buildings so that the supply may be made over a common service connection, and through a single meter, the case is different and the same reasoning cannot be applied. A case of this kind was recently decided by the Missouri Public Service Commission, and it was ordered that a single meter should be furnished to supply both premises. In the case of this company, the Consumers' Electric Light & Power Company, it happened that the same rates were in effect for both business and residence service, so that the only point involved was the question of a minimum charge for one or for two separate services. Nevertheless, the point involved is of interest and may have application in cases of greater financial significance.

AMPLE LEAD WIRES.

The advent of the modern high-efficiency incandescent lamp made the capacity of a given size of lead wire in furnishing illumination much larger than ever before. The result has been a tendency to use No. 14 wire for all branch circuits in residence wiring, unless the actual connected load exceeded its carrying capacity, which cannot ordinarily occur under the rules. It is frequently overlooked that in the future heating devices are likely to be attached to lamp sockets and circuits may be loaded, or need to be loaded, to a point which, if not actually overheating the wire, may nevertheless cause an undesirable drop of voltage in the leads. This tends to make operation of both lamps and heating devices unsatisfactory. In drawing up wiring plans, ample provision should always be made for possible future requirements. It is a good principle to use plenty of copper.

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Happenings in the Industry

Exports for March—Program of Annual Convention of American Institute—Illuminating Engineering Society Elects Officers—Engineers Study New York Street Lighting—Ontario Contractors and Dealers Hold Successful Convention—Concentric Wiring to Be Investigated by Committee—Electrical Supply Jobbers Discuss Reorganization at Spring Meeting

Electrical Exports for March.

From the monthly summary of the foreign commerce of the United States, just issued by the Bureau of Foreign and Domestic Commerce, Washington, D. C., it is evident that the electrical exports from this country last March aggregated only a little less in value than the record shipments of February. For the four classes for which the numbers of articles exported are reported, there were shipped in March the following: Electric fans, 1,706; arc lamps, 221; carbon-filament lamps, 75,317; metal-filament lamps, 523,540.

The following table gives the detailed figures for last March and for the corresponding month of a year ago:

Articles	March, 1916	March, 1915
Batteries	$ 157,497	$ 166,041
Dynamos or generators	72,022	236,305
Fans	18,376	20,533
Insulated wire and cable	269,606	236,849
Interior wiring supplies, etc. (including fixtures)	69,981	65,159
Lamps—		
Arc	3,191	2,409
Carbon-filament	9,548	8,133
Metal-filament	86,894	42,963
Meters and other measuring instruments	63,824	41,305
Motors	473,771	166,648
Telegraph instruments (including wireless apparatus)	19,703	7,335
Telephones	180,534	53,066
Transformers	87,520	27,562
All other	1,372,408	587,363
Total	$2,884,875	$1,661,671

For the nine months ended March 31, 1916, the total value of electrical exports was $21,466,055; for the corresponding period in 1914-1915 the total was $13,867,092; for the similar period in 1913-1914 the total was $19,828,136.

Program of Annual Convention of Electrical Engineers.

The thirty-third annual convention of the American Institute of Electrical Engineers will be held at the Hollenden Hotel, Cleveland, O., June 27 to 30. There will be five technical sessions and numerous entertainment features, which will make the convention both profitable and enjoyable to all who attend.

The opening session will be held on Tuesday, June 27, at 10 a. m. There will be an address of welcome by Mayor Harry L. Davis and the President's Address, by John J. Carty. Two papers will be presented: "Electric Drive for Reversing Rolling Mills," by Wilfred Sykes and David Hall; "Motor Equipment for the Recovery of Petroleum," by W. G. Taylor.

At the Transmission Session in the afternoon there will be a Report of Transmission Committee, by Percy H. Thomas; "Effect of Barometric Pressure on Temperature Rise of Self-Cooled Stationary Apparatus," by V. M. Montsinger; and "Restoring Service After a Necessary Interruption," by F. E. Ricketts. In the evening there will be a dinner-dance and reception.

At the Protective Apparatus Session on Wednesday morning, the following papers will be presented: "Studies in Lightning Protection on 4,000-Volt Circuits," by D. W. Roper; "Experience in Recent Developments of Central-Station Protective Features," by N. L. Pollard and J. T. Lawson; "Protection of High-Tension Distribution Systems by Isolating Transformers," by O. O. Rider; "Megger and Other Tests on Suspension Insulators," by F. L. Hunt; "Experiences in Testing Porcelain Insulators," by E. E. F. Creighton; "New Method of Grading Suspension Insulators," by R. H. Marvin.

In the afternoon there will be an automobile trip and in the evening the Sections Committee conference, open to all members, as well as a theater party for ladies.

At the Electrophysics Session on Thursday morning the following papers will be presented: "Effect of High Continuous Voltage on Air, Oil and Solid Insulation," by F. W. Peek, Jr.; "The Corona Voltmeter," by J. B. Whitehead and M. W. Pullen; "Theory of Parallel Grounded Wires and Production of High Frequency in Transmission Lines," by E. E. F. Creighton. In the afternoon there will be games and other entertainment at Nela Park. After dinner at Nela Park, special cars will be taken to Shaker Heights Country Club, where there will be a presentation of past-president's badge, followed by dancing.

On Friday, June 30, there will be an all-day boat trip on *City of Erie*. A technical session will be held, with the following papers: "Suggestions for Electrical Research in Engineering Colleges," by V. Karapetoff; "Tractive Resistances to a Motor Delivery Wagon on Different Roads and at Different Speeds," by A. E. Kennelly and O. R. Schurig; "Application of a Polar Form of Complex Quantities to the Calculation of Alternating-Current Phenomena," by N. S. Diamant.

Election of Officers of the Illuminating Engineering Society.

The annual election of officers of the Illuminating Engineering Society resulted by means of a letter ballot as follows: General officers of the Society: President, W. J. Serrill, Philadelphia, Pa.; vice-president from Philadelphia Section, George S. Crampton; vice-president from New England Section, T. H. Piser; vice-president from Chicago Section, M. G. Lloyd; general secretary, C. E. Clewell, Philadelphia; treasurer, L. B. Marks, New York City; directors, C. A. Luther, Chicago; D. McFarlan Moore, Harrison, N. J.; P. G. Nutting, Rochester, N. Y.

The term of office for these general officers begins next October.

Section officers were elected as follows: New York Section: Chairman, W. Greeley Hoyt; secretary, Norman D. Macdonald; managers, William J. Clark, Alexander Maxwell, W. H. Rolinson, John B. Taylor and Edward Wray.

New England Section: Chairman, S. C. Rogers; secretary, R. G. Hudson; managers, J. W. Cowles, David Crownfield, C. A. B. Halvorson, Gifford Le Clear and George P. Smith.

Philadelphia Section: Chairman, Robert B. Ely; secretary, T. Elmer Moon; managers, P. H. Bartlett, John R. Hare, George A. Hoadley, T. J. Litle and Walter R. Moulton.

Chicago Section: Chairman, Otis L. Johnson; secretary, James J. Kirk; managers, A. L. Arenberg, A. O. Dicker, H. M. Frantz, E. H. Freeman and F. A. Rogers.

Pittsburgh Section: Chairman, S. G. Hibben; secretary, L. O. Grondahl; managers, Allan Bright, R. B. Chillas, T. W. Rolph, R. H. Skinner and M. C. Turpin.

The section officers will be installed at the first meeting of the 1916-1917 season.

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Results of State's Operation of Generating Station in Massachusetts.

The Metropolitan Water and Sewerage Board of Massachusetts operates a hydroelectric generating station at the Wachusett Dam of the reservoir which supplies water to Greater Boston. During 1915 the station was operated 241 days, the output varying from its minimum amount which the Connecticut River Transmission Company is required to take under its contract with the Board, up to the full capacity of the plant. About 90 per cent of the total water discharged into the aqueduct was used to develop electricity. The following were the results of the year's operation:

	Kilowatt-hours.
Energy sold to Connecticut River Transmission Company	4,825,541
Energy used at power station	12,261
Energy used at sewerage pumping station	113,008
Total	4,950,810
Water used	23,151,700,000 gallons
Average effective head	89.6 feet
Energy developed per million foot-gallons	2.3866 kilowatt-hours
Efficiency of station	75.95 per cent
Earnings:	
Energy supplied Connecticut River Transmission Company at 0.53 cents per kilowatt-hour	$25,575.37
Labor supplied Connecticut River Transmission Company	13.00
Energy used at power and pumping stations, at 0.53 cents	663.92
Total, earnings	$26,252.29
Operating Costs:	
Labor	$ 4,804.13
Fuel for heating building	75.00
Repairs and appliances	446.34
Taxes, to local community	2,800.00
Total operating cost	$ 8,125.47
Net earnings	$18,126.82
Net earnings per kilowatt-hour developed	0.3661 cent

Illuminating Engineers Study New York Street Lighting.

Rain and drizzle did not keep down the attendance at the final session of the season of the New York Section of the Illuminating Engineering Society, held on the evening of June 8, at the auditorium of the United Electric Light & Power Company, 187th Street and Broadway, New York City. Through the courtesy of the company an informal dinner was served to the 150 members and guests prior to the business session.

Chairman D. M. Moore introduced W. T. Dempsey, in charge of street lighting construction and maintenance for the New York Edison Company, who talked on "Electric Street Lighting in New York." After outlining briefly the development of public lighting from the early gas lamps of 1823 down to the present, he said that both electric arc lamps and mantle gas lamps have practically disappeared from the Borough of Manhattan, having been displaced by type C units gas-filled tungsten lamps. Slides were shown giving the day and night appearance of the units. Motion pictures, showing the complete installation of posts as well as the maintenance of the system, gave a much clearer conception of these operations than would have been possible by ordinary means.

The discussion was rather brief because the schedule did not leave sufficient time. Among those who spoke were D. F. Atkins, chief engineer of light and power, City of New York; C. A. Halvorsen, General Electric Company, Lynn, Mass; William A. Durgin, Chicago, Ill.; W. T. Crampton, Philadelphia, Pa.; A. G. Sawin, Newark, N. J., and P. S. Millar, New York City.

Immediately following the lecture all present entered 40 waiting automobiles and were driven over a route of about 15 miles, where practically every type of lighting referred to in the paper could be seen in use. It is unfortunate that rain marred what was otherwise a valuable as well as an interesting meeting. W. F. Little, chairman of the Papers Committee, is to be congratulated, as the attendance at the season's gatherings made a new record.

Ontario Electrical Dealers and Contractors Hold Successful Convention.

The Electrical Dealers' and Contractors' Association of Ontario, held its second annual convention June 6 to 8, at Massey Hall, Toronto, Canada, with a good attendance from all parts of the province. In addition to the convention a good electrical show was a big drawing card which brought visitors from neighboring provinces as well. The exhibition hall was tastily decorated and exhibitors from the United States and Canada displayed their latest electrical conveniences. The show was open to the public in the evening. The attendance was stimulated by giving away many household appliances to ladies who attended the show.

The convention opened on Tuesday afternoon with an address of welcome by G. D. Earle, president, who also reviewed some of the more important activities of the Association. An address on inspection was then given by H. F. Strickland, chief electrical inspector of the Province of Ontario. He made a strong plea for higher standards of electrical construction and pointed out the relation of inspection to the securing of this end.

On Wednesday morning the session opened with an address on advertising, presented by J. C. Kirkwood, who likened advertising to sunshine in farming. Sunshine is needed to start the growth of field products, but the farmer must apply himself steadily to the farm in order to get results. So, likewise, must advertising in the electrical field be accompanied by personal and active work. A paper on "How to Keep the Electrical Business in the Family," was presented by Gordon C. Keith, of Toronto, who gave some original methods illustrating how the electrical contractor might make a successful merchant of himself and reap the profits from the business made possible by the rapid and continuous developments in electricity.

A general discussion on the subject of resale followed, in which R. Grant, of Peterboro, submitted a written discussion stating that the dealers and contractors must meet the jobbers and manufacturers on a common ground to discuss freely a system of standard prices in the same way as is customary and very successful in the grocery business. He suggested that the Association initiate this movement. C. A. McLean spoke as a jobber and said he felt that standard prices properly maintained will give the desired feeling of confidence to the electrical business. This is especially necessary as regards household appliances. In regard to contractors' materials a somewhat different condition may be called for, probably the best being a standard percentage above cost. Edward G. Weed, speaking from the standpoint of the manufacturer, pointed out that prices must be kept as low as possible in order to encourage sales. He thought it was high time that price-cutting of well advertised goods be stopped. He pointed out also how standardization of prices would make for satisfied customers.

At the afternoon session on Wednesday a general discussion on the subject of co-operation was indulged in, addresses being made by Walter Carr, F. M. Dusenbury, A. H. W. Joyner, R. T. Jeffrey and A. C. Lyons. Mr. Dusenbury said that contractors are the legitimate retail dealers in electrical goods. If the contractors are to handle this business to the extent that they should, they must actively go after it. Central stations and contractors are co-operating in a great many cases and such co-operation should exist in every town. Mr. Joyner referred to the relationship of contractors with each other, with their customers and with the manufacturers. He urged that the only satisfactory way to enter into a co-operative plan is to do it unselfishly for the success of the entire industry. Mr. Jeffrey spoke as a representative of the central stations, showing that the more business the central station has

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the more business there is for the contractors. He referred to the extremes existing in some cities of contractors charging exorbitant prices for their work and in other cases turning out work so cheaply and so poorly that reputable contractors would not have a fair chance. Between these extremes there is a happy medium where the contractor can install work properly and get a fair return for his service. Mr. Lyons, president of the Brantford Electrical Club, described the co-operative work undertaken by this organization. Contractors, dealers, jobbers and manufacturers gathered together under its auspices to straighten out all misunderstandings and differences. By a close examination of their various costs, which were carefully audited by an impartial central-station authority, fixed prices for standard wiring were arranged and advertised. A great stimulus to the contracting business resulted and a large number of houses were wired because it was possible to know definitely what the cost would be. C. D. Henderson, secretary of the Brantford Club, outlined the cost system which is now being used by the contractors of Brantford, and which has resulted in successful business.

At the Thursday session reports of committees were presented. W. H. Lodge, on behalf of the Committee on Organization, introduced a resolution as a result of which there was appointed a committee to further consider organization and future action of the Association regarding fixing of fees and other matters. On this committee were appointed W. H. Lodge, chairman; A. C. Lyons, J. N. Miller, W. J. McLinden and E. A. Drury. In accordance with the committee's suggestion, it was decided to leave the Retail Merchants' Association and to form county clubs permitting all electrical men to join and to have a central organization, the officers of which must be electrical dealers or contractors.

Another report presented was that relating to licensing of contractors, which reviewed the work of the committee which has carefully canvassed this matter and which drew up a law that was to be submitted to the Ontario Legislature. On consultation with the Ontario Hydro-Electric Power Commission it was decided, however, to join with that body in securing the enactment of a law which aims to raise the standard of electrical work and to promote co-operation between the Commission and the various electrical interests of the province.

Election of officers for the ensuing year then followed with the following result: President, G. D. Earle, Toronto; first vice-president, J. N. Miller, Peterboro; second vice-president, W. J. McLinden, Owen Sound; secretary E. A. Drury, Toronto; treasurer, M. S. Soules, Oshawa. Chairmen of committees were selected as follows: Licensing Committee, W. H. Lodge, Toronto; Electrical Development Committee, E. Etherington, Stratford; Resale Committee, George T. Dale, Toronto; Inspection Committee, W. R. Fellows, Jr., Blenheim; Organization Committee, A. C. Lyons, Brantford.

At the final session E. F. Griffith, of Toronto, presented a paper on bookkeeping and cost accounting for the contractor and dealer. The necessity for accurate accounting was emphasized and a suitable system of accounts was described. A paper on interior illumination was presented by T. M. DeBlois. The principles of interior lighting were discussed and a plea made that abstract physical efficiency be regarded with less importance than effectiveness of illumination. Proper consideration must be given to the requirements of the eye, such as avoiding glare and providing neither too low nor too high an illumination intensity. A practical talk on developments in incandescent lamps was made by H. D. Burnett, of the Canadian General Electric Company.

Tuesday evening was devoted to formal opening and inspection of the electrical show. On Wednesday evening was given a moonlight excursion on Lake Ontario.

Concentric and Other Bare Grounded-Return Wiring Systems to Be Investigated.

Shortly after the organization of the Associated Manufacturers of Electrical Supplies there was appointed by it a committee of business and technical experts on concentric wiring, which later became known as the Committee on Electric Wiring Systems in the Electrical Industry. The latter has now appointed the following Subcommittee on Bare Grounded-Return Wiring Systems:

Chairman, C. E. Corrigan, Associated Manufacturers of Electrical Supplies, Pittsburgh, Pa.; W. H. Flandreau, International Association of Municipal Electricians, Mt. Vernon, N. Y.; J. C. Forsyth, American Institute of Electrical Engineers, New York, N. Y.; G. S. Lawler, Associated Factory Mutual Fire Insurance Companies, Boston, Mass.; C. Renshaw, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; secretary, William S. Boyd, Western Association of Electrical Inspectors, 175 West Jackson Boulevard, Chicago, Ill.

This committee desires the co-operation of the entire electrical industry in this work, and to that end requests that all information and data on wiring systems having a bare grounded conductor be sent to the secretary. The committee will especially appreciate the following information:

(1) Safety, cost and reliability data based upon practical experience with concentric wiring, or any other type of wiring having one or more bare or partially covered conductors which are permanently connected to earth.

(2) Theoretical or tested installation details or protective features which will safeguard concentric wiring or other wiring systems having bare grounded conductors.

(3) Reliable methods of preventing meter setters or linemen from reversing the polarities of a two-wire system.

(4) A suitable definition of "ground" or "earth" as these words relate to electric wiring.

(5) Practical experience with ground or earth connections: (a) whether they have been found reliable, or unreliable; (b) the proportion found to be unreliable, if any.

(6) Adequate methods of establishing and maintaining a reliable ground or earth connection for safety purposes.

(7) A simple method of test which will insure the detection of unreliable ground or earth connections.

(8) Economies which may be practiced with safety in connection with any of the existing wiring methods.

(9) Estimates or actual figures as to the cost of any protective features reported upon in response to the foregoing requests.

(10) Any data or experience calculated to assist the committee in reaching an accurate conclusion relative to the practicability of bare grounded-return wiring systems.

Massachusetts Lighting Commission Reports for 1915.

The thirty-first annual report of the Massachusetts Gas and Electric Light Commission, which covers the operations of companies and municipal plants for 1915 and includes tables from the annual returns for the year ending June 30, 1915, is about to be issued. The volume consists of 820 pages, which is about 80 more than the last report. Returns are made by 52 electric companies, and for the first time by three hydroelectric companies. There are 22 combination gas and electric companies in the state. There are 36 municipal plants.

The Commission's inspectors investigated smoke abatement and assisted operators to adopt the best methods of complying with the smoke-nuisance law. The decrease in smoke emission is due to the hearty co-operation of owners, engineers and firemen. The number of stationary

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stacks emitting excessive smoke decreased from 786 to 643.

Total assets of electric companies, other than hydro-electric companies, increased $5,000,000 from 1914, the 1915 figures being $77,588,478. One of the companies showed that it had not earned expenses, as against five companies in 1914, while 11 declared no dividend, as compared with 14 in 1914. Gross profits increased $287,797; 43 companies paid dividends, which averaged 11.57 per cent, compared with 10.22 in 1914.

The following electric companies reduced their maximum net price: Ayer, 17 to 15 cents; Cambridge, 10 to 9; Brockton Edison, 12 to 11; Lenox, 16 to 15; Malden, 11 to 10; Marlboro, 15 to 12; Milford, 18 to 14; New Bedford, 11.4 to 10.45; North Adams, 12.5 to 11; Suburban (Revere), 11 to 10; Williamstown, 13 to 12; Worcester Suburban, 15 to 14.

There were 19 fatal electric accidents, as compared with 23 the year before. Only three were company employees.

The report includes new legislation pertaining to lighting companies, and laws advocated by the Commission, several of which have been enacted by the present legislature.

Electrical Supply Jobbers Discuss Reorganizing of Divisions.

A very interesting meeting of the National Electrical Supply Jobbers' Association was held at Hot Springs, Va., June 6, 7 and 8. There was a particularly active series of sessions, the general association meeting morning and afternoon, and there being held at the same time several meetings of the Central Division and the Atlantic Division. Golf was rather taboo because of the importance of the discussions and the difficulty of finding the grounds and the weather in such condition as to allow of a favorable opportunity for playing a good game.

The most important matter coming before the Association at this time was the presentation of and discussion upon the report of the Survey Committee. It will be remembered that at the Detroit meeting in February of this year General Secretary Overbagh presented a number of illuminating suggestions looking to the reorganization of the activities of the Association. In line with these suggestions the Survey Committee recommended that the members of the Association be divided into eight groups which would hold frequent meetings in various parts of the country, leaving but two general sessions, one in the spring and one late in the fall, for the general association. It was considered desirable to group the activities of the various members of the Association as nearly as possible in conformity with the territory into which the most active effort went for the establishment of distribution of electrical supplies upon the part of the various member companies. The report of the Survey Committee will be published and presented fully to the members and definite action will be taken at the general meeting which will be held early in October in Cleveland, O.

Another matter which aroused considerable interest and which afforded conjecture with regard to its great possibilities, was the authorization by the general meeting for the secretary to engage the services of a permanent auditor of operating expense. This expert will investigate the cost of handling various supplies so as to establish definite ratios of expense for the economic distribution of electrical material and equipment.

The various sessions were well attended and devoted in the main to the presentation of committee reports and the discussion of the intimate problems respecting the relation of the distributor to the manufacturer, and the trade and ultimate consumer of electrical material. The matter of manufacturers' price lists was the subject of considerable discussion, and there was evident a tendency toward the suggestion that the distributor would be in a better position with regard to his trade if the manufacturer would refrain from publishing price lists other than the lists of prices which obtained with regard to his immediate distributor. Another subject which attracted considerable discussion was with regard to the growing tendency of manufacturers to quote a single discount rather than a complicated chain of discounts. Undoubtedly this idea will be developed and it was hoped that all manufacturers of standard electrical equipment would shortly make it a business practice to quote a single discount in connection with all matters of distribution and resale.

A. K. Baylor, of the heating appliance department of the General Electric Company, made a very interesting and comprehensive address dealing with the electric-heating situation. He described in detail the litigation between the Hoskins Manufacturing Company and the General Electric Company and told in a vivid and virile way of the broad-minded and high-principled action of the General Electric Company in emerging from this litigation to the decided advantage of the other manufacturers of electric-heating devices, and in conserving the interests of the central-station companies of the country. He explained fully the license agreement which was being made between the owners of the heating-wire patent and the manufacturers of heating devices, and elicited a round of applause when he demonstrated the businesslike methods which had been pursued in establishing a definite and highly satisfactory position for the jobber as an efficient medium for the distribution of this material.

Other addresses were made by Mr. Patterson, of the auditing department of the General Electric Company, who outlined the imperative necessity of business men engaged in all forms of industry to reconcile their accounting methods with the plans which were being formulated and distributed to industry by the Federal Trade Commission, and Frank E. Watts, Past Jupiter of the Jovian Order, who made an eloquent and pleasing appeal for the support of the jobber in the co-operative work now being carried on by the Jovian Order.

Glassware for the Lighting Industry.

Since the outbreak of the war the stoppage of continental supplies of glassware of various kinds has led to the reorganization of this business in England and some very important research work on the subject has been carried out. A special instance is furnished by the work of the Research Committee of the Institute of Chemistry, which has succeeded in establishing the formulas of a number of important varieties of glass used in special optical and laboratory work, supplies of which are now being manufactured in the British Isles.

At the last meeting of the Illuminating Engineering Society of Great Britain, held recently in London, there was an important discussion on glassware in relation to natural and artificial lighting. The question of standardizing the various kinds of glassware used in the forms of bulbs for electric lamps, chimneys, globes, reflectors, etc., was keenly discussed and something was also said on the making of prismatic window glass for securing the maximum admission of daylight into buildings obstructed by neighboring premises.

S. B. Langlands, who read an introductory paper, made a number of interesting suggestions, one of them being that an attempt should be made to standardize the sizes and materials of glassware widely used for lighting purposes, the object being to establish once and for all the best conditions and then, by concentrating on standard types, to bring about economies in manufacture. Special reference was also made to varieties of glass needed for special purposes. For example, it has hitherto been found difficult to obtain neutral-tinted glass plates of specified absorbing power for photometric work. Again while colored glass has been prepared for the purpose of obtaining "artificial daylight" from electric incandescent lamps, there

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are different varieties on the market which do not give identical results. While it is difficult by this means to secure an exact resemblence to daylight, it is at least desirable that some standard conditions should be specified so that the artificial daylight should always have the same properties.

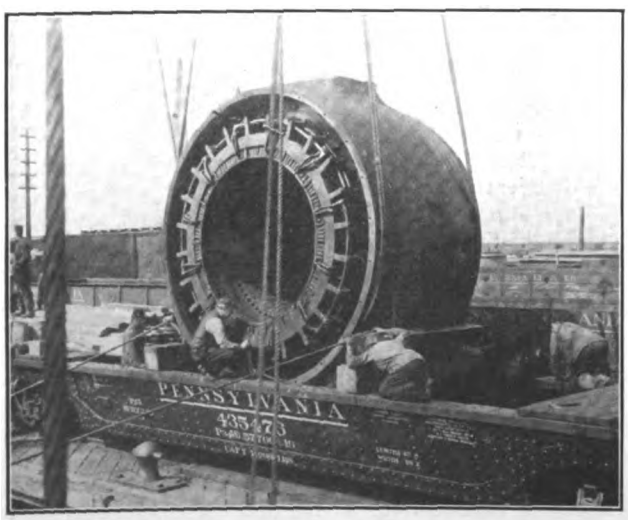
Discussion also turned on the preparation of opal glass for lighting fixtures. Here again there is variation. Some kinds of glass diffuse the light uniformly without enabling the filament to be seen. Others cause the filament to shine through, appearing a dull red, and cause a noticeable modification in the color of the light transmitted. The amount of light absorbed may therefore vary within wide limits, and it would be a help to decide on some standard form of glass which could be easily made and would have the best illuminating qualities.

Among other special types of glass we have the kind now being experimented with, which has the property of absorbing ultra-violet rays and transmitting unchecked the visible spectrum. It is suggested that glass of this kind would be of great utility for cases in museums, containing objects of priceless value. It is well known that the colors of such objects fade in course of time, and that this fading is apparently accentuated by exposure to daylight. The effect of daylight in this respect is ascribed mainly to the action of the ultra-violet constituent. Probably, therefore, by using panes of glass that obstruct these rays the fading of colors could be prevented to a great extent.

It was suggested that the whole question of glassware used in the lighting industry should receive the attention of a special committee to be formed of members of the Illuminating Engineering Society, working in conjunction with other bodies interested.

Transporting an 80-Ton Stator Nearly 2,000 Miles.

The development of the zinc-mining industry in the Joplin (Mo.) district since the European war began has been so intensified that demands for electrical energy for mining operations have become insistently increasing. The Empire District Electric Company, of Joplin, a subsidiary of the Cities Service Company, whose distribution system covers the entire Joplin district, recently was required to meet demands for energy seldom required of a central station. Generating equipment was absolutely necessary. A survey of the market revealed no possibility of obtaining a new unit, but a second-hand 10,000-kilowatt turbo-generator was purchased from the Brooklyn Edison Company. When first installed the machine was shipped from the factory in parts and assembled on the foundation. To save weeks of delay, it was decided to ship the unit in as few parts as possible and avoid complete dis-assembly.



Loading the Stator on a Special Flat Car.

The largest part, the stator, weighs 160,000 pounds, is 14 feet high, 13 feet long and 8 feet wide.

The problem was to find a car to safely transport this enormous mass of iron and copper. Cars were available that could carry either the bulk or weight involved, but none could fulfill requirements except one furnished by the Pennsylvania Lines. Due to the extreme height of the load it was necessary to map out a special routing to avoid bridge and tunnel clearances.

The shipment arrived in Joplin during the early part of May, having made a record run from St. Louis in 48 hours. The cause of this haste, according to the railroad officials, was that the yards were so congested there was no room for "baby elephants."

Tribute to the Memory of E. M. Barton.

A large portion of the June issue of the *Western Electric News* is devoted to the sketch of the career of the late E. M. Barton, one of the founders of the Western Electric Company and chairman of its Board of Directors at the time of his death. The text is illustrated with photographs showing Mr. Barton in his office and with numerous historical photographs showing employees of the Western Electric Company in 1878 and in 1881, etc. Tributes to the memory of Mr. Barton are contributed by H. B. Thayer, president of the company; H. A. Halligan, vice-president; W. P. Sidley, vice-president and general counsel; Gerard Swope, vice-president and general sales manager; A. L. Salt, vice-president and general purchasing agent; Charles E. Scribner, chief engineer, and F. R. Welles, a former vice-president. Others outside of the Western Electric Company who pay tribute to his memory are: Theodore N. Vail, president of the American Telephone & Telegraphy Company; U. N. Bethell, vice-president of the American Telephone & Telegraph Company; B. E. Sunny, president of the Chicago Telephone Company, and Thomas D. Lockwood, general patent attorney, American Telephone & Telegraph Company.

An interesting feature of the issue is a contribution by Mr. Barton written shortly before his death entitled "How I Hired Mr. Thayer."

National Advertisers Declare for Honest Advertising.

The Association of National Advertisers, representing the leading general advertisers of America, has taken a forward stand with regard to honest advertising in line with the inspirational movement now being conducted by the Associated Advertising Clubs of the World.

At the annual meeting of the Association of National Advertisers, held at Dayton, Ohio, on May 5, the following Declaration of Principles was unanimously adopted:

RESOLVED that we, members of the ASSOCIATION OF NATIONAL ADVERTISERS, are opposed to advertising of the following kinds:

All advertising that is fraudulent or questionable, whether financial, medical or any other; all advertising that is indecent, vulgar or suggestive either in theme or treatment; that is "blind" or ambiguous in wording and calculated to mislead; that makes false, unwarranted or exaggerated claims; that makes uncalled-for reflections on competitors or competitive goods; that makes misleading free offers; all advertising to laymen of products containing habit-forming or dangerous drugs; all advertising that makes remedial, relief or curative claims, either directly or by inference, that are not justified by the facts or common experience; and any other advertising that may cause money loss to the reader or injury in health or morals or loss of confidence in reputable advertising and honorable business.

RESOLVED that we recognize our own obligation as advertisers to conform to these principles.

RESOLVED that we urge upon all publishers and upon all sellers of advertising space or service, a strict adherence to these principles and that in so far as the exigencies of our individual business will permit, we direct our advertising to those mediums which make the observance of these principles their rule and practice.

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Miscellaneous NEWS NOTES

Patriotism Is Topic at Los Angeles Jovian Meeting.—Patriotism and preparedness were the keynotes of a luncheon given by the Jovian Electric League of Los Angeles, Cal., June 7. Judge P. J. McCormick gave an address on "Sparks at Random on the Subject of Patriotism."

Protest Electric Charters.—Protests have been made to the governor of Pennsylvania against the approval of the charters of the Lawrence Hydroelectric Company and the Conoquessing-Lawrence Light & Power Company, whose incorporation papers were approved by the Public Service Commission recently. After a series of hearings protest was made by the Pennsylvania Power Company.

New Officers for Chicago Section, A. I. E. E.—The nominating committee of the Chicago Section, A. I. E. E., has presented the following nominees for the year 1916 and 1917: Chairman, Taliaferro Milton; secretary, W. J. Crumpton; member executive committee, W. J. Norton. Election will be by letter ballot and the result will be announced at the annual convention of the A. I. E. E. at Cleveland, O., June 27-30.

Tri-State Association to Convene.—The sixth annual convention of the Tri-State Water and Light Association of the Carolinas and Georgia will be held at the Isle of Palms, June 21-23. The program includes a large number of speakers who will cover important matters relating to city light and water departments. J. G. Barnwell, city manager of Rockhill, S. C., will speak on "The City Manager and His Responsibilities." W. F. Stieglitz, of Columbia, S. C., is secretary and treasurer of the Association.

Kansas City Jovians Rejuvenate.—The Jovian League of Kansas City, Mo., held its third rejuvenation under the present administration on the steamer *Chester*. The initiation was held in the ballroom of the boat and was finished while the boat was in motion. Three hundred took the trip, including women and children, the latter drawing prizes given by the B-R Electric Company, Western Electric Company, Kansas City Light & Power Company, Funsten Electric Company, Westinghouse Electric & Manufacturing Company and General Electric Company. Fifteen candidates were initiated.

Merger of Rhode Island Central Stations Is Effected.—The Narragansett Electric Lighting Company, Providence, R. I., has bought a controlling interest in the Westerly (R. I.) Light & Power Company, which supplies light and power in a territory of about 200 square miles and serves a population of 30,000. The Narragansett company now controls all the electric lighting business in southern Rhode Island and in southeastern Connecticut. The Westerly company's gross income has increased from $106,931 in 1911 to more than $150,000 in 1915, and it paid, the latter year, 5 per cent on both common and preferred stock. The former majority owners of the property were Bodell & Company, who have controlled it since 1912. It is understood that the price paid was $95 per share.

Kentucky Passes Workmen's Compensation Law.—In common with other employers of five or more persons, the electrical companies of Kentucky, beginning with August 1, will operate under the terms of the workmen's compensation law enacted by the last session of the Legislature. The constitutionality of the law has been upheld in a decision just handed down by the Kentucky Court of Appeals, which passed on all except one section which relates to the matter of indemnities payable to non-resident aliens related to the persons assured. Later decisions in this instance will not affect the validity of the law as a whole. Rates and indemnities are prescribed, but no state fund is created and companies may insure with commercial or mutual concerns or carry their own insurance.

Northern Cedar Poles in Detroit.—The Detroit Edison Company reports that during the year 1915 over 5,000 Northern cedar poles were used by the company. This includes only the poles used in the Detroit district and not those used in the various other territories served by the company.

Holyoke to Have One-Cent Power Rate.—The municipal light department of the city of Holyoke, Mass., has reduced its power rate to large consumers to 1 cent per kilowatt-hour for 500 or more horsepower used over a 24-hour period, effective July 1. Other new rates, which eliminate inequalities, have been established. The percentage discount has been abolished, prices quoted now being net.

Massachusetts Companies Show Large Business Gains.—Among the Massachusetts electric-lighting companies which show a large gain in business during the past 10 months are the Leominster Electric Light & Power Company, which has made a net gain in horsepower connected of 338 per cent; the Spencer Gas Company, 306 per cent; the Clinton Gas Light Company, 254 per cent; and the Milford Electric Light & Power Company, 208 per cent.

Baltimore Section, N. E. L. A., Elects Officers.—At the annual meeting of the Baltimore Consolidated Section of the National Electric Light Association, held May 31, W. H. Cassell was elected chairman; Thomson King, vice-chairman; D. C. Bruce, secretary, and W. A. Zimmerman, treasurer. The meeting was addressed by H. A. Wagner, president of the National Electric Light Association and president of the Baltimore Consolidated Gas, Electric Light & Power Company, by C. M. Cohn, vice-president of the company, and others.

New Orleans Company Issues Monthly.—*Energy* is the name of a new monthly publication which has entered the field of central-station house organs. It is published by the employees of the New Orleans (La.) Railway & Light Company and undoubtedly will do much towards enhancing the spirit of co-operation and good fellowship which already exists among the employees. The May issue contains a rather complete account of the very successful electric show which was held in New Orleans April 24 to 28. W. E. Clements, commercial manager of the company, had much to do with the success of the affair.

Portland Employees March in Preparedness Parade.—About 600 employees of the Portland (Ore.) Railway, Light & Power Company, among them President Franklin Griffiths and other officials of the company, marched in the preparedness parade held in Portland recently. This number would have been greater had not more than 75 per cent of the employees been forced to remain on duty during the parade. The employees of the Portland company have been encouraged to identify themselves with military organizations, and this corporation was the first in Portland to openly endorse the preparedness movement.

New Jersey Company Gives Safety-First Lectures.—An interesting safety-first lecture and demonstration was given by A. J. Van Brunt, director of safety education of the Public Service Corporation, in Jersey City, N. J., May 31. The meeting was attended by the employees in the gas and electric commercial and operating departments. Mr. Van Brunt was assisted by J. Anderson, chief inspector of the Public Service Company, who demonstrated on first aids for persons receiving an electric shock or being overcome by gas. The Public Service Corporation maintains a safety educational department, and illustrated lectures are given twice each year. The lectures are always new and fitted as far as can be to the class of employees to which they are delivered. The Public Service Corporation has 800 feet of moving-picture film and some 500 lantern slides for use in its safety-first movement.

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Electricity in the Manufacture of Pianos

Description of the Processes Involved and Advantages of Central-Station Service in This Industry—Data Are Given on a Typical Installation Purchasing Power

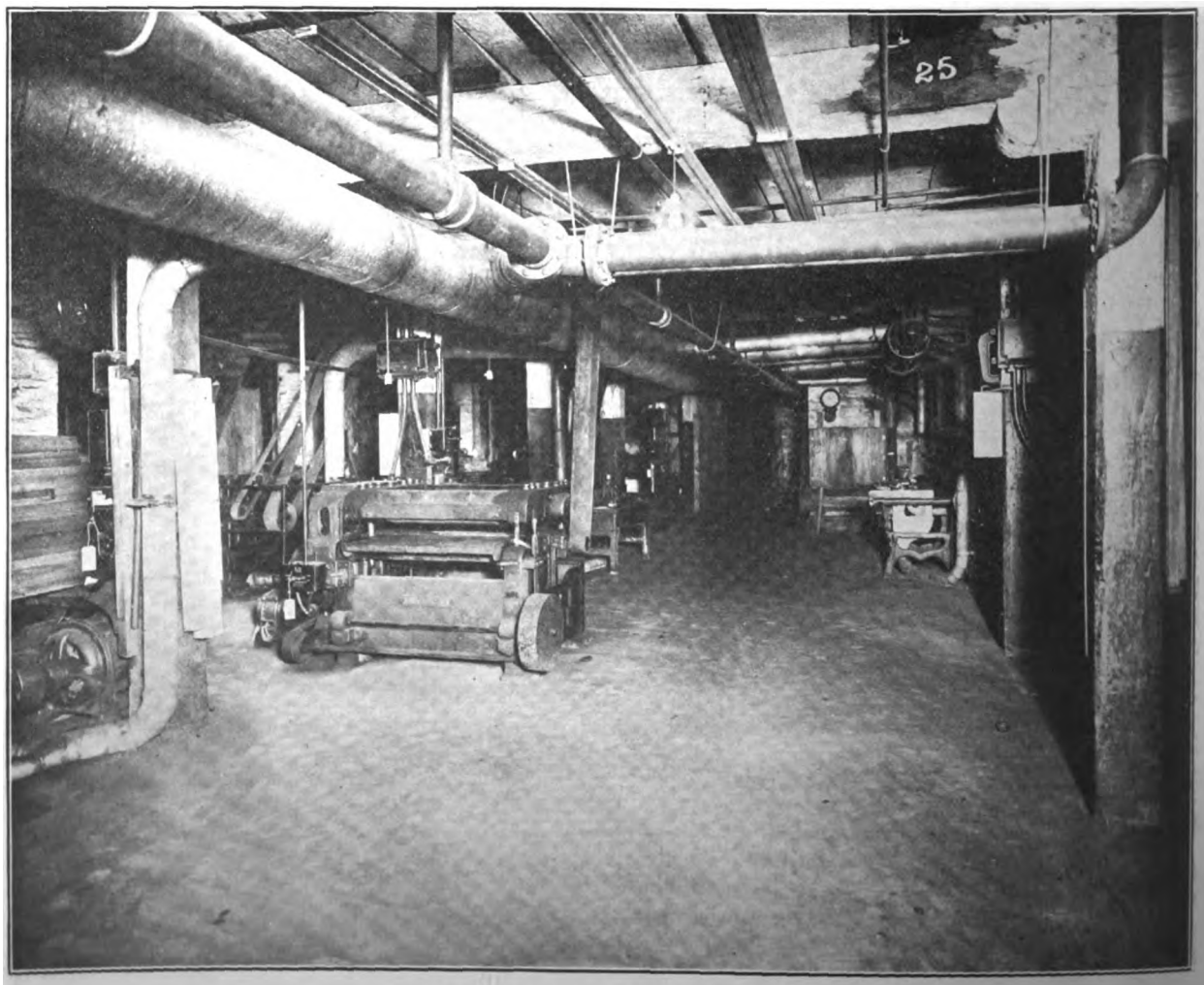
Industrial Power Series—Article No. 167.

PIANO manufacture, with the possible exception of some of the largest companies, is generally confined to making the cases, backs, a small amount of metal work, and assembling. In the general equipment of machinery, therefore, woodworking tools predominate. By nature of the class of work carried on, the use of any particular machine is more or less intermittent and for this reason individual drive is especially applicable, or if group drive is used the number of machines composing each group should be small. As woodworking machines are operated at practically constant speeds, squirrel-cage induction motors are particularly adapted to the work.

As a typical illustration of a piano-manufacturing plant, completely equipped with electric drive and using central-station service, a description of the Wegman Company's factory at Auburn, N. Y., is given in the following paragraphs. This company makes high-grade pianos, both upright and grand, and has a capacity of twelve instruments daily. The plant consists of a large three-story and basement building located along the lines of the New York Central Railroad, fully equipped with the latest machinery, driven both individually and in small groups. All motors are three-phase, 220-volt, 60-cycle, squirrel-cage machines. Service is furnished by the Empire Gas & Electric Company from its 2,200-volt, 60-cycle distribution system. It may be mentioned that the former Wegman plant was completely destroyed by fire a few years ago and the present buildings were formerly occupied by a company manufacturing traction engines. The entire machine equipment as well as the mechanical power equipment of the old company was removed, and although large quantities of steam for kilns and heating are required, necessitating a boiler plant, central-station service was decided upon as the most economical and satisfactory. All motor feeders are run in conduits and each motor is provided with a fuse box in addition to the starting compensator. Motors of five horsepower and under are started from switches.

Advantages of Central-Station Service.

It may be well to consider some of the advantages of electric drive and central-station service for this class of industries. Owing to the intermittent use of the machine, where electric drive with purchased power is used, power costs cease entirely as soon as a machine is stopped in the case of individual drive and where group drive is used only sufficient energy to overcome the friction of small line shafts is used. Certain machines can be grouped so that the average power demands of the group will be ap-



Motor-Driven Planers in Piano Factory.

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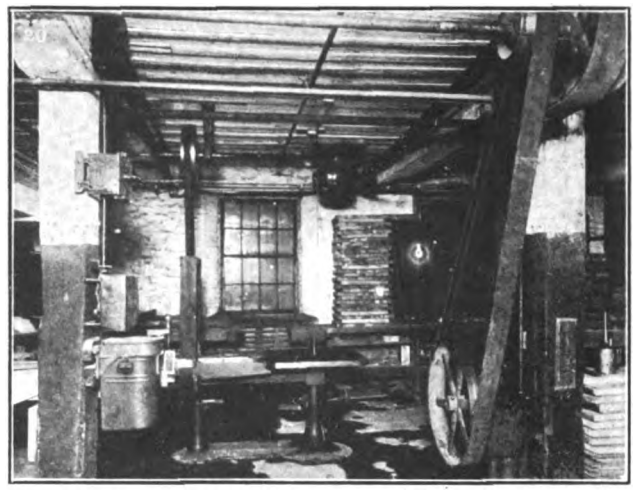
proximately uniform, and for small machines this drive will be found satisfactory, as the motor will carry a load approximately normal. Planers and large circular saws and some other woodworking machines have heavy and intermittent power demands, therefore the whipping of shafting and the slipping of long belts owing to this condition is eliminated by motor drive, uniform speed is obtained and each machine can be crowded to its maximum capacity thereby increasing production. The ease of control when electric drive is used insures that the machine will be shut down as soon as its work is done and there will be no continued friction loss from jack shafts, counter shafts and other devices necessary with mechanical transmission of power.

Although modern plants are provided with systems for removing wood refuse from the machines, there is considerable dust that will collect in the building, and where line shafts and heavy belts are used this is kept in circulation to a greater or less degree. Electric drive reduces upkeep expenses and materially adds to the life of a building as the strains and vibration from heavy shafts and large belts are decidedly deteriorating in their constant use. There can be a more economical disposition of floor area with electric drive and the machines can be placed in the most logical position for facilitating movement of the raw and finished material. Various departments can be worked overtime to pick up work that is dragging and the power consumption is confined to such departments as the power requirements of machines in other departments cease when shut down. Continuity of service is practically assured as the interruption of service of one machine or a small group does not interfere with the remaining machines.

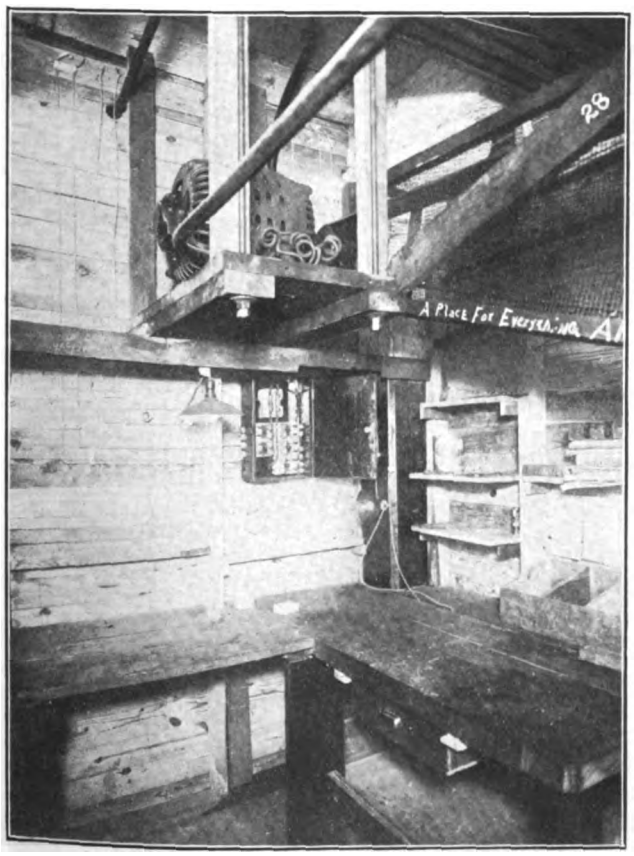
Special Applications.

In the Wegman plant there are a number of special machines which result in great economies. One in particular is a special planer for piano backs which planes the two upright edges simultaneously with a far greater degree of accuracy than can be insured with hand work. This machine has a capacity of 200 backs daily and requires three men to operate it. It requires the services of 25 men to perform the same work by hand. This planer is individually driven through a short jack shaft direct-connected to the motor shaft. The motor is rated at 10 horsepower and operates at 1,800 revolutions per minute.

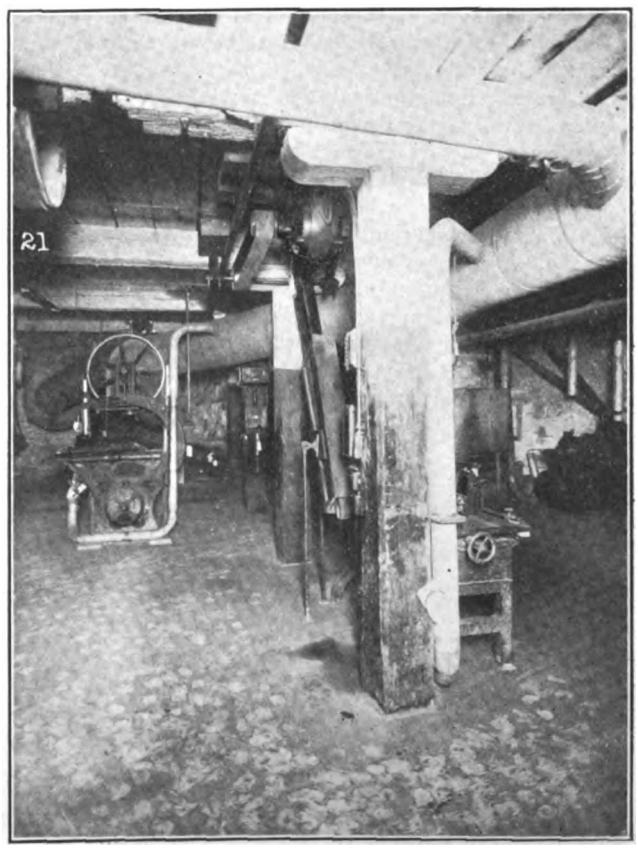


Motor-Driven Tenoning Machine.

Another machine that is a great labor saver is for polishing woodwork. Highly finished wood as used in all piano cases requires much rubbing, and the polishing machine has been introduced to eliminate part of the hand work. The work is clamped on a suitable table and mechanically operated pads rub the surface. This machine is driven by a five-horsepower motor, running at 1,800 revolutions per minute. Even the coarser dressing of the wood is machine work, done by various types of sand-



Bracket Suspension of Motor Driving Woodworking Machinery in Piano Factory.



Band Saw With Direct-Connected Motor—Motor-Driven Planer in Foreground.

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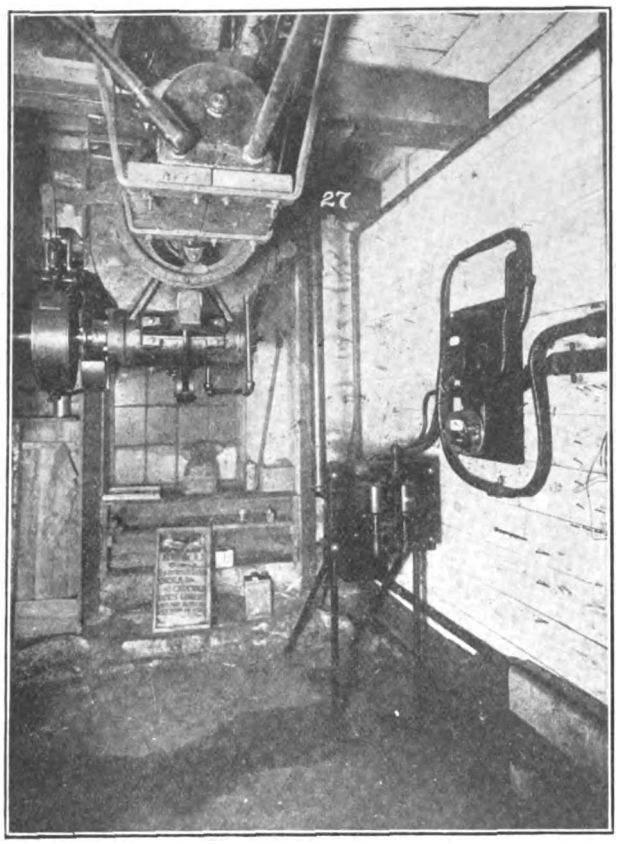

Motor Driving Elevator Mechanism.

paper machines. One type consists of an adjustable table with a sand-paper belt running over suitable pulleys. The belt runs above and beneath the table and the upper side is pressed against the wood to be smoothed by a block in the hands of an operator. This machine together with a wood-boring machine is driven by a 7.5-horsepower 1,606-revolutions-per-minute motor through a line shaft.

All machines are relieved of refuse by a system of piping connected to an exhaust fan which is driven by a 12-horsepower motor, running at 1,200 revolutions per minute. Another feature is the drive of two circular saws with the tables placed side by side. The motor is placed on the floor at the rear of the machines and is direct-connected to a short jack shaft which is in turn belted to the two saws. This combination is driven by a 7.5-horsepower, 1,606-revolutions-per-minute motor. For cutting up heavy lumber there is an automatic-feed rip saw and a cross-cut saw on a swinging arm. These machines are driven by a 20-horsepower motor operating at 1,200 revolutions per minute. There are many other motor applications, both individual and group, which are enumerated below:

No.	Horse-power.	Speed R.P.M.	Kind of Drive.	Application.
1	10	1800	Belt	Special planer for piano backs.
1	7.5	1606	Group	Sand-paper machine, boring machine.
1	5	1800	Group	Band saw, boring machine.
1	10	1800	Group	Three sand-paper machines.
1	15	1200	Belt	Sturtevant exhaust fan for removal of wood refuse.
1	5	1200	Direct	Band saw.
1	5	1800	Belt	Scroll saw.
1	10	1800	Belt	Surface planer.
1	25	1200	Belt	Automatic feed sand-paper machine.
1	5	1800	Gears	Planer.
1	7.5	1606	Group	Two circular saws.
1	5	1800	Belt	Surface planer.
1	7.5	1606	Belt	Joiner.
1	2	1200	Belt	Boring machine.
1	5	1800	Belt	Rip saw.
1	25	1200	Belt	Planer.
1	25	1200	Group	Wood lathe, special wood lathe, planer.
1	20	1200	Group	Automatic-feed rip saw, cross-cut saw.
1	5	1800	Belt	Boring machine.
1	5	1800	Group	Three emery wheels, drill press.
1	5	1800	Group	Glue machine, radial drill.
1	15	1200	Group	Joiner, circular saw, pump.
1	5	1800	Group	Band saw, saw sharpener.
1	2	1800	Belt	Drill.
1	5	1800	Belt	Fan for heating system.
1	5	1800	Belt	Wood-polishing machine.

Composite Balance Sheets of Massachusetts Companies.

Electric lighting companies in Massachusetts gained in the aggregate almost a million dollars in gross income in the year ended June 30, 1915, as compared with the year before. Income from commercial lighting increased about $620,000, from power $200,000, and from rent of motors and fixtures almost $100,000. The latter has come to be a considerable source of revenue to Massachusetts central stations, amounting in the case of motor rentals to about $60,000, and for rental of fixtures $93,000. The renting of motor equipment to factories and shops was taken up by electric companies in the central part of the state about two years ago.

The general change in central-station practice from selling electric lighting by contract to the metering of energy used for that purpose is reflected in the returns, which show that in 1914 contract sales yielded $4,781,000, while in 1915 the income from that source was only $159,000. On the other hand, meter sales rose from about $4,700,000 to $9,942,000. Income from public lighting was about the same as in the preceding year, but electricity sold to other companies yielded about $30,000 less.

On the other side of the balance sheet, the largest items of expense increase were in the wages of station employees and of those caring for lights. These two items showed an increase of about $85,000, or 7.5 per cent. Repairs and renewals of lines and conduits jumped from $806,000 to $896,000, but repairs and renewals of meters and transformers showed a decrease, from $240,000 to $131,000. General salaries advanced from $824,000 to nearly $891,000, but salaries of officers increased only $9,000 in all.

Interest charges decreased $50,000 and dividends increased more than $500,000. Expenditure for coal was practically the same in the two years—almost an even $2,000,000.

Flood Lighting an Entire City.

The officials of Seal Beach, Cal., have devised the novel idea of partially illuminating their city from the outer edge of the long pier, which extends outward into the ocean from the central portion of this attractive place of amusement. This is without doubt the most unique illuminating installation of its kind ever undertaken by any municipality in the western part of this country. At the end of this long pier there is a battery of electric searchlights, which are so arranged that at night they illuminate the entire water front of the city. They may also be revolved so that their light may be thrown for miles up and down the beach. The light from these searchlights may be seen for a great distance along the coast, as well as for miles inland and out to sea. In this battery there are 41 searchlights, each being of more than 25,000 candlepower.

Installation of Flood-Lighting Units for Lighting Town in California.

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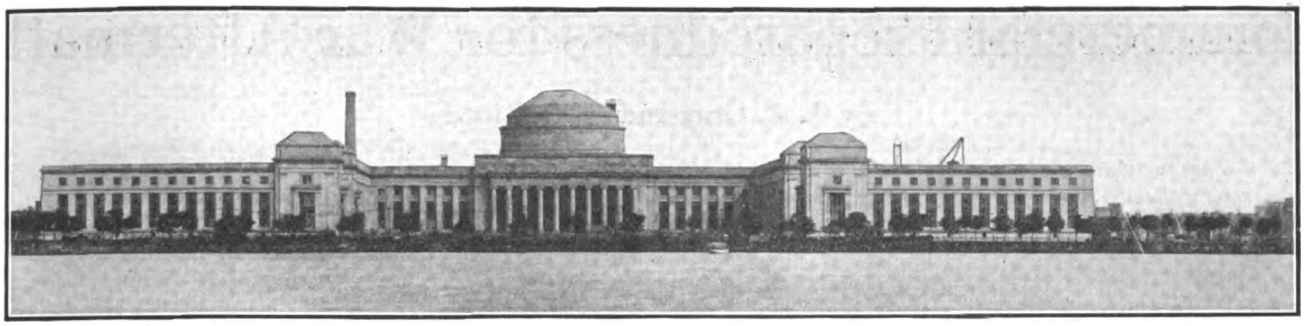


Dedication of New Massachusetts Institute Buildings

THE dedication of the new buildings of the Massachusetts Institute of Technology, at Cambridge, Mass., which occurred June 12 to 14, was an event of importance in the scientific and technical world. From the time of its founding, in 1861, M. I. T. has been notable for the superior quality of its instruction and for the large number of able and well-trained men who have graduated from the institution. From small beginnings it has grown to almost 2,000 students, of whom 345 during the past year were engaged in studies pertaining to electricity.

No educational group in the country is perhaps comparable with the new technology plant, on the Charles River basin. The very extent of the structure along the water side is impressive. A great central court opens on the river, rising in broad terraces of steps. Beyond this is the colonnaded portico of the library, surmounted by a Roman dome of substantial and imposing aspect, about 200 feet high.

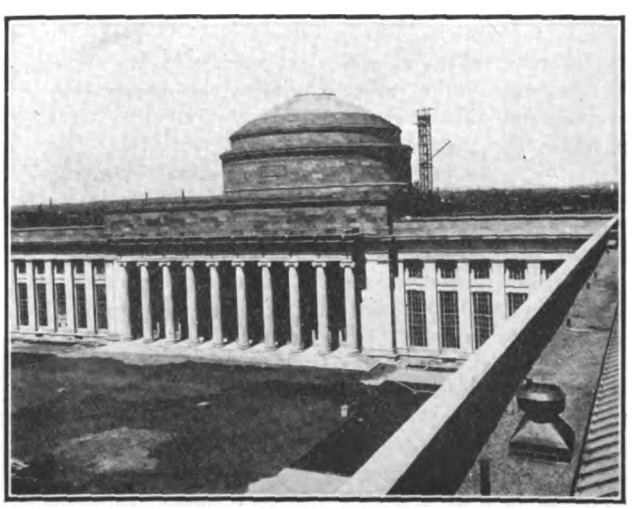
The buildings nearest the river are of three stories, with pilasters running to the top of the second story. The structures behind are of four stories. All are of classic design.

The front court, and other courts immediately back of the front row of buildings, are flanked by department buildings, which are linked together so as to afford circulation from one end to the other of the vast group. The buildings are comparatively narrow and receive light from both sides.

Half of the area of land, about 2,250,000 square feet in all, is devoted to the educational plant; the other half will be given to an undergraduate clubhouse, gymnasium, dormitories and commons—social features the Institute has lacked hitherto.

Dedication Events.

There were practically five distinct programs, for invited delegates and guests, alumni, 1916 seniors, undergraduates, and women, the latter alumnae and families of delegates and alumni. The great spectacular feature was a masque and pageant in the great court, Tuesday evening. From a flotilla arriving at the embankment debarked the faculty and guests, bearing the archives of the Institute. In the center of the court was a great ring illuminated with spotlights, while electric searchlights flooded the whole arena, producing extraordinary effects. The drama produced dipicted the rise of man from chaos to conquest of all nature. The finale represented the old Technology greeting its successor and was a fitting climax.



New Library Building.

Other features of the celebration, which also marked the semi-centennial of the first graduating class, were: A formal farewell to the old buildings; fraternity luncheon; the laying of the corner stone of Walker Memorial; marine, aquatic aerial and submarine events at the Basin; inspection of the new plant; graduation of the class of 1916; a banquet at which the pan-continental telephone was demonstrated and parades, teas, luncheons and reunions.

Lighting Arrangements.

Eighty-two projectors and two high-powered navy searchlights were used in the illumination of the Masque and Pageant on June 13. On either of the roofs of the buildings flanking the Great Court in which the drama was given were 34 1,000-watt stereopticon lights spaced at three feet three-inch intervals and located 55 feet above the courtyard level. All were equipped with color screens except four lamps on either side, 12 being blue, 9 green and 9 red. The screens were all pure colors, of the Pevear type, and enabled any color ranging from white to be obtainable in combination. Six 500-watt projectors were located in the third floor windows of the building at the head of the court, and the two searchlights were on the roof, trained on ships in the Basin.

Under the floor of the central ring, which served as a stage, were four 1,000-watt units, each located in a pit with glass cover at floor level, and there were also four 250-watt units, similarly located, to illuminate streams of water projected over them, to produce effects in water dances.

All the illumination was controlled by telephone from an operating booth at the back of the east grandstand. At each station a man received and passed on the pageant director's orders to the men in charge of the dimmers.

The projectors were of Crouse-Hinds, Sun-Ray and Kleigh manufacture, and the searchlights, which were of the Carlisle-Finsch type and of about 60 amperes capacity, were borrowed from the United States Navy. J. H. Anderton, of the Stone & Webster Engineering Corporation, had general charge of the installation and operation of the lighting.

President R. C. Maclaurin, of the Massachusetts Institute of Technology, has the distinction of having financed the construction of the new plant. He secured gifts of about $9,000,000, and at the same time carried forward the regular work of the institution without interruption.

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Commercial Preparedness for War Aftermath

By A. A. Gray and M. G. Lloyd

The possibilities of electrical trade in Russia by American manufacturers and exporters are extensive, as Russia supplies but a small part of her own wants and previous electrical imports have been largely from Germany. Preparations should be made now for prosecuting this business promptly after the cessation of hostilities, when the pressure of orders and difficulties of foreign shipments will have been relieved.

THE United States is at present experiencing one of the most active periods of its industry and commerce in its history. A considerable volume of the present business is directly traceable to the European war and the termination of this war will undoubtedly introduce another period of radical readjustment. Wise executives will not wait until that time arrives to make their plans for prosecuting business under the new conditions. Preparations for the future should be made in the present, and commercial preparedness is quite as essential to the well-being and prosperity of a business corporation as is preparedness for defensive purposes to the well-being of the nation. Business preparedness involves looking ahead to determine where business operations will be carried on, and then perfecting the machinery to carry out these operations without delay or confusion when the time arrives.

In this country hundreds of thousands of men who, only a year or slightly more ago, were working for a stipend of from $2 to $3.50 per day, are now literally rolling in wealth from their point of view. Ordinary wages for thousands of men have increased in many cases 200 to 300 per cent. These workmen are by all accounts living up to the limit of their income, indulging in many luxuries heretofore unattainable. The problem of the future is not so much a question of maintaining the wage scale at its present basis as it is of fending off conditions that will bring about a wage scale lower than labor has received in many years in this country.

If conditions such as these are allowed to come about it will mean a more unhappy revolution in the relation of capital and labor than this country has ever been subjected to before.

How is the possibility of such an industrial cataclysm to be avoided? No one has appeared upon the political horizon nor has a student of economics made an appearance, in possession of an acceptable and logical answer. The solution of the problem is difficult, indeed, because even though we stretch prescience to the limit, we have no guide marks of past experience paralleling present conditions to lead us to a reasonable postulate from which to project our expectations of an answer.

The danger is not in the impossibility of arriving at a solution; the grave concern is in lulling ourselves into a sense of security and remaining indifferent to the necessity for an immediate study of the portents of the future and a courageous impulse to overcome the difficulties no matter how momentous and insuperable the distant view appears.

It is of prime necessity that associations of manufacturers, publishers of daily newspapers, magazines and trade and technical publications particularly, give earnest study to the methods which must be incorporated into business and domestic activities in view of the best possible estimate of conditions the future will bring forth.

Manufacturers in the United States in many lines are at present enjoying a period of unprecedented activity and a corresponding profitable employment of their facilities. Prices of manufactured goods are high because those who are buying want things badly and there is no parsimony today in barter and exchange when the fate of a nation may hang upon its ability to secure equipment quickly.

For a considerable period after the end of the war this country will undoubtedly be called upon for a great amount of manufactured commodities which will go into the rehabilitation of the countries now at war.

So far as foreign business with European countries is concerned, it is to Russia, that great unconquered field of industrial opportunity, that the manufacturers of the United States must turn their business eyes. Of all the countries in Europe it is undoubtedly a fact that we are better regarded in Russia than in any other.

The object of this article is to point out the opportunities which exist for disposal of electrical merchandise in Russia. That country represents an extensive market for the disposal of electrical goods, both in the present and in the future. There is at the present time a very active demand in Russia for electrical machinery and equipment of all kinds. At the present, however, the majority of American manufacturers do not need to go to so far afield for orders and the obstacles to carrying on trade with Europe are serious. The unwarranted interference by England and Germany with the commerce of neutrals, not only with belligerent nations, but with each other, and their disregard of the rights of neutral commerce as established by treaties and international law, have made our commerce in that quarter of the globe hazardous and unsatisfactory. Ocean freight rates are abnormally high and the rate of foreign exchange also militates against exports. Communication with foreign correspondents is also carried on at a disadvantage, as mails are interfered with and there is no assurance of delivery of cablegrams. It might be mentioned here that it is advisable to send mail matter to European countries during the war by registered post, as the chance for delivery is thereby increased, and if not delivered, matter can be more easily traced.

Trade after the war, therefore, presents many more attractions than orders for immediate delivery, but the opportunities for the latter are also large and offer unusual profits to the manufacturer or exporter who is in a position to prosecute this business.

In addition to the preparations which may be undertaken at home, there will be a number of details which have to be attended to in the foreign market. Among these may be mentioned the securing of agents or representatives in the foreign countries, the arrangement of credits, the preparation of advertising, the investigation of the requirements of the market and the arrangement of shipping facilities. Reference to these in greater detail will be found below.

Russian Electrical Trade.

The consumption of electrical products in Russia has shown a remarkable increase during the last ten years. The total volume of electrical imports to that country in 1906 was $2,850,000. By 1913 this had increased to $13,000,000. Of the latter over $8,000,000 is credited to Germany. It would thus appear that the latter country has been supplying Russia with about twice as much of her electrical material and equipment as all other countries put together. This conclusion, however, is not entirely reliable, since products from Switzerland and France and other European countries which reach Russia by way of

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Germany or by shipment from a German port are credited in the statistics to Germany. It is nevertheless true that that country has been the main source of supply for the Russian consumption of electrical machinery and materials.

Of 1,802 chief towns in Russia, there were in 1911 only 74 which were electrically lighted; by 1915 this number had risen to 225. The proportion is thus still at a low figure, although recent growth has been large and the prospect of even more rapid extension of such facilities after the completion of the war may be confidently anticipated. Certainly the demand for such conveniences among the common people will be enormously greater as a result of the war. Many young men have been taken away from their homes for the first time and through contact with other communities will have learned greater possibilities of ministering to their wants and their comfort than were ever realized before. They will have had their ambitions awakened and their desires quickened. The elimination of vodka from the daily ration has enormously increased the consuming capacity of the Russian for merchandise of all kinds and it has left him with a clearer head to increase his own earning power and to take an interest in those things which will make his life fuller and more in keeping with modern developments in other countries.

The effect of the war on millions of the peasantry can hardly be imagined. Hundreds of thousands of young men, through their excursions into foreign places with the Russian army are becoming familiar with accommodations they never knew of before. Better clothed, better fed as soldiers and as refugees, they are receiving an inspiration which is firing them with a desire for more and better things.

There will be a demand in Russia after the war for merchandise of all kinds in greater quantities than was ever known before, and electrical development will experience an impulse in its proper proportion.

Railway electrification has been seriously considered by the Russian Government and it will not be surprising at any time to see large developments in this field taking place in that country.

All of Russia's needs, however, are not to be met by foreign imports. The telephone system of the country is conducted by the Government and all equipment for this purpose is obtained from domestic manufacturers. Foreign trade in this particular line would consequently be limited to providing local systems. Factories for the manufacture of certain other electrical equipment already exist in Russia, but their capacity is far from being sufficient to meet the requirements of the local demand. The copper production of Russia has been steadily increasing and will probably soon be sufficient to supply domestic requirements. Whether factories will be established to supply the requirements for insulated wire and similar products remains to be seen. There will undoubtedly be a large field of opportunity for the investment of American capital in manufacturing plants of all kinds for supplying local needs; at the same time the equipment of such plants would make a market for considerable quantities of machinery. There is already a demand for machinery which is not being met along such lines as mining, textiles and steel manufacture. The depletion of stock during the war and the actual destruction in the war zone have made requirements for replenishment which will undoubtedly be large.

To the manufacturer in the United States, loaded to the guards with orders, going into near delirium from the pounding of impatient customers in one direction and simulating madness in his reproaches to the fiends in the form of producers who are holding up his raw material and to the railroads, short of cars and making impossible the deliveries of what he has available, the prospect of foreign trade does not seem so interesting. The market is so far away; what do we know about Russia anyhow? What do the people in Russia know about the things we make? Their principal consumption is in fur-topped, tremendous boots, toe-length overcoats, leather belts, steeple hats, dog whips and chains to lead excursions into Siberia!

Who Will Get the Trade?

As pointed out above, Russian trade in the past, especially in the line of electrical manufacture, has been largely with Germany. This has been due partly to geographical contiguity, to German banking facilities in Russia, to German commercial enterprise, a favorable commercial treaty, and familiarity with the requirements of the market. To successfully take the place of German traders, Americans must be willing to put forth the same effort. Of course, after the war, German influence will be at a minimum and the feeling against that country will make it hard for German firms to re-establish their trade. Russian orders will by preference go in another direction. Strong efforts will be made by English manufacturers to secure this trade. In spite of the fact that they are allies with Russia in the present war, the feeling toward them in that country is not entirely favorable. For years England was one of the traditional enemies of Russia and that feeling has not been entirely dissipated. On the other hand, the United States is the traditional friend of Russia and our relations with that country have always been upon an amicable basis. Other things being equal then, American products are likely to be in favor. In order to secure and maintain the trade, however, American manufacturers cannot sit in their offices and wait for orders to come to them, but must make an effort to get in touch with the market. They must be properly represented abroad, they must supply articles that meet the needs of buyers, and must be prepared to do business on terms which are satisfactory to the purchasers.

The fears expressed in many quarters that European manufacturers will be in a position to undersell their American competitors are likely to prove unfounded. Prices paid for goods of such origin in former times have not been conspicuous for their low values. After the war, manufacturing in the belligerent countries will be carried on at a disadvantage. The high rate of mortality during the war will have depleted the ranks of workmen, and the experience following previous wars has shown that this contraction in the supply of labor results in a higher wage and consequently increased manufacturing costs. The demand for reconstruction work in the belligerent countries will be large, and will absorb a large amount of the available labor. Taxes will necessarily be high in order to carry the burden of the enormous war debts which are now being contracted, and there is no reason to believe, in the light of history, that the present governments of the European countries will have sufficient acumen to place these taxes anywhere else than upon industry and business. The American manufacturer will consequently be subjected to less severe competition than in normal times.

Perhaps this conclusion might be altered should the wide employment of women in factories, which has taken place during the war, continue after its conclusion. A change of this nature is more likely to take place in England than in Germany, but it is not likely that such a suicidal policy will be carried out even in the former country. Industrial conditions during the past generation have been so bad in England as to seriously lower the standard of average health and physical development among English men. Subjecting women to similar conditions would result in an even more serious deterioration of the race, and it is not likely that such a condition would be looked upon with favor, even for the purpose

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of maintaining British commercial supremacy. Moreover, British commercial policy in the past has not included catering to the idiosyncracies of the local demands in foreign countries. The English have usually been content to offer their product to the foreign purchaser and let him take it as it is or leave it. In some markets this has been a serious handicap, and German traders have been quick to take advantage of it, but in Russia this attitude will not be of so much importance because the trade in electrical lines will be largely satisfied with foreign stock designs. This condition will also make it easier for the American manufacturer to supply satisfactory material.

Credit for periods of four to six months has been a common basis for doing business in Russia and although, at the present time, cash upon delivery or against manifest of shipments is more often available, firms going actively after Russian business should be prepared to arrange terms of credit. This does not necessarily mean that the manufacturer or exporter must carry this burden, but credit facilities should preferably be arranged through the banks. The establishment by the International Banking Corporation, which is now controlled by the National City Bank of New York, of a branch at Petrograd, will help to solve this problem for American trade.

The securing of proper representatives in Russia is a serious matter. The practice of establishing exclusive sole agencies is one of very questionable desirability. In many cases this practice has proved a detriment to the manufacturer. The efforts of such agencies in many cases are confined to peddling of the agency as a whole at a profit, or to dividing the territory up among a number of subagents. Local representatives in direct touch with the manufacturer or exporter are usually preferable. Great care should be exercised in securing these representatives and in extending credit to them. Credit extensions to large factories or established corporations are usually safe, whereas individual traders are more frequently open to suspicion.

A number of commercial associations are in existence which should facilitate the establishment of foreign connections. One of these is the Russian-American Chamber of Commerce, with headquarters at Moscow. Other societies have recently been founded for the economic development and extension of foreign trade of Russia. The Russian Trade and Industrial Union and the Moscow Merchants' Society are prepared to supply information and negotiate sales. The former contemplates establishing trade and industrial museums throughout the country with exhibits of samples.

Advertising in Russia has not reached the state of development with which we are familiar in this country. The methods employed are more simple and in fact even crude. Modern methods might prove quite effective if carried on in a way that would not be offensive to native taste. Advertising campaigns started at once would probably result in beneficial returns later on. Trade periodicals are few in Russia and the field could be covered without great efforts. A favorable rate of exchange at the present time would reduce the cost quite appreciably below the normal rates. Catalogs in the Russian language would, of course, be of great assistance, but are not absolutely essential, as most large business houses can carry on negotiations in English. Ordinary English units of measurements are generally satisfactory in engineering lines, although not in use by the common people, among whom the metric system is well established.

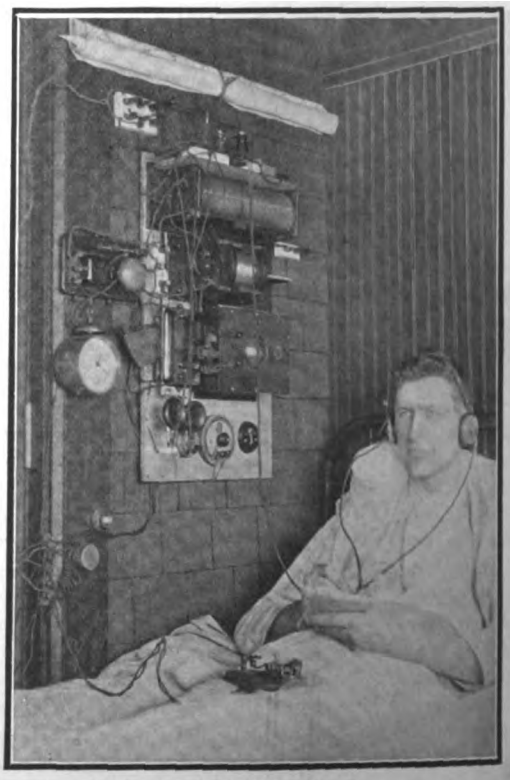
There is a vast opportunity for the investment of American capital in Russia at the present time, as vast natural resources are awaiting development. Connections established in this manner would, of course, open great opportunities for American trade in furnishing equipment for factories, machinery for power houses, etc. Foreign capital is welcomed for such purposes, and the enterprise of the Germans in this respect was an important element in their domination of trade. The war has resulted in the withdrawal of a considerable part of this capital and other sources must be looked to in the future. The American opportunity is consequently opened in every direction. American capital may find profitable investment, American products will meet a waiting market and American men will find many opportunities for the application of their ability, brains and experience.

Pittsburgh Patient and Student Keeps in Touch with World by Wireless.

By means of wireless telegraphy a patient in the Tuberculosis League Hospital, Pittsburgh, Pa., is able to cultivate acquaintances over all the country. Although confined to a couch on a sleeping porch for several months he did not feel that he was isolated from his fellowmen and time passed quickly and pleasantly.

Paul F. Shuey, a university graduate, was engaged at work on a fellowship at the Mellon Institute for Scientific Research when his health began to fail. He went to the hospital, but could not endure idleness. While in bed he continued his electrical studies and rigged up a wireless outfit. The apparatus was placed on the wall at his bedside and the aerial was spread from a mast on the roof of the hospital building. The outfit was installed primarily to get the correct time from the United States Observatory at Washington, but the keen enjoyment of talking to new-found friends and of picking up messages that floated through the air was not to be resisted and Mr. Shuey improved his outfit.

Radiograms from all parts of the country now cheer the patients at the hospital. The station at Sayville, L. I., which receives the German war bulletins, is heard constantly, and the baseball scores are received regularly during the season from the Arlington station. Mr. Shuey has become known to all the amateur wireless men within a radius of 100 miles of Pittsburgh.



Sending Wireless Messages From Bed.
[Photo from Pittsburgh Industrial Development Commission.]

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COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Electric Cooking Activity in Seattle.

The Puget Sound Traction, Light & Power Company, of Seattle, Wash., is actively engaged in promoting the use of electric cooking and reports very satisfactory returns. H. J. Gille, sales manager of the company, advises that range sales for the first four months of 1916 are about double those for the corresponding period last year, and sales are increasing from month to month.

The company employs eight men who devote their entire time to selling electric ranges, in co-operation with local dealers. These salesmen call only on selected prospects among the utility's light and power customers. Prices for the electric ranges include the cost of wiring, the latter being turned over to local electrical contractors. Liberal terms are offered to all who desire them.

The company maintains two range display rooms and a model kitchen in which advertised demonstrations are held twice a week. The company is also contributing to the support of an electric-cooking school and free public lectures on electric cooking. Electric-cooking demonstrations are also conducted at various fairs and public gatherings under the auspices of the Puget Sound company. The company employs a demonstrator who gives free instructions to every range purchaser.

Aside from the personal solicitation of the salesmen, the greatest results have been obtained from newspaper advertising which is confined to two daily papers and several country weeklies. Personal letters are also sent to prospective range buyers and electric-range booklets are distributed from display rooms and periodically mailed to prospectives.

Improving Central-Station Clerical Service by a Visible-Signal System.

One of the annoying problems of a large central station appears to have been solved in a unique and very successful manner by the Cleveland Electric Illuminating Company, Cleveland, Ohio. We refer to the "waiting-for-duplicate-bills" problem—which may be taken to include not only duplicate bills, but deposit receipts, meter readings and any other information contained in the accounting department and wanted for the immediate use of a waiting customer.

Here is the way it used to happen: Scores of people every day, mostly during the noon hour, would come into the company's main office to pay their electric light bills, but without bringing their bills with them. This, of course, necessitated (and still necessitates) the making out of a duplicate bill. The customer would be told to wait until his bill was ready—generally from five to fifteen minutes. Upon arrival of the duplicate bill, sent down from the billing department via pneumatic tube, the desk clerk would lustily call out the customer's name, and the latter would then take the bill to the cashier and pay it. Often, however, however, hitches occurred in the service; the desk men, engrossed in some matter or other, would not call out a customer's name until he or she had waited so long as to become disgusted, and leave; there was no means of telling instantly how many customers were waiting at any one time.

Referring to the illustrations, here is the way it now works out: Mary Smith, consumer, who requires a duplicate bill, is told to take No. 6, let us say, and watch

Desk Set for Communicating with Bookkeepers in Billing Department.

Annunciator Board for Notifying Customers That Duplicate Bill Is Ready.

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the numbered signal board, bearing numbers from 1 to 16, until her number flashes up. The desk man throws over key No. 6 on his desk set, causing small, white signal lamp No. 6 to light, not only on his set but on the two duplicate sets used by other clerks in the same large room. At the same time a white signal lamp No. 6 lights upstairs in the billing department. When the billing clerk receives, through pneumatic tube, slip bearing No. 6 and the customer's name, he makes out duplicate bill, sends it down, and presses his own switch No. 6, causing 6 to light upon the large board downstairs, and also lighting a red lamp on each of the three duplicate clerks' sets. The customer sees 6 light on the large board, and claims her bill. The clerk delivers it, and throws his key No. 6 to neutral position, clearing the number from the board. The whole transaction is quiet, visible and as speedy as could be desired. The system was designed by engineers of the Illuminating Company, under the supervision of J. T. Kermode, manager of the company's service department.

Electric Water Heater in Boys' Dormitory Solves a Problem.

An interesting application of an electrical water heater is in a Dormitory of Mill Brook School, Concord, Mass. The students' rooms are located on the second floor of a recitation building and gymnasium, in which the heating facilities are required only a part of the time—in the cold season. To provide for a supply of hot water for the pupils' use in their rooms and in the bath rooms, a Simplex water heater was installed, with a 30-gallon tank in connection, in the basement of the building. The switch on the circuit connected with the heater is in the hallway, on the floor where the students' rooms are heated. In order to procure hot water in the morning, or at any other time, the teacher in charge turns on the current and in five to eight minutes sufficient hot water is available for all the 6 or 8 pupils to wash or to take baths.

The element of safety is a very valuable feature. Much of the time the building is entirely vacant and fire left burning would be a source of danger. The heater can be left connected without danger to the property or the equipment; but it can be shut off by the snapping of the switch, which is located in view beside the head of the stairway.

Louisville Company Offers Its Office To Churches for Bazaars and Fairs.

A thousand or more Louisville ministers, charity organization officials, heads of hospitals, benevolent clubs, etc., have received a circular letter from the Louisville Gas & Electric Company, which, whether or not it results in the recipients taking advantage of the offer, is certainly going to add to the good will the town holds for the company. The letter was an invitation to persons addressed to make use of the offices of the company on Chestnut Street, near Fourth Street, for bazaars, candy sales, etc., and read as follows:

At frequent intervals churches and religious societies have bazaars, candy sales and other affairs of this kind, and it is usually difficut to secure a suitable store room or hall in which to hold them. In addition there is always the annoyance of having installed a gas stove, suitable electrical appliances, having the gas and electric services connected, the cleaning and arranging of the place, etc.

Mr. Donald McDonald, General Manager of our Company, has instructed me to extend an invitation to all churches and religious and charitable organizations to conduct such affairs in our office at 311 West Chestnut Street, which is centrally located and excellently arranged for such purposes. We only require about one half of the floor space, and therefore the entire east portion of the room on the ground floor will be at your disposal.

Sufficient notice should be given to avoid conflict of dates and to allow us to suitably rearrange the place.

We will have installed a gas range or any gas or electric appliance desired and put one of our porters at your disposal without any charge whatever.

As many of our customers remit to us by mail, they seldom come to our office. Therefore we will be glad of the opportunity to become better acquainted with them. If you will extend this invitation to the organization you are associated with, I assure you it will be greatly appreciated.

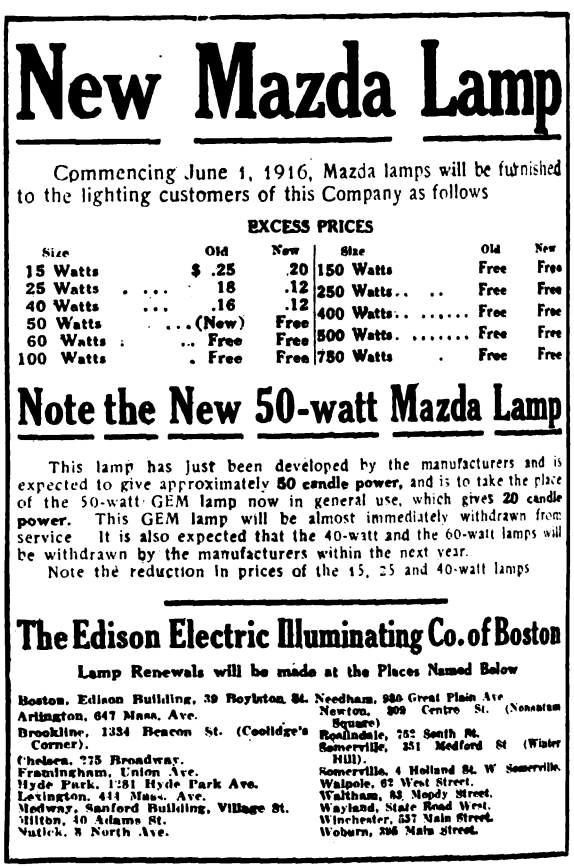
This is, of course, the dull season for bazaars, cake or candy sales, etc., but the company is receiving acknowledgments in numbers from those who received the letter. The space available is greater, perhaps, than that provided in the average store room, and, though occupied by desks and occasional exhibitions, it can be readily cleared for such uses as considered in this connection.

Large Contract for Power in Minneapolis Flour Mills.

The Minneapolis division of the Northern States Power Company has signed a contract with the Washburn-Crosby Milling Company calling for the delivery of 4,600 horsepower of electrical energy to the Minneapolis flour mills. The contract is for a period of 15 years and largely increases the quantity of electrical power heretofore supplied the mills by the power company.

Boston Edison Company Furnishes New 50-Watt Mazda Lamps.

The Edison Electric Illuminating Company of Boston on June 1 began to furnish its lighting customers with the new 50-watt Mazda lamp which has recently been developed and gives about 50 candlepower. This lamp will



New Mazda Lamp

Commencing June 1, 1916, Mazda lamps will be furnished to the lighting customers of this Company as follows

EXCESS PRICES

Size	Old	New	Size	Old	New
15 Watts	$ .25	.20	150 Watts	Free	Free
25 Watts	18	.12	250 Watts	Free	Free
40 Watts	.16	.12	400 Watts	Free	Free
50 Watts	(New)	Free	500 Watts	Free	Free
60 Watts	Free	Free	750 Watts	Free	Free
100 Watts	Free	Free			

Note the New 50-watt Mazda Lamp

This lamp has just been developed by the manufacturers and is expected to give approximately **50 candle power**, and is to take the place of the 50-watt GEM lamp now in general use, which gives **20 candle power**. This GEM lamp will be almost immediately withdrawn from service It is also expected that the 40-watt and the 60-watt lamps will be withdrawn by the manufacturers within the next year.

Note the reduction in prices of the 15, 25 and 40-watt lamps

The Edison Electric Illuminating Co. of Boston

Lamp Renewals will be made at the Places Named Below

Boston, Edison Building, 39 Boylston St.
Arlington, 647 Mass. Ave.
Brookline, 1334 Beacon St. (Coolidge's Corner).
Chelsea, 275 Broadway.
Framingham, Union Ave.
Hyde Park, 1281 Hyde Park Ave.
Lexington, 414 Mass. Ave.
Medway, Sanford Building, Village St.
Milton, 40 Adams St.
Natick, 8 North Ave.
Needham, 980 Great Plain Ave
Newton, 309 Centre St. (Nonantum Square)
Roslindale, 752 South St.
Somerville, 251 Medford St (Winter Hill).
Somerville, 4 Holland St. W Somerville.
Walpole, 62 West Street.
Waltham, 83 Moody Street.
Wayland, State Road West.
Winchester, 537 Main Street.
Woburn, 396 Main Street.

Advertisement Announcing Lamp Prices.

replace the 50-watt Gem lamp now in general use, and the Gem will be withdrawn from service. The 50-watt Mazda will be made the standard for new installations.

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MUNICIPAL OWNERSHIP.

By T. R. Hay.

The modern central station has come to be a public utility in the broadest sense of the word, in many cases, doing an interstate business and, therefore, subject not only to direction and control by the State but also by the Federal Government. In order to give the best possible service at the lowest price and also on account of the peculiar conditions entering into the manufacture and sale of the product all public utilities are of necessity natural monopolies and public service regulation by commission is a recognition by the State of the monopolistic character of such enterprises. The favorable showings made by the central-station companies in reducing the cost of electricity to the consumer and in increasing the efficiency of their service is due mainly to a reduction in the capital expenses and to lower operating costs. The importance of the service rendered by a central station as an economic factor and, in fact, as a daily necessity, is indicated by the volume and diversity of its business. Such economic agents are necessarily always undergoing great changes, with an accompanying increasing tendency toward consolidation with a view to concentration of the source of supply from which radiate widespread transmission lines to convey the electric energy to its several and diversified points of application.

To a greater extent than ever before these lines are crossing state lines and serving various municipalities, thus being subject, as before mentioned, to State as well as Federal regulation. It is not to be presumed, however, that any regulation, however discriminating and harassing, will prevent the proper and continued development, on an increasingly larger scale, of the central-station industry, the great benefits of which have only commenced to be realized and appreciated at their real value. It is not sufficient to know that the concentration of the power supply avoids economic waste and creates a new factor in civilization, but it is imperative that the public must also realize that in order to efficiently and continuously carry on the work that has been started, interference by regulating commissions should be temperate, intelligent and based on logical premises and not on whim or fancy or on the political considerations of the moment. Regulation, properly and intelligently exercised, should be and is of great value to the community and also to the central stations as by standardizing its rates and practices a more equitable situation as between producer and consumer has been brought about. In the past policies were in force and so carried out that they worked injustice to the consumer and caused the producer to be generally regarded with odium. Rates were not standardized and when the exigencies of the situation seemed to warrant, a rate was quoted that would get the business, thus discriminating as between consumers and without regard to the amount of electricity used.

Difficulties of Municipal Ownership.

Considering municipal ownership and operation of public utilities we find that, so far as the central station is concerned, such ownership has, in the past, been confined to the cities and has not been carried on in the extensive manner generally practiced by the up-to-date privately owned and operated corporation. This plan of operating the modern public utility by popularly chosen officials meets with a serious and economically destructive handicap from the start. It is difficult to find competent men for private employment with all its investigations and safeguards, but in the public service none of the safeguards against inefficiency exist. Under our present system of frequent rotation in office, party politics, under one name or another, is the determining consideration. However efficient an official may be the mere fact that he does not accept one party affiliation rather than another is sufficient cause for his removal from office and the substitution, for the time being, of another man who bears the right party designation. The efficient and honest official is ousted from office at the very time when his effectiveness in the public service is at its maximum. Nothing requiring special skill or ability can survive such a system. Unnecessary men, often inefficient and incapable men, are added to the payroll merely to pay a political debt by gratifying the personal caprice of the individual affected and regardless of qualifications or necessity. Duplication, as in Cleveland, for example, on an economically destructive scale takes place, for all of which the public citizen, the taxpayer, pays in the long run. Taxation for the purpose of revenue is one of the basic principles of any government. With a municipally owned and operated utility, while it is of course possible to regulate the price of the product for sale and to bring this price below that charged by a potential competitor this price for service must provide an income that makes possible an economic return or else the deficit must be made up by the taxpaper. The public possesses the power to regulate taxation and can at any time adjust the payments of the corporation to a fair percentage of the value. Through control, by regulation and taxation, of the price of the service rendered the public possesses the power of preventing any kind of abuse as it can always compel the maintenance of an excellent standard of quality of service.

Municipal Plants Not Economically Conducted.

If what experience we may have had for our guidance has not taught us that public enterprises, whether city, state or Federal, cannot be or are not conducted as economically and efficiently as under private ownership, it should yet seem plain that this must necessarily be true, for the chief incentive of all business is gain and no business can be permanently profitable which fails to serve its patrons effectively or is heedless of the need of economy. With a municipally operated enterprise no such incentive exists and no need of economy is plainly apparent. It is not the business of a municipality, a state or a government to make money and while officers selected may be, and generally are, quite as honest as the officers or heads of private business enterprises, they are not expected to earn money, and where their duties involve its expenditure, they are not of necessity concerned over the fact that the department over which they preside is not being operated at a profit, since appropriations may be confidently looked for in case of a deficit. As their incomes are fixed and their tenure of office is frequently uncertain, they lack the spur which the promise of increased income as a reward for efficient work affords. They cannot count upon a term of service long enough to make worth while a complete mastery of a business so technical and so highly specialized as the manufacture and sale of electricity.

In the possession of these powers does it not seem wiser to all to add great volumes of private capital to our public resources, rather than to withdraw this capital from our municipal treasuries or from expenditure for other more desirable, and often necessary, uses? Does it not seem preferable to keep the great army of employees of our public utilities in efficient and stimulating private employment rather than in inefficient and parasitic public employment? Where the service rendered is adequate and good and the price fair; where the interests of the public and that very near part of the public, the employees, are given just consideration; where, in the larger sense, the higher responsibilities of public service are recognized, private ownership must in the long run appeal to the sober second thought of the people and will undoubtedly prevail as one of the economic creeds of our industrial and political life.

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POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

An Electrical Laundry Process Combined With Electric Motor Drive.

The advantages of electrical drive for laundries are so numerous that the leading plants of this industry are now equipped for this form of power, but there is another application of electricity that has passed the experimental stage and is worthy the attention of the central station of every city as a means of increasing the demand from one of its large laundry customers. This adaptation consists in using the current directly as an aid in cleaning everything brought to the plant.

The Model Laundry at Nashville, Tenn., which is considered the largest plant in that city, has been using this process since December 1 with highly satisfactory results, both from the standpoint of the owners and from that of the Nashville Railway & Light Company, which is supplying the energy. The electrical method of washing, in which electric current replaces various chemicals in the washing machines, has benefited the laundry both by a reduction in the cost and by increasing the patronage. The saving in washing cost is estimated by the owners of the plant at 25 per cent, but at the present time the saving reaches about 40 per cent, owing to the high price of chloride of lime and other chemicals, which would otherwise be used to remove dirt. In addition, there has been an increase of business, it is stated, of 15 per cent, since the use was begun. The electrical process has proven more efficient in every respect and has been, both directly and indirectly, an excellent advertising feature.

The Model Laundry has been an electrified plant for the past six years, every machine used in its laundering work being operated by electricity.

The actual operation of the electrical process is a simple one. It is merely conducting an electric current by means of a salt solution through a tub in which a shell, containing the articles to be washed, rotates.

The first step is transforming the 220-volt alternating current from the central station lines to 110-volt direct current, by means of a seven-kilowatt, motor-generator. The current is conducted to a small vat in which the salt water is heated and also to the washing machines, of which there are 19, arranged in three rows.

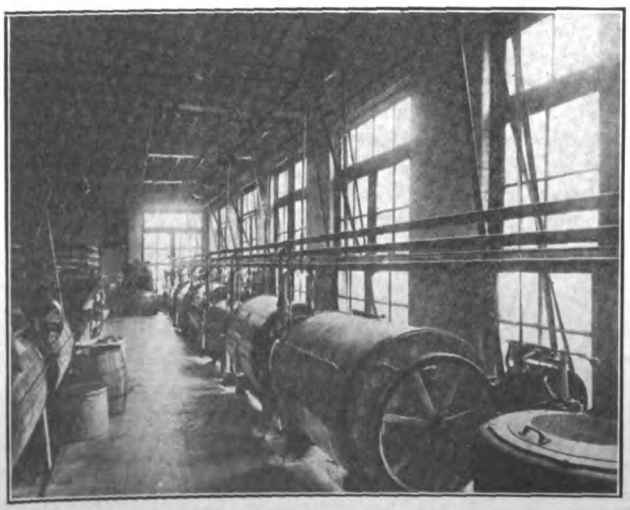
The salt water consists of a solution of 27 pounds of salt to about 100 gallons of hot water. This runs through a small vat, holding a set of carbon plates, through which a 30-ampere, 110-volt current passes. This electrolysis releases a small amount of chlorine. The current also serves to keep the water hot. The temperature need not be as high as when chemicals are used, water heated to 160 degrees Fahrenheit being as effective as boiling water in ordinary methods.

The water is then piped to the washing machines. An automatic valve regulates its entrance to the tubs, and every precaution is taken here to prevent grounding. Every bolt and screw is carefully insulated and an insulated gasket inside the pipe prevents any contact between the water and the pipe.

The tub consists of a large wooden cylinder, the largest being about three feet in diameter and 54 inches long, holding 100 shirts. The shell is perforated, so that the water constantly splashes through the garments, and the direction of rotation is reversed at each half-turn, to assist in the washing. Pure soft soap is added to the water by the operator.

When the electrical process was installed, a crescent-shaped plate, alloyed of aluminum and lead, was placed at each end of the tub, with a thin insulating plate guarding it. The wires were attached to these plates. A post at one end holds two switches and an indicator lamp, the socket for the latter being so arranged that the current cannot be switched on unless the lamp is in place. Besides the switch controlling the current, there is a double-pole reversing switch, which on being turned once a week, reverses the direction of the flow of the current through the washer. This causes uniform wear on the plates and also serves to remove the dirt collecting on the positive plate.

The use of the electric current as a cleansing aid pre-



Battery of Motor-Driven Washers in Model Laundry, Nashville, Tenn.

Electric Irons, Motor-Driven Mangles and Other Machines, Model Laundry.

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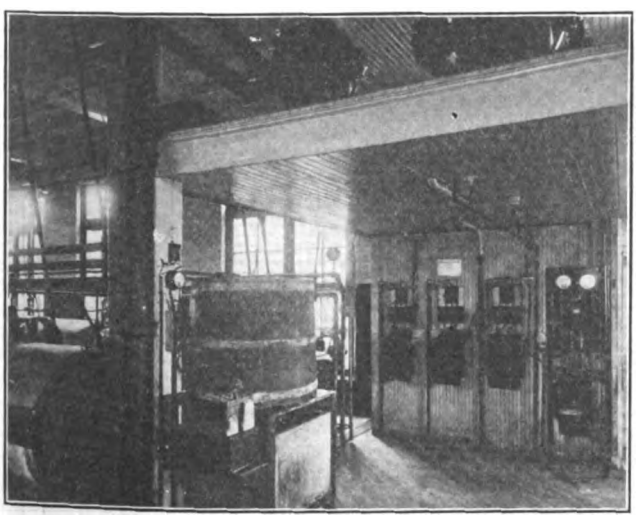
vents the injury to the garments caused by chlorides and other "biting" chemicals ordinarily used by laundries. While the latter are claimed to affect dyes, the current fixes them more strongly, so that white clothes, instead of becoming gray through continued washing, become whiter, and colored articles are made to hold their colors. The electric current also is a germicide. The Model Laundry has made a number of tests of this and bacteriological analysis has shown that the rinsing water of electrically washed clothes is purer than the city's filtered water.

The Model Laundry has, of course, featured its process in its advertising and in addition the improvement in the work done has made a strong appeal to the public, resulting in a big increase in business.

The current required for this process has averaged about two amperes per machine, for 10 hours a day. The average consumption has been 860 kilowatt-hours per month. As the water in the machine is changed several times during each washing and the current is on only between the time the tub is filled and the draining is begun, there is not a constant consumption.

The plant has, in all, 40 motors, with a total of 58 horsepower. These range in size from ⅛ to 10 horsepower. The smaller motors are direct-connected. The washing-machines are driven by three 10-horsepower induction motors, which, with the motor-generator set, are placed on a balcony. Each motor is connected by a belt drive to a shaft running one of the rows of washers. The motors on all machines are left running throughout the day, requiring no attention from the operators, most of whom are girls. Motors have required no attention except for regular oiling by the machinist of the plant.

The manager of the plant, D. D. Canfield, considers that electric drive has proven a success for many reasons. One of them is that in a laundry it is frequently desired to add a new machine or to shift an old one and this can be done without considering the position with reference to line shafts (except for washers). The only belting is that on the washing machines, which are operated by men, and on which the belts may be placed out of danger, so that there has never been any serious accident. With steam, it is a practical impossibility to keep soot from coming in through



Vat, in Foreground, in Which Water is Electrically Treated and Heated.

belt-holes, adding to the expense of washing. Finally, electricity has been more economical, it being estimated that $2,500 a year is saved in power costs. This estimate is based on the saving in wages of an engineer and fireman, the interest on an investment of about $10,000 in boilers and the difference between the cost of fuel and upkeep and the present cost of electric power.

The electrical washing process is controlled by the Electrical Washing Machine Company, which sells the right to its use to one laundry in each section, the price being based on the population and amount of business done. The company supplies the various additional equipment necessary and contracts with local concerns for the installation under its supervision.

Motor-Driven Pump Saves City $2,000 in Cleaning Reservoir.

By installing a motor-driven centrifugal pump for the purpose of cleaning its 51,000,000-gallon reservoir, the city of Nashville reduced the cost of this operation nearly two-thirds. When the reservoir was given its last general cleaning by means of hand-scrapers, in the latter part of 1913, the expenditure was $4,200. This did not include, however, the labor of city workhouse prisoners, who composed one-third of the force employed on this work. This year the city's payroll on this work on which only free labor was used, was $1,625, while the cost of the motor and pump was $725, so that it was paid for by its initial use. The cost of the energy, which was purchased from the Nashville Railway & Light Company, was approximately $40. The work required 1,500 kilowatt-hours.

Probably of greater importance than this saving, however, was the reduction in the time required from one month to eight days, the work being started May 16 and completed early May 25. The reservoir is divided into two basins and it is necessary to have half the supply cut off during the cleaning process. This renders it necessary to supply a small section with untreated water and for this reason it is desirable to reduce the time as greatly as possible. However, even this will be obviated in the future by brick dividing walls inside each basin.

The motor used was a 35-horse-power, single-phase, 110-volt, 60-cycle motor, operating at 1,165 revolutions per minute. It was placed over the well in which the raw-water supply was received and pumped to a 3-inch main running over the weir which was built at the top of the dividing wall. The main had connections about ten feet apart so that the hose pipes which were used could be moved about more easily. The stream at each hose had a pressure of about 75 pounds and the material was moved rapidly.

The motor and pump, which are direct-connected, are mounted on a crane and will be used whenever it is desired to empty any of the wells. The reduced cost and time will also enable the waterworks department to clean the entire reservoir once a year. The new method was introduced by Commissioner Robert Elliott and the work was under the direction of Turner H. Morton, supervisor of the waterworks.

Boston Edison Company Takes on New Power Business.

Two steam plants, one gas-operated and one oil-operated plant, have recently been shut down in Boston Edison territory and electric power service substituted. On May 1 a new D schedule was put in effect, which was very favorable to power users of 50 kilowatts and over. New business secured includes the following diversified industries:

	Kilowatts.
National Metal Company, in metal furnaces	140
Albert & J. M. Anderson Mfg. Co., electrical manufacturers	250
American Steam Gauge & Valve Company	250
Holbrook, Cabot & Rollins, contractors	415
Babson-Dow Manufacturing Company, screws	165
Whitney, Lynch & Quinlan, dyestuffs	75
Hunt-Spiller Mfg. Corp'n, castings	125
American Tube Works, additional	600
American Express Company, for charging trucks	270
Pelham Trust, office building	150
Two hotels and two apartment houses, total	445

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Power Campaign of the Public Service Electric Company.

The Public Service Electric Company, New Jersey, has inaugurated an extensive campaign throughout its different territories in the state to interest new users for electric power. A series of announcements, termed "Talks on Power," as shown in the accompanying illustrations, are being made in local papers in the various sections, setting forth comprehensive data and information regarding the advantages of electric power for industrial operations. Each announcement is about 8 by 16 inches in size, and is arranged to cover a specific condition of power service.

This campaign is directed to the manufacturing plant, with particular reference to the convenience and economy to be derived through using the company's service, and reproducing authentic statements from present consumers relative to the advantage and efficiency of central-station power. In each announcement attention is directed to the extent of the company's operations, comprising 22 generating plants and 61 substations with a total capacity of 300,000 horsepower, one of the largest interconnected electric systems in the country. At the present time power is supplied to over 10,000 concerns in the state.

Talk No. 1 is designed with a caption to appeal to the manufacturer who may be operating an individual plant for factory operation; prominence is given to a letter from a firm which has abolished its local plant in favor of central-station service, referring to existing conditions warranting the change. A brief argument along the lines of reduced cost of operation comprises the text, driving home the economical features of central-station power, as well as the other advantages attendant. Space is also given to listing a few of the company's consumers using over 1,000 horsepower.

Talk No. 2 covers the operation of the isolated plant in connection with central-station service for emergency. As in the first announcement, a statement is reproduced from a local concern directly along the line of the argument at issue. This talk is a direct appeal for the economy of central-station power to meet unusual demands, also introducing the idea of such type of service exclusively with the evident advantages enjoyed by the manufacturer. Similar to the first talk, reference is made to a few of the large power consumers of the company.

Talk No. 3, the last issued up to this time, is devoted to the power waste evidenced in the average belt drive, with an indirect appeal for the use of motor-driven machinery; a concrete illustration of power loss through friction of a main shaft drive is given. The letter reproduced from a Camden firm testifies to the satisfactory service derived through the adoption of central-station service.

This publicity campaign will be continued to cover all phases of power service as applies to factory and manufacturing operations, the different talks appearing each week. The idea is interesting in the singling out and appealing to the different industries in the interests of central-station electric service, and closely followed by personal calls and co-operation in response to inquiries, the campaign will undoubtedly result in a decided increase in the number of power users for the company.

Campaign on Electric Glue Pots Instituted in Boston.

The Boston Edison Company is canvassing all carpenters, builders and box makers in its territory for the introduction of electric glue heaters. A circular letter with facsimile signature of W. G. Stetson, superintendent of the appliance department, calls attention to the low cost of operation, safety and ease of use. The one-quart size costs only about one cent a day to keep the glue in perfect conditions for use. Heaters of one, two and four-quart capacity are offered on 30 days' trial.

Three of a Series of Newspaper Advertisements Published by the Public Service Electric Company in Business.

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ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING IN VERY DAMP PLACES.

Interesting Features of and Special Methods Used in Wiring a Dye House.

By William T. Estlick.

The inside wireman is frequently called upon to handle some difficult jobs of all kinds both for lighting and power service, but there is one class of inside work that calls for very careful thought and consideration. It is the wiring of very damp places, such as dye houses, packing houses, etc.

Before wiring a new dye house some time ago, the writer consulted several other electricians as to their experiences in wiring such places; although neither had had actual practical experience in such work, they advocated the use either of lead-covered cable or lead cable in conduit. It seemed to the writer, however, that in the case of using lead-covered cable this would make a rather expensive installation, if single-conductor cables were used on the three-wire, three-phase system employed in the plant, and if three-conductor cable were used, it would be rather difficult to make good splices, especially after the main cable was installed and fastened in place; even should the splicing be well done, it would be difficult to insulate it perfectly and permanently so as to prevent moisture, steam, acid fumes, etc., from creeping into the crevices in the insulation. In the case of lead-covered cable drawn into conduit, it would be still more difficult than in the foregoing case to make splices and the matter of draining the conduit would also have to be taken into account.

If a cabinet were installed outside of the damp department and the branch circuits run to its separate motors

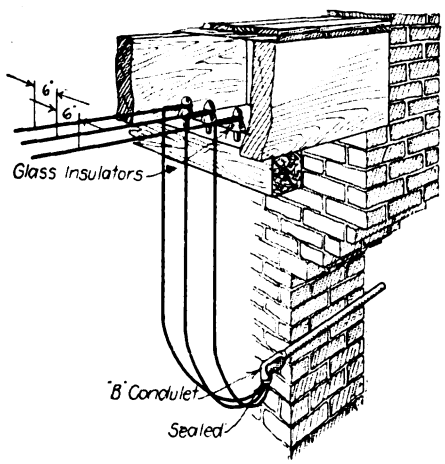

Fig. 1.—Manner of Bringing Wires Through Partition.

continuously without a break, such an installation would be first class. If a waterproof cabinet could be installed in the dye house and the branch circuits be made continuous therefrom, that too would make a good job. But in the case mentioned an installation of this type would have involved too much expense.

After careful consideration it was therefore decided to run a main line through the center of the dye house. This was run as a three-wire line, the wires being mounted on glass insulators six inches apart and installed in a way similar to outside wiring. Double-braided, rubber-covered wire was used. The wooden insulator pins were first well soaked in warm shellac and allowed to dry, then they were installed on the beams about 10 feet apart; upon this were placed the glass petticoated insulators. When

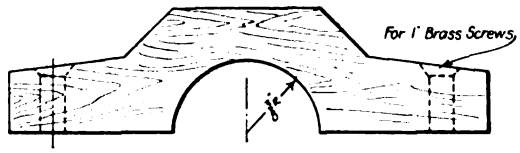

Fig. 2.—Special Impregnated Wood Cleat.

the wires were pulled up and fastened in place the installation presented a very neat appearance.

Just outside of the dye house was placed the main cutout switch in a cabinet and the conduit run from this cabinet through the partition into the dye house. A type B Condulet with a porcelain cover was placed on the end of the conduit, which was carefully sealed to prevent moisture from getting into the conduit system. The general arrangement is shown in Fig. 1.

Since putting the branch lines on insulators would mean a great deal of work and drilling so as to fasten the insulators in place, and since the machinery and apparatus did not permit loose wiring on the side or even open wiring, another scheme had to be devised. The branch-circuit wire was placed in flexible tubing which was taped and varnished to make it waterproof. It was fastened by

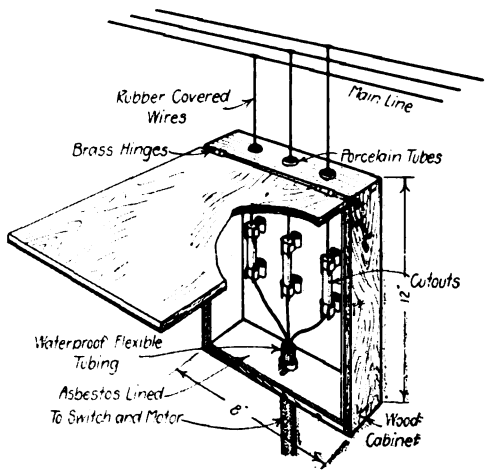

Fig. 3.—Special Branch-Circuit Cutout Cabinet.

means of wooden cleats which were cut out on a band saw; these were also soaked in warm shellac and fastened with wood screws. Fig. 2 shows one of these cleats. These were used in place of ordinary pipe straps because the latter might injure the tubing and would be subjected to corrosion, which would undoubtedly prove injurious to the wiring.

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Where the branch lines were connected to the main line, the splicing was thoroughly made and all soldering flux used carefully wiped off. The joint was then well insulated and two coats of varnish applied. The wires were run to a wooden cutout cabinet, which was also dipped into warm shellac and lined with asbestos. This cabinet was made with a door with the hinges at the top, as shown in Fig. 3, and was placed at the side of the upright pillar under the beam, leaving a space of about 12 inches for the wiring; this was done to prevent the water leaking from the ceiling onto the top of the cabinet. The door of the cabinet was always kept closed. The wires entered the cabinet through porcelain tubes taped and sealed, and the flexible conduit was fastened to the bottom of the cabinet and also sealed. This tubing was made continuous from the cabinet to the switch and from the switch to the motor. Wherever the tubing entered or left the cabinet or switch any space left around it was carefully filled up to prevent moisture from getting in.

Although the writer did not obtain prices enabling him to judge of the cost of wiring with other materials for the sake of comparison, it is very evident that the installation as described was far more economical and flexible than any other could have been. This method of installation is very flexible because additional motors can be connected anywhere along the line and the inexpensive method of installing them compared with the other methods mentioned at the beginning of this article, warrants its use in such places where it is difficult to properly install and insulate a conduit system where such a system would last only two or three years at the most.

When the insulation becomes affected it is only necessary to take advantage of a day when no work is being done in the department, such as Sunday or any other holiday, and while the room is dry and then varnish or shellac the entire system. This gives a slickered appearance to the entire outside. The steam which condenses and the water which drips from the ceiling onto the wiring readily runs off before it has a chance to penetrate the insulation.

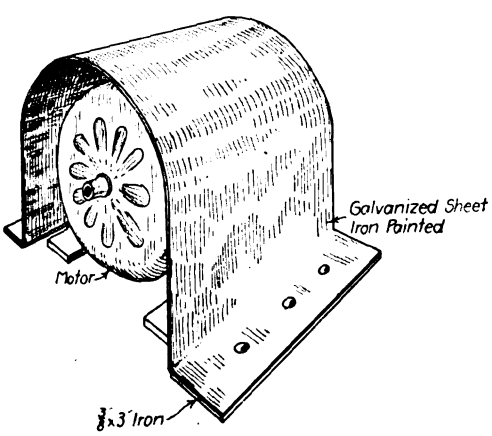

Fig. 4.—Galvanized-Iron Shield for Motor.

All the motors used in this dye house were incased in a wooden inclosure as far as possible and where this was not possible the motors were protected from dripping water by means of galvanized-iron shields made up as shown in Fig. 4 and well painted.

Operation of Motor-Generator for Motion-Picture Use.

On account of the very large number of motion-picture theaters considerable interest attaches to problems connected with the operation of their electrical equipment. A peculiar case involving a motor-generator set used for this purpose has been called to our attention by J. W. Thorne, of Beaumont, Texas.

This set included an alternating-current motor and a direct-current generator, the latter being compounded and having its series and shunt fields differentially connected. In changing from one picture machine to the other, both arcs are on for a short time. This doubles the series-field excitation, which would bring the generator voltage down too low for good operation. To prevent this, a change-over switch is used which cuts a resistance in series with each arc, thus maintaining a high enough voltage across the shunt field to give the proper operating voltage.

It was found that when a cold carbon was started, with only one machine in service, the arc became so dim for about a minute that it almost went out. The resistance of the cold carbon was evidently so low that it allowed a heavier current to flow through the arc, thus strengthening the series field, which caused the voltage of the machine to fall. It was therefore suggested to leave the change-over switch open with the resistance in series until the carbon got hot and it was found that this remedied the trouble. The machine is now used continuously without a flicker.

Duties of Boston Edison Company's Construction Bureau.

The functions of the construction bureau of the Boston Edison Company, and its relation to the several other departments, were outlined by L. L. Elden, head of the electrical engineering department, at a recent hearing before the Gas and Electric Light Commissioners of Massachusetts.

When an extension to plant, like a new substation, is decided upon, the electrical engineering department decides on general features, like capacity, number and voltage of units, number and character of switchboard panels; and lays out the requirements in diagrammatic form. This is the basis of an estimate which is made from general prices, showing about what the total cost will be.

The construction bureau, once the authority to build is obtained, draws the plans, works out details of wiring, and looks up all the data necessary for the purchase of instruments and everything that goes into the substation, the object being to deliver to the operating department a station entirely complete.

Having prepared the plans with details of material to be purchased through the purchasing bureau on a contract or a number of different contracts, the construction bureau has to follow up the progress of the work, the manufacture of the machinery, its factory testing, installing and final acceptance.

In the case of a conduit line, the electrical engineering department makes a sketch showing the street and approximate location, where manholes are required with respect to street corners and customers' entrances, also indicating service connections, cable required and size of conduit. On securing authority for the expenditure, these data are turned over to the construction bureau.

The latter then makes soundings for manholes, makes test pits to determine whether there is any obstruction, and examines the city records to find out where other conduits and pipes are in the street. It procures permits from the city government for the excavation, draws the plans for the contractor to work by, and arranges for the exact location. It secures permission from abutting owners to put pipes into their premises, and finally makes ready to start excavating. In case obstructions are met, or quicksand, new plans may have to be prepared, as it is often necessary to make detours to avoid something not shown in the city plan, as a cesspool, old manhole or possibly abandoned piping system. It devolves on this bureau to pay the contractor the extras involved in this special construction, and finally to deliver to the operating department the completed conduit line, with cable installed, ready to operate. The construction is done, as a rule, by a construction firm under contract.

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Alternating-Current Motor Windings

By Justin Lebovici

This is the first installment of a new series of articles dealing with the windings of alternating-current motors and is supplementary to the series started in our issue of April 22, dealing with the general characteristics of motors. The present article deals with single-phase windings. Subsequent articles will discuss polyphase windings of open and closed types, mechanical construction f windings, etc.

In all rotating electric machinery, be it direct-current or alternating-current, motor or generator, the windings consist of conductors moving in relation to a magnetic field, thus cutting flux and generating an electromotive force

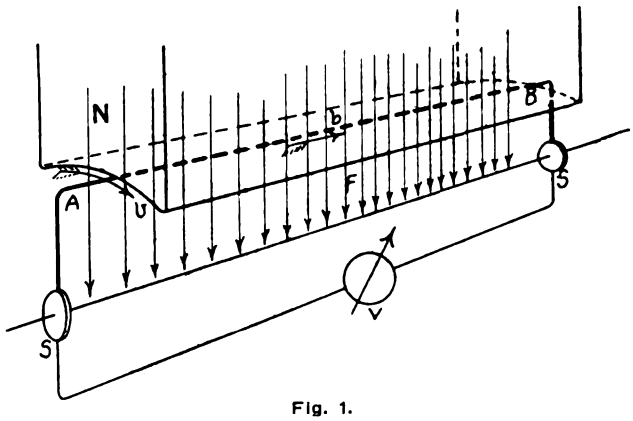

Fig. 1.

between the ends of the conductors. Assume a magnetic field F (which in order to fix our idea may be assumed to be produced by the north pole of a direct-current machine) and a conductor AB moving across the face of the pole in the direction of the arrow v. An electromotive force is generated between the ends A and B of the conductor AB, due to the conductor cutting the flux F of the pole N.

If we connect the points A and B by means of slip rings S S to a voltmeter V, it will indicate a difference of potential. For the above assumptions the point B will be at a higher potential than point A. If we replace the voltmeter by an ammeter, the latter will indicate a flow of current, the direction of flow through the ammeter being from the point B of high potential to the point A of low potential (arrow b).

In the case of the generator, the conductor AB is the seat

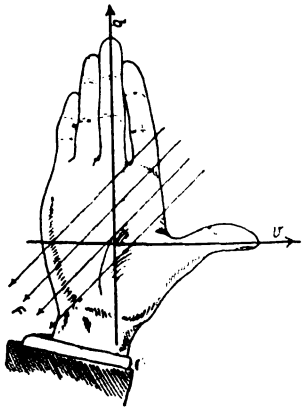

Fig. 2.

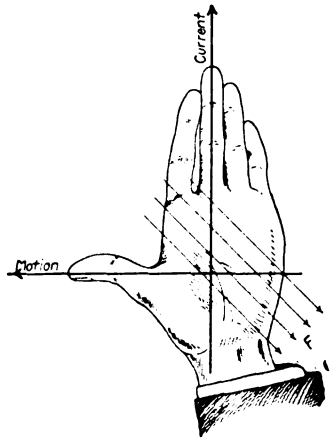

Fig. 3.

of an electromotive force which drives the current through the meter.

The direction of arrow b in Fig. 1 can be found by means of Fleming's right-hand rule. Imagine the right hand so placed in the magnetic field that the flux enters the palm and the thumb indicates the direction in which the conductor moves in relation to the magnetic field (arrow v in Fig. 2). The fingers will then indicate the direction of the resulting electromotive force (arrow b).

In the case of a motor a current is sent through the conductor AB (see Fig. 1) and, due to the interaction of the conductor and field, a force will ensue and may cause motion. In consequence of this motion the conductor AB cuts the field F as in the case of the generator, and an electromotive force is generated between the ends of the conductors. To this is given the name of counter electromotive force, since it always opposes the electromotive force applied to the conductor terminals, producing the current. The direction of resulting motion can be found by means of Fleming's left-hand rule. Imagine the left hand so placed in a magnetic field that the flux enters the palm, and the fingers indicate the direction of current flow. The thumb will then indicate the direction of the resulting motion (Fig. 3).

The direction of the flux F is always from a north pole N

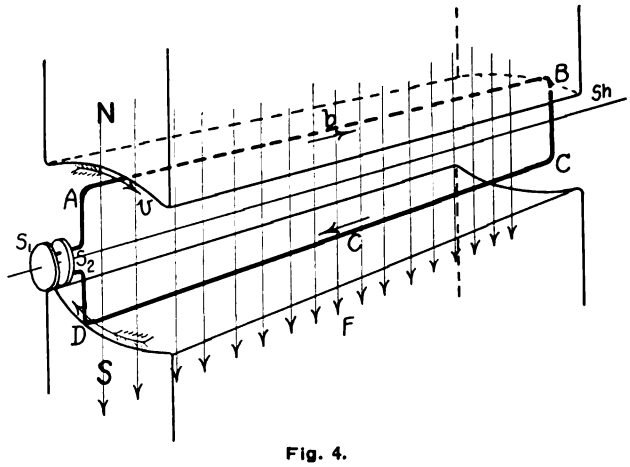

Fig. 4.

towards a south pole S, as shown in Fig. 4, which may represent the magnetic field of a bipolar direct-current machine.

Consider now two conductors AB and CD in Fig. 4 at diametrically opposite points on the surface of an armature, rotating clockwise, as indicated by the arrow v. The voltages generated in AB and CD have respectively the direction of arrows b and c.

If we connect conductors AB and CD by a wire BC, the electromotive forces generated in AB and CD will add up to a resultant voltage which can be measured between two slip rings S_1 and S_2, mounted on the same shaft as the armature carrying the conductors AB, CD. The connections BC, AS_1 and DS_2 are called end connections. AS_1 and DS_2 are called leads.

The conductors AB, CD, together with the end connections BC, AS_1, DS_2 constitute a winding element.

Winding elements variously interconnected to meet electrical requirements such as output, speed, voltage, frequency, number of phases, etc., constitute the electrical windings to be described in the following.

Logically our problem is three-fold:

(1) To arrange the conductors around the armature (conductor diagram).

(2) Connect the ends of the conductors to form a winding (winding diagram).

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(3) See that the conductors and end connections form mechanically and electrically a structure which will withstand the various forces acting on same.

We will treat (1) and (2) together and will develop the rules for laying out the conductor and winding diagram.

The Conductor Diagram.

If we connect the points *A* and *D* in Fig. 4 directly through

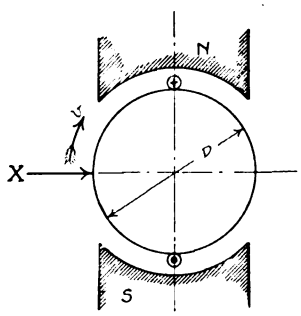

Fig. 5.

a wire we obtain a closed loop through which a current circulates in the direction of the arrows *b* and *c*.

Fig. 5 shows the end view of Fig. 4, looking toward the collector rings S_1 and S_2. Since we look upon the feather of the

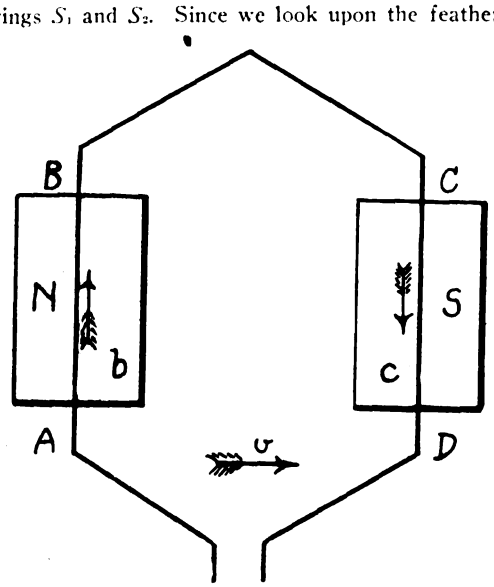

Fig. 7.

arrow *b* (Fig. 4) we will indicate the direction of the current in the conductor *AB* by a cross. Looking at conductor *CD* we see the point of the arrow *c*; hence we will represent the

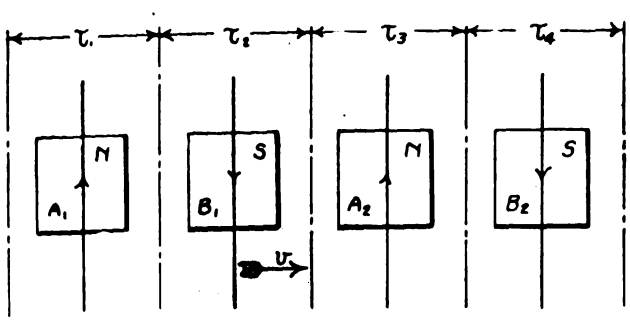

Fig. 9.

direction of the current in conductor *CD* in Fig. 5 by a dot. The direction of rotation of the armature is indicated in Fig. 5, same as before, by arrow *v*.

In Fig. 4, by connecting the conductors *AB* and *CD* with the end connections *BC* and *AD* we have formed a loop through which a current is circulating as indicated.

We could have obtained the same current flowing in the conductors *AB* and *CD* if, instead of connecting the conductors, as shown in Fig. 4, we would have connected the conductors

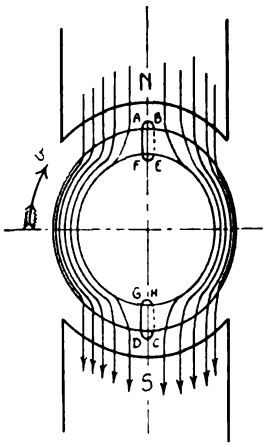

Fig. 6.

AB and *CD* as shown in Fig. 6. In Fig. 6 the armature is a ring, while in Fig. 4 the armature is a cylinder.

We are thus led to two fundamentally distinct types of windings and armature constructions:

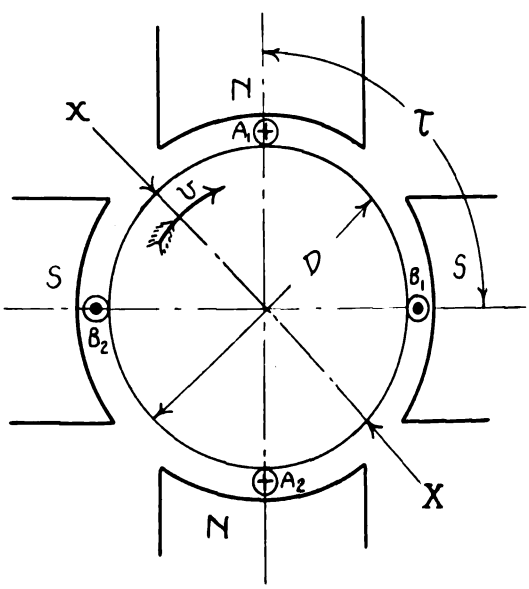

Fig. 8.

(*a*) The ring winding shown in Fig. 6.

(*b*) The drum winding shown in Fig. 4.

The ring winding and armature construction, invented by

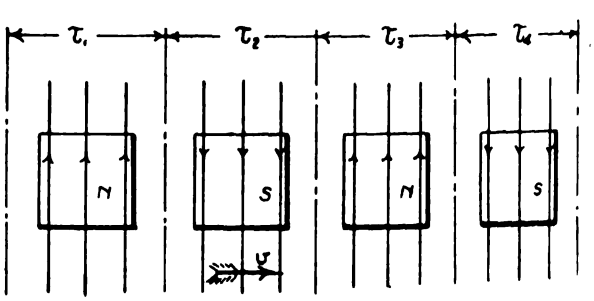

Fig. 10.

Pacinnotti and Gramme, was very much used in the early days of dynamo construction, but has been almost completely abandoned today and replaced by the drum type of armature and winding.

The ring winding will be described in future only because it lends itself readily to diagrammatic representations of phe-

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nomena occurring in all kinds of dynamo-electric machinery.

Referring to Fig. 4, it can be easily seen that only the part of the conductors AB and CD directly under the pole faces N and S are effective in generating voltage; the rest of the

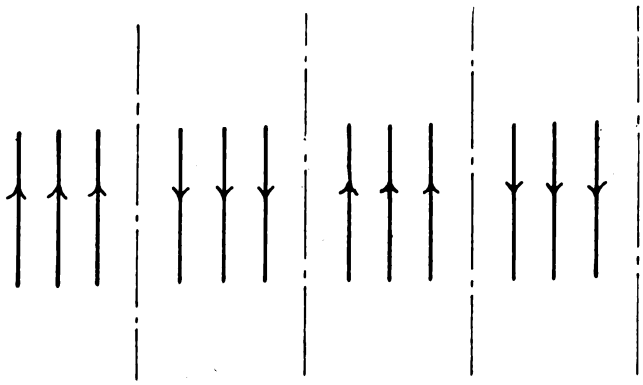

Fig. 11.

conductors AB and CD, as well as the end connections BC and CD, are useless as far as generating voltage is concerned.

Since the distribution of flux in a ring armature is as indicated in Fig. 6, the conductors EF and GH are not cutting magnetic flux and in consequence do not aid in generating voltage. EF and GH then greatly add to the amount of idle copper, as compared to the drum winding shown in Fig. 4. This is one of the reasons why the ring winding has been abandoned; other reasons will be given later.

A more common representation of Figs. 4 and 5 is obtained by showing the poles N, S and coil AB CD developed in a

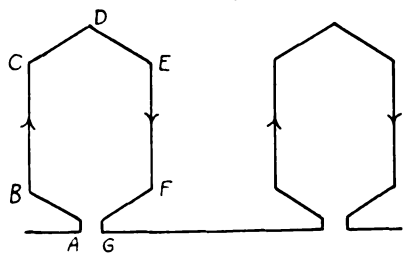

Fig. 13.

plane, as indicated in Fig. 7—all notations having the same meaning as in Fig. 4. AB and CD are the active conductors. BC and AD are the end connections. In Fig. 7 the position of conductor AB coincides with the center line of pole N, and CD coincides with the center line of pole S. The distance between the center lines of two consecutive poles measured

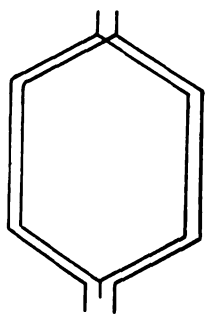

Fig. 15.

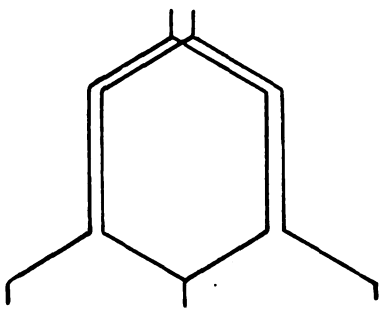

Fig. 16.

around the armature surface is called the pole pitch and usually designated by the Greek letter τ.

If D is the diameter of the drum or armature in Fig. 5, the pole pitch

$$\tau=\pi D/2$$

and is expressed in inches if D is measured in inches. The pole pitch may also be measured in degrees and in the case of Fig. 5 we have, since the whole circumference corresponds to 2π or 360°,

$$\tau=\pi=180°.$$

In Fig. 7 the distance between conductors AB and CD measurged around the armature is equal to the pole pitch. The distance between AB and CD measured in this way is called the coil pitch or winding pitch.

So far we have dealt only with two poles and one conductor under each pole. We can imagine the diagram shown in Fig. 5 cut open at the point X and spread until it coincides with the part XA_1B_1X in Fig. 8, and an identical part XA_2B_2X added to it as shown in Fig. 8. We obtain in this way a four-

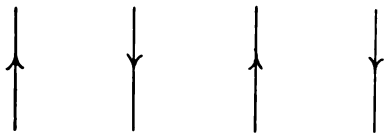

Fig. 12.

pole arrangement. By opening Fig. 8 at a point X and inserting one more pair of poles we would obtain a six-pole arrangement. Any multipolar arrangement can be considered as resulting from an addition of bipolar elements.

The pole pitch τ in Fig. 8 becomes

$$\tau=\pi D/4$$

or generally, if we call p the number of bipolar elements making up the multipolar machine, or the number of pairs of poles,

$$\tau=\pi D/2p$$

It is convenient when measuring τ in degrees to assign to

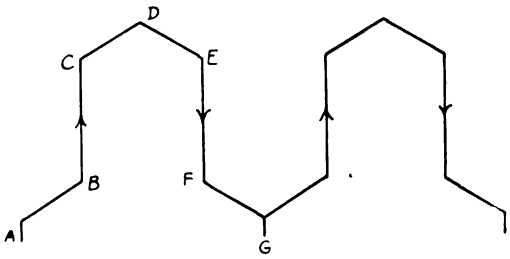

Fig. 14.

the pole pitch the value 180°, and to distinguish it from the actual mechanical angle, they are called electrical degrees.

Developing Fig. 8 in a plane we obtain the conductor diagram shown in Fig. 9.

In Fig. 9 we still show one conductor only under each pole. The conductors are usually laid in slots evenly distributed

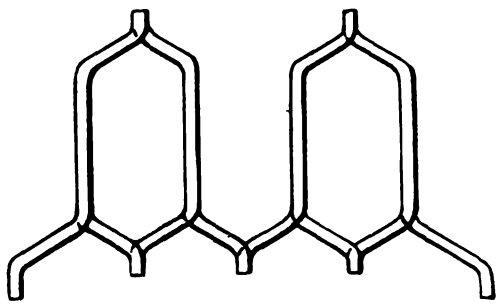

Fig. 17.

around the stator or rotor periphery. Fig. 10 shows the same conductor diagram as Fig. 9 but shows three conductors under each pole. If we apply Fleming's right-hand rule to any conductor along pole pitch τ_1, we obtain the same direction of current. Since the arrow indicating the direction of generated voltage and the polarity N and S presuppose each other for an

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assumed direction of rotation, we may in future omit in the conductor diagram the poles and reduce the conductor diagram to what is shown in Fig. 11.

Since the scheme of end-connections we will employ to connect the conductors in Fig. 11 to a winding have no effect upon the amount of electromotive force generated, it is well to always start the winding diagram by laying out the simple conductor diagram shown in Fig. 11.

The individual conductors in the conductor diagram, Fig. 12, are most commonly connected to form coils according to one of the schemes indicated in Fig. 13 and Fig. 14.

The type of winding shown in Fig. 13 is called *lap* winding, while the type shown in Fig. 14 is called a *wave* winding. The winding element or coil *ABCDEFG* is, as a rule, completely formed to shape outside the machine in a manner to be described later. For our discussion the coils in Figs. 13 and 14 are made up of the two coil elements *BC* and *EF* and the end connections *CDE*, *AB* and *FG*. Actually *ABCDEFG* may and usually will consist of one continuous copper conductor and we speak of a *single-turn* coil. More of such single turns can be connected in series to form a *multiple-turn* coil. Such a coil is shown in Fig. 15. The leads may be brought out as shown in Fig. 15 or as shown in Fig. 16.

Fig. 17 shows a winding using coils illustrated in Fig. 16. In this case we still speak of a wave winding but this evidently refers to the way the leads are brought out. In all above diagrams the coils *ABCDEFG* may be made up of two or more wires in parallel. In the diagrammatic representations of windings we will treat the coil sides *BC*, *EF* and the end connections *CDE*, *BA* and *FG* as if they were single conductors.

(To be continued.)

Pipe-Bending Machine Economical in Telephone-Conduit Installation.

The New England Telephone & Telegraph Company has installed at its metropolitan construction department in Boston a pipe-bending machine for making the bends in conduit used for terminating the laterals for underground conduit lines to poles or building walls.

A right-angle bend of 3.25-inch iron pipe, with a 27-inch radius, is required. Formerly these bends were bought of jobbers at about 55 cents each. With the bending machine the cost is about 10 cents each, regular iron conduit being bent to required shape, and 10 to 15 bends being made per hour.

The machine consists of an iron form rigidly supported by a framework set in a concrete foundation. The form exactly fits the inside arc of the completed bend. Outside the form is a bending shoe swinging from links pivoted on the proper center and so connected by levers that it can be forced against the pipe, thus producing the desired curve by easy stages. Four men are required—three on the lever and one to set the shoe.

The pipe is not appreciably flattened by the process and uniform bends are now quickly and cheaply produced.

Pipe-Bending Machine.

PECULIAR DIFFERENCE OF POTENTIAL BETWEEN GAS AND WATER PIPES, BOTH SUPPOSEDLY GROUNDED.

By John L. Gleason.

A few days ago a neighbor called me in to explain to him why his maid was getting shocks from the range in the kitchen. She thought they were coming through the floor. The floor was covered with linoleum and I was unable to feel anything after touching both the coal and the gas ranges alternately, so, as the maid could not speak English, I told my neighbor that I thought it must be imagination on her part. Two days afterwards the same thing occurred and she wanted to "throw up" her job unless the trouble was fixed up. My neighbor also had a similar experience, so I went over again and could not get any shock until I happened to touch both the gas and coal ranges simultaneously, and then I got a good one, which I thought to be about 110 volts. I went back to the shop and brought a weatherproof socket with a 110-volt lamp and a couple of wire leads, and got full candlepower on the lamp between the two ranges.

This sort of "buffaloed" me, as I couldn't see why there should be a difference of potential between the gas and water service when both entered the building from a common ground. Realizing that one side of the secondaries was grounded, why should it not be a ground common with the gas service? It occurred to me that possibly one side of the circuit, opposite to the grounded side, might have become grounded ahead of the insulating joints at some of the combination outlets throughout the house, so I investigated this.

I took a 50,000-ohm magneto generator and found both legs of all the branch circuits were perfectly clear as were also the submains which ran from the distribution cabinet in the bathroom on the second floor to the meter in the basement. I then tried some "straight" gas outlets in the basement and found that I could get shocks from any of them when standing on the concrete floor. Then I pulled open the main service switch and the same conditions existed. I thought possibly the main service switch was leaking, but it proved to be all right.

The next thing which I decided to try was to put the 110-volt lamp across the gas and the water services, which were within a foot of each other in the basement wall, and found a difference of potential there of at least 110 volts. How much current was flowing I had no means of knowing, but I found it would melt a piece of No. 18 stranded lamp cord right off.

Having thus demonstrated that, as far as the building was concerned, the job was right, I notified the power company and it finally sifted down to the fact that a transformer in a manhole, some 200 feet away from this particular service, had a cable from it on which the lead sheath had become grounded on the copper conductor, and the current backed up into this house through the gas service and caused the bother. I grounded the gas and water systems where they entered the building with proper clamps, and No. 4 wire, thinking that injury to the transformer, rather than the house or its occupants, was the lesser of two evils. This transformer in the manhole supplied about a dozen different customers, all of whose gas and water services were examined to see if there was any difference of potential; but there was none with the exception of the house in question. The gas services common to the neighborhood are of 1.5-inch wrought-iron pipe, tapped into a three-inch iron main.

That there should be a difference of potential between the gas and the water service is a "new one" for me. Although I have been a master electrician and master gas fitter for 23 years, this is the first time I have experienced such a condition in any house.

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The Reason Why—What It Was

By George W. Hill

This article is a sequel to the one by Mr. Hill published in our issue of May 27. It gives a simple and business-like solution of the problem then presented, which related to an apparently lucrative business proposition. The lesson taught is a very valuable one to electrical contractors and dealers and emphasizes the importance of knowing all cost elements in the business, particularly the overhead costs. It also shows how this knowledge can be instantly applied in analyzing any proposition.

In the Electrical Review and Western Electrician of May 27 last, an article appeared under my signature, in which I attempted to describe a condition that is met with nearly every day in the year in the electrical contracting and merchandising business. There was displayed with this article a sample financial statement of a contractor, which the writer believed would make it perfectly apparent to all why it was that a certain dealer refused to place an order for an article, which cost the dealer $1.87 f. o. b. cars, New York City, and on which the manufacturer had established a resale price of $2.50.

On reference to the financial statement it will be observed that the overhead or operating expense was such that it would not permit any intelligent business man making such a contract under the circumstances.

Many contractors in looking at a proposition of this kind assume that $1.87 is the cost, while as a matter of fact the cost is $1.87 plus the freight and drayage and plus the overhead or operating expense.

Let us assume in this particular transaction that these articles were heavy and that the freight and drayage was 25 cents on each. Now let us take the average overhead expense of the contractors of the country, which is in my opinion about 33⅓ per cent, and I am frank in saying that I believe that there are many who have a greater rather than a smaller overhead. Adding the freight and drayage makes this article cost $2.12. One-third of $2.12 is 70 cents. This added to the cost delivered brings the cost of the article up to $2.82, or 32 cents above $2.50, the resale price established by the manufacturer through the columns of various periodicals, and which he insists upon the dealers maintaining.

I believe, if the manufacturers of an article are sincere in desiring to assist the contractor and dealer to make money and in placing him in a position to buy more goods and pay for them, that they should first consult the dealers and learn the average overhead per cent before attempting to establish an intelligent selling price.

While there are many manufacturers whose business methods cannot be questioned, some, however, rely wholly upon the contractor's ignorance of his costs in putting over deals of this kind.

If you will observe closely that when representatives come along with propositions of this kind, in which the selling price is less than one-third greater than the buying price, you will find usually that great stress is laid upon prompt payment. They make a decided effort to make an early settlement. They sometimes offer inducements for cash, and in such cases it is well that some contractors take advantage of this discount for cash, for this may be all that saves them from losing money on the transaction. They want your money before you wake up and become aware that the difference between the buying and selling price is not all profit. You have the goods on hand. You do your utmost to sell them, and by pushing them to save yourself, you perhaps create a demand for them among your customers, and the final result is that, in order to accommodate your customers, you are compelled to handle an article at a loss indefinitely.

This kind of business reminds me of a transaction which I witnessed not long ago. I was waiting in a small town store one day for a train, when a young salesman entered the store representing some soft-drinks house. He was selling some beverage by the barrel, and making contracts for the entire requirements for the season. He informed the dealer that he would furnish him with a beautiful imitation polished barrel with a fine nickel faucet. He would, as an extra inducement, furnish free of cost to the dealer, 12 fine, large steins or mugs in which to serve the beverage. The large, fine mugs closed the bargain. After the representative had departed with a perfectly good order to supply the dealer with his entire requirements for the season, the merchant began to think. He had contracted for several barrels of this beverage, and had permitted the agent to present him with large twelve-ounce mugs or steins, which he had agreed to use, while as a matter of fact, a six-ounce glass or mug was all any one person would care to have at one drink. It began to soak in on him that, if he used the mugs which were to be furnished him free of charge, he was going to give his customers twice as much beverage as they would require for a nickel. He began to see that in order to get the nickels from his customers he would be compelled to buy twice as much of the beverage from the company as he would otherwise require, if he used six-ounce mugs or glasses, and yet it was these self same mugs which he was to get for nothing that had induced him to make the contract.

Too many men enter into such contracts without thinking. Do your own thinking. Don't let the salesman do it for you. Just analyze the proposition from your own standpoint and not from all that is told you by the salesman. Don't be so anxious to get something for nothing. If you will investigate these "something-for-nothing" propositions, you will usually find that there is a string to the deal where it can be pulled back out of your reach.

Many of you have no doubt stepped out to the sidewalk on the first day of April and found to your surprise and delight, perhaps, that some unfortunate person had lost a big, fat pocketbook, but as you stooped to pick it up it disappeared. There was a string to it and, if you listened, you were able to locate the other end of the string, for presently, when you had retired a safe distance, you heard some boy or girl yell "April Fool." Just so in business. You may think that you have found a deal where you are going to get something for nothing, but about the time that you are ready to get away with it you will find to your dismay that it has disappeared and, if your eyesight and hearing are good, you will be able to locate the other end of the string. The fellow who is at the other end may not yell "April Fool," for it may not be April, but the season of the year does not alter the nature of the case.

Portland Prepares New Electrical Code.

The City Council of Portland, Ore., recently passed a new electrical code, changed in a number of respects, to bring it up to the standards of the National Electrical Code. The changes pertain particularly to construction features, and are not of a nature to increase the cost of wiring, but rather tend to decrease the cost. City Electrical Inspector Dunlap and F. D. Weber, of the Underwriters' and Electrical Board of Appeal, prepared the code.

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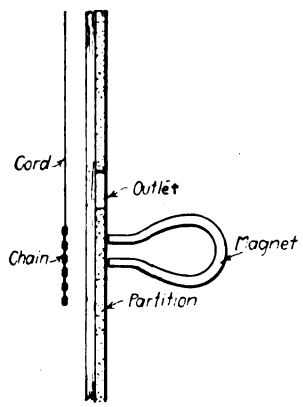
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Fishing to Wall Outlets.

In wiring old buildings for wall receptacles or switch outlets where it is difficult to hook a fish string or chain, take a piece of steel or iron fish chain about one foot long, tie to a strong string or cord, and drop between partition



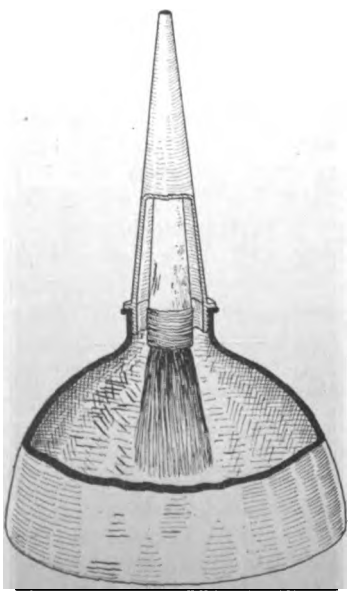
Use of Magnet as Aid in Fishing.

where the wall outlet is located. Take a strong laminated horseshoe magnet, or a small electromagnet which can be operated by one or two dry cells, and move the magnet in the vicinity of the chain and up to the hole. The chain will be drawn to the hole, where it can be caught by the fingers, or a small hooked wire.

Benjamin Swanson.

Receptacle for Asphaltum Paint and Brush.

In the accompanying sketch is shown what I have found to be an excellent method of carrying asphaltum paint in a wireman's tool kit. Take an ordinary machine oil can and a small round paint brush. Clean the can with gasoline or benzine. Cut the handle of the paint



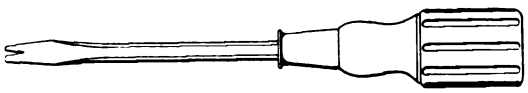
Oil Can as Paint and Brush Receptacle.

brush so it will fit into the spout of the can. Fill the can with the paint. This method of carrying the brush and paint keeps both in usable condition and saves much time in looking for a brush whenever the occasion arises on a job for using one.

John Bornholdt.

Screw Driver As Wire Guide.

When wiring sockets, receptacles, snap or flush wall switches, etc., it is customary to use a screw driver to



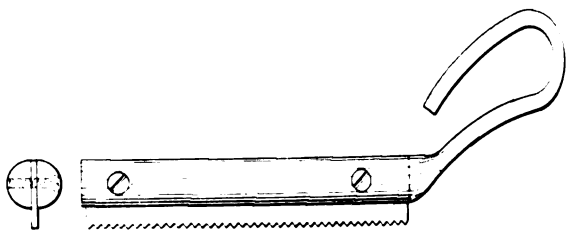
Screw Driver Adapted to Guide Wire.

guide the wire around the binding screws so that when these are screwed down their heads will hold the wire all around. In doing this with an ordinary screw driver it is apt to slip off the wire and therefore frequently break the porcelain. To prevent this, I file a notch in the middle of the screw-driver end as shown. This notch serves to hold the driver from slipping off and it therefore guides the wire more easily and quickly around the screw.

S. B. Trunkat.

Convenient Commutator-Slotting Tool.

A convenient little tool for undercutting mica between commutator bars is shown in the accompanying sketch. It can easily be made from one-half-inch half-round iron which will form



Home-Made Commutator Slotter.

a strong and comfortable handle. The piece of hack-saw blade is held between the two sides by two flat-head screws.

R. L. Hervey.

Reducing Bushings Made on the Job.

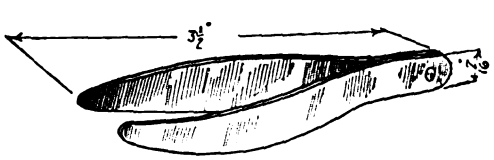
A great many electricians do not know that they can make a good serviceable reducing bushing from an ordinary coupling. It is possible to make a three-quarter to one-half-inch bushing from a one-half-inch coupling by cutting a three-quarter-inch thread on the outside of the coupling. In the same way a one to three-quarter-inch bushing can be made by threading the outside of a three-quarter-inch coupling. This scheme enables one to use a larger Condulet, Adaptibox or other fitting, than possible otherwise and also to change from one size conduit to another by means of these reducing bushings.

Charles Rubner.

How to Make a Pair of Tweezers.

Procure an old hack-saw blade and break it in two, using the pieces that already have the holes in the ends. Grind all the teeth off and taper somewhat, as shown in the sketch. Then rivet the two pieces together, after which the points, if necessary, can be bent a little towards each other. A good length would be about 3.5 inches long by seven-sixteenths inch wide.

F. A. Grohsmeyer.



Tweezers Made from Hack-Saw Blade.

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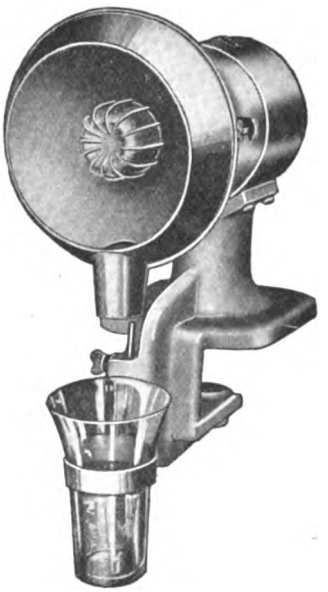
NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Electric Lemon Squeezer.

Thomas Mills & Bros. Company, Philadelphia, Pa., has recently developed the electrically operated fruit-juice extractor illustrated. This outfit is suitable for restaurants, soda fountains and other places where it is necessary to extract the juice from large numbers of lemons or oranges.



Motor-Driven Fruit-Juice Extractor.

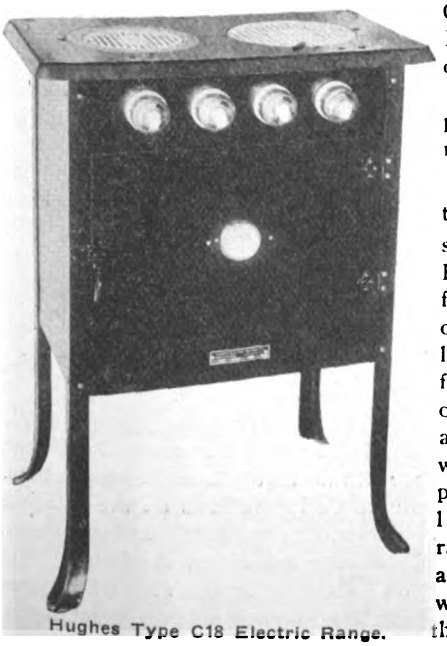
It consists of a motor-driven hemisphere provided with ribs similar to the ordinary hand-operated glass extractor. The lemon or orange is halved and held against this hemispherical part. The juice is caught in a deflector at the back and runs down through a spout at the bottom.

A clamp is provided for attaching the outfit to a table or counter and a ring is attached below the spout to support the glass.

The outfit is equipped with 0.1-horsepower universal motor made by the Robbins & Myers Company, Springfield, O.

New Inexpensive Types of Hughes Electric Ranges.

Purely through a popular demand which grew so large that it had to be recognized, the Hughes Electric Heating Company, Chicago, Ill., has brought out four new models of lower-priced electric ranges.



Hughes Type C18 Electric Range.

In many localities the central stations and the Hughes salesmen found that the cost of the standard line was too high for certain classes of the inhabitants and that there were great sales possibilities in a lower-priced range. In accordance with this waiting business, the Hughes company is now manufacturing a new line of all-black-enameled ranges which are much lower in cost, owing to the omission of fancy nickel-plated legs and trimmings, white-enameled splashers and other costly features. Another reason why these ranges can be priced so much lower is because their legs are not cast but formed from angle iron.

The lowest-priced range of this new line is the type C 18, which sells for $39.50. This range has a two-burner cooking surface, one unit with a maximum of 1,500 watts, the other 880; it also has a two-burner oven, each unit having a maximum of 880 watts.

The highest-priced stove of this group is the type C 4, which is of the cabinet type and sells for $70.00. It has a three-burner cooking surface, two-burner oven, an elevated warming shelf and a large open lower shelf. The maximum loads of the cooking burners are 1,500, 1,100 and 880 watts, and of the oven burners 1,100 watts each. The two other types vary in design and capacity between the small and the larger ranges illustrated.

To give some idea of the popularity of this inexpensive all-black-enameled line, 42 of the C 4 type were sold last week for installation in the new Imperial Arms Apartments in Portland, Ore. There is no doubt but that these ranges exactly meet the needs of thousands of housewives who are more interested in the utility, convenience and wholesome cooking qualities of electric ranges than in showy appearance of these appliances. These new Hughes ranges, from the electrical and cooking standpoints, embody the same high standards that have given Hughes electric ranges their excellent reputation.

Hughes Type C4 Electric Range.

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Improved Disk-Strain and Pin-Type Insulators Invented by Louis Steinberger.

Because of the rapid increase in power transmission through high-tension lines special interest attaches to some radical improvements in the design and construction of disk-strain and pin-type insulators which have recently been invented and patented by Louis Steinberger, president and general manager of the Electrose Manufacturing Company, Brooklyn, N. Y. A few typical designs embodying these inventions are shown in the accompanying sectional illustrations.

A simple form of disk-strain insulator is shown in Fig. 1. It will be observed that the insulating portion in this case consists of two smooth outwardly flaring disks which are united in the body portion of the insulator so as to form an integral insulating body completely inclosing the mechanical strain members. The latter are metallic and are arranged to interlock so as to form an extremely strong structure, such that even though the insulation were totally destroyed the line could not fall to the ground. The outer ends of the strain members, in this case shown as eyes, can be unscrewed and replaced by clevises, threaded studs, sockets, etc., to meet special requirements. Between the inner metallic strain members, and completely insulating them from each other, is an insulating filler made of fireproof composition with very high dielectric qualities.

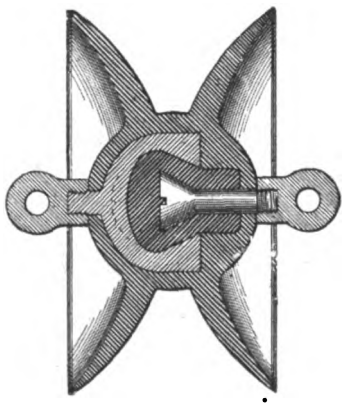

Fig. 1.—Section of Disk-Strain Insulator with Plain Disks.

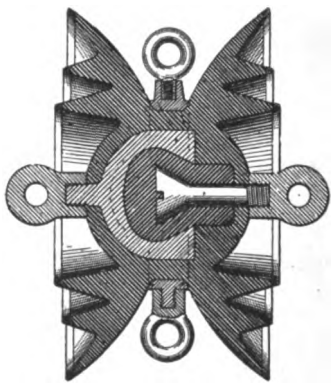

Fig. 2.—Section of Strain Insulator with Collars on Disks.

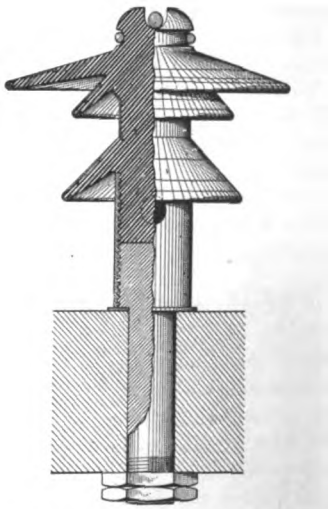

Fig. 3.—Partial Section of Pin-Type Insulator with Improved Pin Mounting.

Where it is desired to use a strain insulator on a line of much higher potential than that suited for the type of insulator shown in Fig. 1, the construction shown in Fig. 2 is employed. It will be observed in this view that the interior construction is similar to that already described. The chief feature of the latter modified type is that the disks are provided on their outer surfaces with outwardly extending ridge-like rings or collars, the whole being molded into a unitary structure. The object of these intermediate rings or collars is to increase the length of path between the ends of the strain members, thus making the device especially adapted to extremely high voltages. The design shown in Fig. 2 also shows that it is surrounded in the middle between the disks by a metallic ring to which are secured several eyes. This construction may be used for supporting arc lamps, etc., or where it is necessary to brace the strain insulator in several lateral directions.

A most important feature of these insulators is that the peripheral edges of the disks, and the outward edges of the intermediate rings or collars shown in Fig. 2, are provided with metallic annular shield rings. These serve to equalize the dielectric stresses and they also provide a convenient path for arcs, thus permitting the easy and quiet dissipation of their energy. These metallic shield rings also serve as elements of a condenser and thereby secure a uniform distribution of the electrostatic field about the insulator. In the case of abnormal electrical discharges, these shield rings also prevent puncturing the insulator, this being done without reducing the effective line insulation.

This capacity effect is also embodied in the design of the pin insulator shown in Fig. 3. Each of the flaring disks or petticoats is provided with metallic annular shield rings and the upper surfaces of these flanges have imbedded in them similar conducting shield rings. These various shield rings serve to dissipate thoroughly and rapidly any abnormal charge that tends to travel from the line conductor in the upper groove downward to the pin. These shield rings are arranged so that the discharge must pass over the surface of the flanges instead of through the body of the flanges or the insulator. They likewise serve to uniformly distribute the electrostatic field. The general theory of this design is that these shield rings provide an interrupted conducting path from the line to the ground which consists of alternate ring sections of extremely high and low resistances, the latter serving to distribute the charge and therefore to protect the insulator from injury due to confinement of the charge to a narrow path, while the portions of high resistance provide the high impedances to the passage of normal line current which is necessary to prevent grounding the line itself. These metal shield rings also serve to give greater mechanical strength to the insulators themselves.

Another very important characteristic of this type of pin insulator is the improved mechanical construction of its support. It will be observed from the sectional view that the pin does not penetrate the insulating body of the insulator itself but ends at the base of this body. The lower portion of the insulating stem is molded within a metallic sleeve, which also surrounds the top of the pin and gives great mechanical strength, without reducing the high dielectric strength of the insulator.

Motor Application to Bottle-Filling and Corking Machine.

The Standard Automatic Machine Company, Rochester, N. Y., has developed a machine that fills and corks bottles. One operator places the bottle in the jaws on the rotating part of the machine. This moves the bottle under a pump, which delivers a fixed amount of liquid to the bottle. The bottle is then carried on past another operator who places a cork in its neck and this is driven into place by a

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mechanism through which the bottle passes. The jaws holding the neck of the bottle are then opened and the bottle slips onto a chute or conveyor on which it is carried away. The machine is unusual in that it combines both filling and corking in one mechanism and each bottle receives an accurate amount of liquid.

This machine is designed to operate at a number of different speeds to adjust for the capacity of the bottle, the number of pumps used, and the speed of bottling desired. It is equipped with a one-horsepower direct-current adjustable-speed Westinghouse motor.

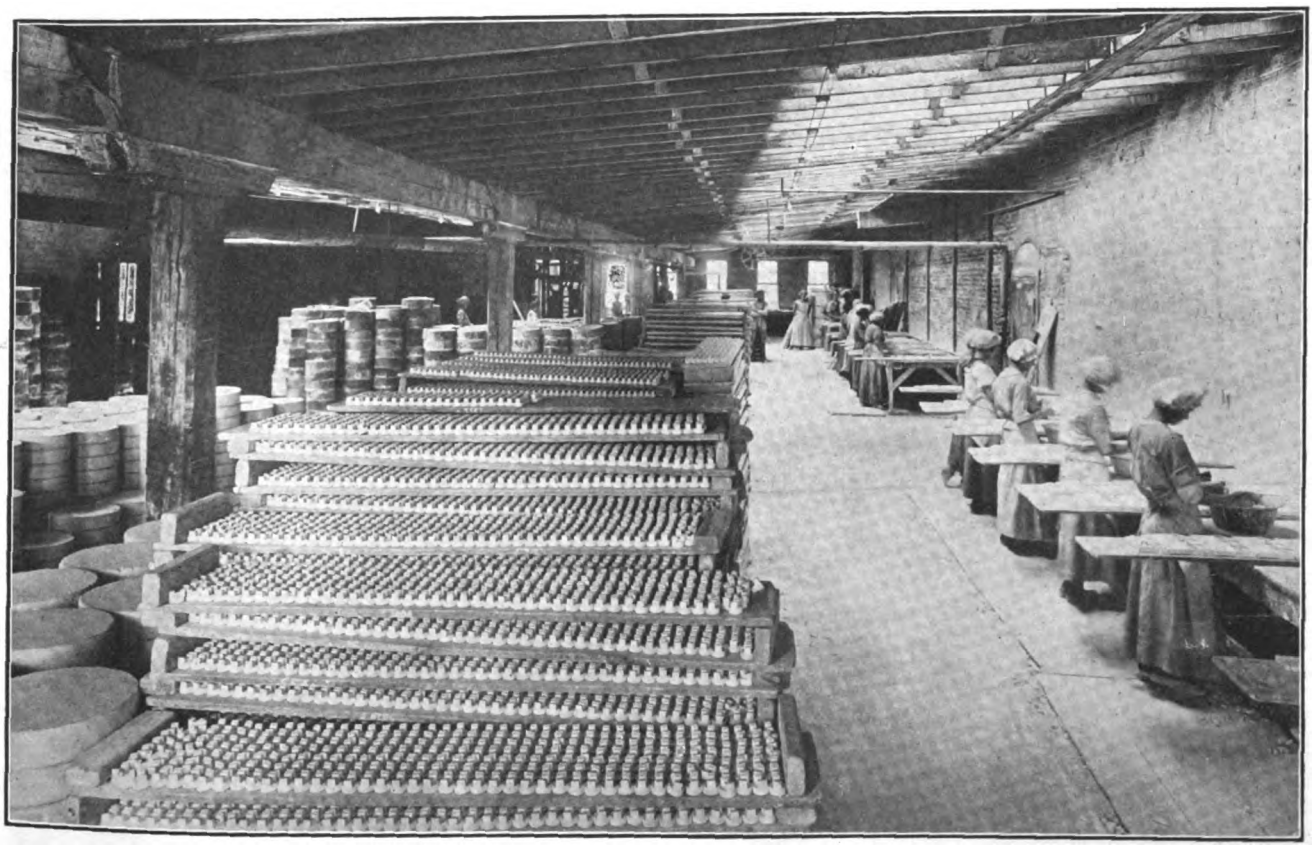
Hospital Finds Novel Use for Electric Heater.

The Saint Mark's Hospital, of Salt Lake City, Utah, has a set of four dumb waiters running from the basement to the first, second and third floors carrying food from the kitchen to the various wards. Great difficulty was encountered in keeping the food warm from the time it left the kitchen until it arrived at its destination.

Mr. Chadron, general manager of the hospital, gave the problem careful study and finally designed and had built seven portable wagons. Each of these wagons accommodates 26 trays and is arranged with sliding doors that make the outfit practically air-tight. A Western Electric navy-type air heater is mounted on the bottom of the wagon with a cord and plug attachment capable of being connected ten feet away from the wagon. An hour before each meal the various heaters are connected to a source of electric current so that at mealtime the interiors of the wagons are satisfactorily heated. After the wagons are loaded with the trays of food, the heaters are disconnected and the whole contrivance is placed on the elevator and raised to its destination where the heater is again connected to the current supply and keeps the food hot.

Electrically Heated Food-Tray Wagon for Hospital.

The new system is in constant operation and it is found to work perfectly. The food is served to the patients quite as warm and palatable as when it left the kitchen range. The installation has been the object of favorable comment in hospital circles.



View in Dipping Room of The Findlay Electric Porcelain Company's Factory.

The many uses of porcelain in the electrical industry have resulted in bringing the manufacture of electrical porcelain to a very highly developed point. A great deal of study has been given to the properties of porcelain for insulating purposes and to the influence thereon of manufacturing methods. From these studies manufacturers have profited greatly and notably The Findlay Electric Porcelain Company, whose factory at Findlay, O., covers several acres and includes several departments. Above is shown a view in a department known as the dipping room, in which the glaze is applied to the ware. In the foreground can be seen stacked on drying boards several thousand Buckeye patented reversible split knobs for which the company owns the exclusive manufacturing rights. The company also manufactures the Findlay patented interchangeable self-centering split knob and a complete line of standard electric porcelain products of the highest grade. There are also facilities for making special porcelain according to special drawings and specifications.

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INDUSTRY ACTIVITIES

The Borden Company, Warren, O., has published a 16-page catalog on "Beaver" die stocks and pipe cutters.

Leeds & Northrup Company, Philadelphia, Pa., has issued Bulletin No. 219-A, on its lamp and scale for use with galvanometers.

The Robert Skeen Electric Works is building a one-story business structure, 100 by 100 feet, at Ninth and Everett Streets, Portland, Ore.

Betson Plastic Fire Brick Company, Rome, N. Y., has issued a mailing folder which illustrates and describes Betson boiler furnace linings.

Christopher Bach, Jr., 192 Broadway, Milwaukee, Wis., is distributing a mailing folder describing an adjustable drill for cutting holes in wall cabinets.

The Pacific Electric Manufacturing Company, switchgear builders, formerly located at 80 Tehama Street, has moved to 827 Folsom Street, San Francisco, Cal.

Producers' Mica Company, 225 East Twenty-second Street, Chicago, Ill., has prepared Catalog No. 15, which gives price lists on mica for insulating and other electrical uses.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Descriptive Leaflet 3896, on pin-type porcelain insulators, and Leaflet 3827, on oil-well motors for pumping on the beam.

General Electric Company has prepared plans for four new buildings as additions to its River and Federal Street works at Lynn, Mass. Three of the buildings are to be used for manufacturing purposes and the fourth will be used for a dispensary.

The Electric Storage Battery Company, Philadelphia, Pa., has purchased a large tract of land adjoining its factory at Nineteenth Street and Allegheny Avenue, and plans are being made for the erection of additional buildings for manufacturing purposes.

Chelten Electric Company, Philadelphia, Pa., has issued its 1916 catalog of electrical specialties. These include several types of wall switches, receptacles, attachment plugs, fuses, switch boxes, etc. The catalog lists and illustrates these and also shows some of the important buildings in which they are extensively used.

Presto Electric Company, of San Francisco, Cal., recently purchased a site in Thirteenth Street, near Chanslor Avenue, Richmond, Cal., and will begin work shortly on a plant for the manufacture of electric appliances, which will cost $45,000, exclusive of machinery. It is expected the plant will be ready for operation about October 1.

Cutter Electrical & Manufacturing Company, Philadelphia, Pa., has issued a circular describing its recent publication on typical I-T-E circuit-breaker installations. The use of I-T-E circuit-breakers in several hundred plants is described and illustrated, the book being about 350 pages, 9 by 11 inches, neatly printed and bound. A limited edition is being distributed.

Calebaugh Self-Lubricating Carbon Company, Incorporated, 1511 Columbia Avenue, Philadelphia, Pa., has recently been receiving numerous pleasing letters from many users of its No-Spark carbon brushes. These users have freely attested to the excellent results obtained with these brushes for motors and generators. Among their improved qualities are sparkless commutation, self lubrication and practically frictionless operation, freedom from rapid wear, large capacity, etc.

Diehl Manufacturing Company, Elizabeth, N. J., has issued bulletin No. 106 on its type-G direct-current motors and generators.

Frankel Connector Company, 177 Hudson Street, New York City, has issued a booklet on its testing clips, spark plugs and solderless electrical connectors.

American Carbon & Battery Company, East St. Louis, Ill., is preparing plans for the erection of a new factory building to be used for the manufacture of flashlights.

Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill., is distributing a large mailing folder descriptive of the last drive in its 1916 campaign on Benjamin "92" sockets.

Deuth & Company, Incorporated, manufacturers and importers of incandescent lamps, announce the removal of their executive offices on June 1 from the Fifth National Bank Building to larger quarters in the Equitable Building, New York City.

Westinghouse Church Kerr & Company, engineers and constructors, 37 Wall Street, New York City, have issued a folder on the construction of the Canadian Pacific Railways at Calgary, Alta, Can. Centralized control in construction work is emphasized in the folder.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., announces that the C-H magnetic gear shift has been adopted by the Premier Motor Car Corporation, of Indianapolis, Ind., and will be standard equipment on new models shortly to be placed on the market by the Premier company.

Domestic Engineering Company.—J. A. High, president and general manager of the Home Electric Light Company, of Boston, Mass., was in Dayton, O., recently in connection with his representation of the Domestic Electric Company's product, "Delco-Light," in the New England States. The Domestic Electric Company, of New York City, will handle the new lighting system in parts of New York and New Jersey.

Western Electric Executive Offices Are Moved.—The executive departments of the Western Electric Company, Incorporated, at New York City, moved on June 5 from 463 West Street to new offices in the Telephone and Telegraph Building at 195 Broadway. The move was made necessary by the steady growth of the company's engineering departments which will occupy the space that has been vacated. The change also brings the executive departments in closer touch with the heart of New York's business district. The patent and the local New York distributing departments, as well as the engineering department, remain at 463 West Street.

Triangle Conduit Company has been incorporated under the laws of New York for the manufacture of armored conductor, flexible steel and non-metallic conduit at its factory established in Brooklyn, N. Y. The officers of the new company are James R. Strong, president; V. C. Gilpin, vice-president; J. E. McAuliffe, treasurer, and Francis W. Russell, secretary. Mr. Strong is well known in the electrical industry through his many activities and through his identification with many trade organizations. Mr. Gilpin and Mr. McAuliffe have been engaged in the manufacture and sale of products similar to those manufactured by the new company and have an extensive acquaintance throughout the country. The office of the company in New York City is at 2010 Broadway.

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PERSONAL AND BIOGRAPHICAL

MR. C. H. KRETZ, who was elected president of the Gas, Electric and Street Railway Association of Oklahoma at the fifth annual convention, held in Oklahoma City, May 23-25, is manager of the Okmulgee (Okla.) Ice & Light Company. He was born in Baton Rouge, La., and was educated at the University of Louisiana and at Cornell University. On completion of his work at Cornell Mr. Kretz was commissioned an engineering officer in the United States Navy with the rank of ensign and served during the Spanish-American war. At the close of the war he became assistant professor of mechanical engineering at the University of Louisiana, remaining a member of the faculty of that institution until 1906, when he accepted the management of the Baton

C. H. Kretz.

Rouge Electric & Gas Company. In 1910 Mr. Kretz became manager of the Beaumont (Tex.) Traction, remaining with that company until 1914, when he accepted his present position with the Okmulgee Ice & Light Company.

MR. ERNEST GONZENBACH has announced his resignation as manager of the Empire United Railways, Syracuse, N. Y., and is preparing to establish a business enterprise in that city. Mr. Gonzenbach was formerly president of the Sheboygan (Wis.) Railway & Electric Company.

MR. A. E. DeMERRITT, representing the Philadelphia Utilities Bureau, has been in Lexington, Ky., where he is making a survey of the electric lighting and power situation, including the plant and books of the Lexington Public Utilities Company, preparatory to a report in connection with the proposed new franchise of the company.

MR. F. H. RICKEMAN, formerly manager of the Interstate Light & Power Company, Galena, Ill., has been appointed sales manager, in which capacity he will have charge of the rapidly increasing demands of the Illinois-Wisconsin zinc mining fields. He has been succeeded as manager by MR. W. L. MILLER, formerly superintendent of construction and distribution of the Northern States Power Company.

MR. H. E. DAWSON recently accepted the position of contract agent for the Metropolitan Electric Company, Reading, Pa. For the past five years Mr. Dawson has been with the Edison Lamp Works of General Electric Company, Harrison, N. J., in advertising and general campaign work.

MR. O. F. ABRAHAMSON, formerly with the Indiana Electric Lighting Company, Columbus, Ind., was recently appointed commercial manager of the Interstate Public Service Company, Indianapolis, Ind. Mr. Abrahamson is a graduate of Armour Institute of Technology and was one of the first graduates of the Chicago Central Station Institute.

MR. JAMES A. GREEN has been appointed vice-president and general manager of the Northern Idaho & Montana Power Company and in this capacity will co-operate with MR. ELMER DOVER, vice-president of H. M. Byllesby & Company, in charge of Pacific Coast properties, and president of the Northern Idaho & Montana Power and Oregon Power companies, in the operation of the Byllesby properties in Montana, Idaho, Oregon and Washington.

MR. J. L. WHITE, formerly manager of the Albany (Ore.) division of the Oregon Power Company, has been appointed superintendent of the Willamette Valley division of the Oregon Power Company comprising the cities of Eugene, Springfield, Albany, Corvallis, Dallas and other communities, and in this capacity will assist MR. ATTILLA NORMAN, vice-president and general manager of the Oregon Power Company, whose duties have been extended to include the Coos Bay (Marshfield) division.

MR. JOHN BAUER, who is connected with the bureau of statistics and accounts of the Public Service Commission for the First District of New York, has been chosen head of the new department in accounting, corporation finance and public utilities at Princeton University. Before joining the bureau in 1914, Mr. Bauer had charge of the department of accounting and elementary economics at Cornell University and acted in a consulting capacity in general accounting, rate and capitalization cases. He will not assume his new position until September, remaining with the commission during most of the intervening time.

MR. THEODORE N. VAIL, president of the American Telephone & Telegraph Company, was one of the distinguished visitors in Chicago during the Republican National Convention, June 7 to 10. Mr. Vail was a delegate from Vermont and was active in all of the meetings. During the week local newspapers published interviews with Mr. Vail and he was the guest of honor at numerous social events during his stay. Other prominent electrical men in attendance at the convention were Newcomb Carlton, vice-president of the Western Union Telegraph Company, and C. C. Adams, vice-president of the Postal Telegraph Company, and N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company.

DR. R. C. MACLAURIN, president of the Massachusetts Institute of Technology, was greatly instrumental in financing the construction of the new Institute buildings described on other pages of this issue. Dr. Maclaurin secured gifts of approximately $9,000,000, and at the same time he carried forward the regular work of the institution. He is a native of Edinburgh, Scotland, and is about 46 years of age. His early boyhood was spent in New Zealand, whence he returned to England for his education. He took the degrees of A. B. and A. M. at Cambridge and on graduation was elected a fellow of St. John's College. Dr. Maclaurin came to this country in 1896 and after studying our educational institutions for a year, accepted the professor-

R. C. Maclaurin.

ship of mathematics in the University of New Zealand, became a trustee and was dean of the law faculty for four years. In 1907 he came to Columbia University as professor of mathematical physics, and a year later was made head of the department. In November, 1908, he was appointed president of the Massachusetts Institute of Technology. Dr. Maclaurin's work for that institution is splendidly exemplified by its magnificent plant.

MR. ROBERT MONTGOMERY, manager of the commercial department of the Louisville Gas & Electric Company, has been elected president of the Advertising Club of Louisville, Ky.

MR. J. C. HUTCHINS, president of the Detroit United Railways Company since 1902, has resigned, and has been made chairman of the board, a newly created position. MR. FRANK W. BROOKS, vice-president and general manager of the company, has been elected president and general manager. Mr. Hutchins stated that his retirement as executive head of the company was brought about by his desire to have a rest.

OBITUARY.

MR. JAMES H. GREEN, who was employed by the Holmes Electric Protective Company for over 50 years, died June 5 at his home in Brooklyn, N. Y., aged 75 years.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

WESTFIELD, ME.—The Westfield Electric Company has been incorporated with a capital stock of $10,000 to construct and operate an electric light and power plant. The incorporators are R. J. Colbath and H. A. Anderson of Mars Hill, Me., and A. C. Frost, of Limestone, Me.

PORTSMOUTH, N. H.—The Rockingham County Light & Power Company, operating an electric-lighting plant in this city and furnishing electricity to various street railway lines in the vicinity, has been authorized by the Public Service Commission to issue $750,000 of negotiable gold bonds secured by a mortgage.

ST. ALBANS, VT.—The Public Electric Light Company proposes to extend its lines to Cambridge, Jefferson and Milton, to provide energy for street lighting and commercial service. A 16,000-volt line is proposed.

MONTPELIER, VT.—Articles of association have been filed creating the Arlington Light & Power Company with a capital stock of $50,000. The proposed corporation is seeking a charter to manufacture and distribute electricity in the towns of Arlington, Sunderland and Sandgate. Otto C. F. Kinum, Schnectady, N. Y., and local men are the subscribers.

RUTLAND, VT.—The Vermont Public Utilities Corporation has purchased the holdings of Ryegate (Vt.) Light & Power Company.

AYER, MASS.—The Ayer Electric Company is negotiating with the town authorities with a view to an enhanced street-lighting scheme.

BOSTON, MASS.—The Boston Edison Company is planning a new generating station near the present L Street station. The first unit will be a 30,000-kilovolt-ampere General Electric turbogenerator, 14,000 volts, and running at 1,800 revolutions per minute. Excitation will be at 250 volts. This will be the first generator installed by the Edison Company for 14,000 volts and it will be its first horizontal machine. Four 1,230-horsepower Babcock & Wilcox cross-drum boilers, designed for 350 pounds working pressure, will be installed in connection. The plant is expected to be ready for operation in the fall of 1917.

BOSTON, MASS.—The Metropolitan Water & Sewerage Board of Boston, which operates a hydroelectric station at the Wachusett dam where the runoff is utilized to produce electrical energy which hitherto has been sold to the Connecticut River Transmission Company, proposes to construct a transmission line to connect this plant with another generating station at the Ludbury dam, which is nearing completion. The distance is 15.5 miles and the plan is to construct a two-circuit underground cable line 700 feet from the Wachusett station and a one-circuit overhead line on expanded steel truss poles the remainder of the distance. The estimated cost is $60,000. The object of the connection is to increase the reliability of the service and to enable energy to be delivered from either station, as most desirable.

GREENFIELD, MASS.—The Greenfield Electric Light & Power Company has asked the Massachusetts lighting commission's approval of consolidation with the Deerfield River Electric Light Company of Conway, and for approval of an issue of 5,000 shares of employees' stock at $10 per share.

LUDLOW, MASS.—The Ludlow Electric Light Company has been granted permission to extend its transmission lines from North Street to East Street. Permission is asked from the Town Board for the erection of a transmission line in Center Street about three miles long.

MANCHESTER, MASS.—Plans are being made here for extensions to the whiteway system on Main Street and there is a possibility that the system will be made to include other business streets.

NEWBURYPORT, MASS.—The Massachusetts Gas and Electric Light Company has approved the issue of 570 shares of new stock, at $130, by the Newburyport Gas & Electric Company, the proceeds to pay for extension of lines into West Newbury and construction begun on the company's new generating station.

NEW IPSWICH, MASS.—City officials are considering a contract with the Derry Electric Lighting Company providing for an electric street-lighting system.

WORCESTER, MASS.—Extensions of the newly improved street-lighting system were recommended by the City Council committee on street lighting. Fourteen luminous arc units are proposed.

NEW BRIGHTON, N. Y.—The Richmond Light & Railroad Company is installing in its power house at Livingston, Staten Island, a 6,000-kilowatt Westinghouse unit, including steam turbine, generators, condenser and pump equipment. The new generator will be air cooled by means of an air washer and pump outfit manufactured by the American Spray Company, 201 Devonshire Street, Boston, Mass., which will have a capacity of 37,000 cubic feet of air per minute.

OGDENSBURG, N. Y.—The St. Lawrence Transmission Company is building a new line at DeKalb Junction to a point near Estella mine in Hermon. DeKalb Junction will be given a 24-hour service. The new line will be connected with the main line from Hannawa Falls.

PERRY, N. Y.—The Perry Electric Company has purchased a site near Federal Street on which a new boiler house will be erected this summer. Plant improvements are also being considered. The plant supplies electrical energy for light and power to Perry, Warsaw, Gainesville and Castle.

PORT JERVIS, N. Y.—The question of the proposed consolidation with the Port Jervis Light & Power Company, the Orange County Lighting Company and the Orange County Power Company is being considered by officials of the three companies. It is expected that there will be a hearing before the Public Service Commission shortly regarding the consolidation, which probably will be effected.

RANSOMVILLE, N. Y.—The Lewiston & Lake Ontario Shore Power Company is constructing a transmission line into this city and will furnish energy for power and lighting.

ROCHESTER, N. Y.—The Rochester Railway & Light Company is installing a new underground conduit system in Atlantic Avenue between University Avenue and Culver Road. It will be necessary to install the conduit through rock for a distance of about 1,000 feet.

WOLCOTT, N. Y.—The Northern Wayne Electric Light & Power Company has made a proposition to install a new lighting system here which will include a number of ornamental standards.

BAYONNE, N. J.—The City Commissioners have signified their intention of awarding a new five-year electric-lighting contract to the Public Service Electric Company. The company agrees to install a new street-lighting system to form a white way along Broadway, and to expend $25,000 during the coming year in replacing its overhead lines with an underground system, and $10,000 a year for ten years following in extensions to this work.

IRVINGTON, N. J.—The Irvington Improvement Association is renewing its former discussions to bring about the installation of a municipal electric-lighting plant.

JERSEY CITY, N. J.—The Board of City Commissioners will install new electrical fixtures at its high service pumping station. Bids for equipment will be called for immediately. Michael I. Fagen is city clerk.

MORRISTOWN, N. J.—The Morris County Traction Company will build a new transformer station at Kenvil, and a new transmission line leading from the plant will be constructed.

PENNSVILLE, N. J.—The Salem-Pennsgrove Traction Company will build a new power plant. Stern & Silverman are the engineers.

BEAVER FALLS, PA.—The Petersville Electric Company has been incorporated to operate in Conoquenessing Borough with a capital of $5,000 by W. S. Craig, J. D. Perrott and others, of Pittsburgh. The company's office will be in this city.

EDDYSTONE, PA.—The Chester and Eddystone Street Railway Company has been granted a charter to operate an electric railway between Eddystone and Chester.

FALMOUTH, PA.—The York Haven Power Company will install a new street-lighting system here.

FRANKLIN, PA.—The French Creek Township Power Company and the Sandusky Creek Township Power Company have been incorporated to operate in the townships of those names with a capital of $5,000 each by J. B. Brooks, M. C. Cornell and Joseph McCormick, of Erie. Offices for the companies will be maintained in this city.

MONTGOMERY, PA.—The local electric-lighting plant was damaged recently when the engine flywheel flew apart. New machinery will be installed as soon as possible.

PHILADELPHIA, PA.—The Atlantic Refining Company will erect a power house at 3144 Passyunk Avenue, to cost about $5,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company is having plans prepared by John T. Windrim for a seven-story office building to be erected at 1004 Chestnut Street adjoining its main office building.

SHEPHERDSTOWN, PA.—The Shepherdstown Light & Water Company has been incorporated with a capital of $40,000 to install and operate electric-lighting and water systems.

WASHINGTON, D. C.—Immediate developments of the water power site at Great Falls on the Potomac River to provide electrical energy for Washington is urged in a report submitted by a committee of the Chamber of Commerce. The committee recommends that a proposal be made to Congress authorizing an investigation of the project.

GAFFNEY, S. C.—A representative of the Southern Power Company has been engaged in securing right of way for the purpose of bringing the company's lines into Gaffney. A site for a substation and right of way from Gaffney to Rutherfordton, N. C., has been secured. The transmission line will be erected by way of Forest City, Caroleen and Rutherfordton and will furnish the mills at those places with electrical energy for power and lighting. The Electric Manufacturing & Power Company at Gaston Shoals on Broad River has been furnishing power to Gaffney for several years and the Southern Power Company's plant is located at the Ninety Nine Islands on Broad River, but several miles farther from Gaffney.

NORTH CENTRAL STATES.

COLUMBUS, O.—The Columbus Railway, Power & Light Company has announced that it will abandon its site for a new power station on the Scioto River, just north of West Broad Street, in view of the fact that the Chamber of Commerce has requested this step, in order that a plan to protect the city from floods may be carried out. The company will probably select another site.

LORAIN, O.—Construction work on a large power plant for the National Tube Company in this city has been commenced. The plant will be equipped with gas engines which will be supplied with gas from coke ovens now under construction.

MADISON, IND.—The iron smokestack of the Madison Light & Railway Company's powerhouse, being replaced by a concrete stack, recently collapsed during building operations.

ALVIN, ILL.—The Alvin Grain & Electric Company has been incorporated with

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a capital of $10,000 by F. M. Yeazel and others and will install and operate an electric-lighting plant here.

CALEDONIA, ILL.—The Illinois Northern Utilities Company is considering an extension of its transmission lines to furnish electric service here.

LITCHFIELD, ILL.—Preparations are being made to rebuild the interlocking plant of the C., C., C. & St. L. Railway in this city. The present switching tower may be replaced by a new one.

WARREN, ILL.—The Warren Light & Power Company has been granted permission by the State Public Utilities Commission to issue $10,500 in notes.

HOWARD CITY, MICH.—The Universal Power Company has filed articles of incorporation and is organized to manufacture gas and develop power facilities in Montcalm and Mecosta Counties. Howard City and Morley are to be the principal cities benefited. The capitalization is $60,000 and J. M. Donahue, George Arnold and G. M. Doty are the incorporators.

MADISON, WIS.—The Capital Interurban Company of Madison has been organized to construct an electric railway from Madison to Janesville, a distance of 42 miles. The capital stock is $10,000, and the incorporators are Gustave Pickhardt, of Milwaukee; E. C. Smith, of Madison, and others.

ODANAH, WIS.—A. E. Appleyard, of Ashland, has purchased the franchises issued to D. U. Parkinson for installing telephone and electric-lighting systems here and will proceed with the erection of the plants.

BEMIDJI, MINN.—An election will be held soon to vote on the question of establishing a white-way system here.

CALEDONIA, MINN.—Plans are being made for the extension of the Root River Lighting & Power system from Spring Grove to this city.

MINNEAPOLIS, MINN.—It is reported that the Minneapolis General Electric Company is preparing plans for a substation at 930 Hennepin Avenue, to cost approximately $7,000.

SAUK CENTER, MINN.—The Minnesota Light & Power Company, of St. Cloud, has recured an option on the plant of the Central Minnesota Power & Milling Company, of this city, according to reports.

WABASHA, MINN.—The Wisconsin-Minnesota Light & Power Company, of Eau Claire, Wis., has commenced the construction of a transmission line to this place.

ANTHON, IOWA.—Bonds in the sum of $20,000 have been voted for the establishment of a municipal electric-lighting plant.

ELVINS, MO.—The Missouri Public Utilities Company, of Cape Girardeau, has been granted a franchise to install and operate an electric-lighting plant here.

MARSHALL, MO.—At an election to be held June 26 a bond issue of $75,000 will be voted on. If the issue is authorized the proceeds will be used to erect an electric-lighting plant or to purchase the present plant.

MT. VERNON, MO.—C. A. Moore, engineer, Frisco Building, Joplin, Mo., is preparing plans for improvements to the electric-lighting and waterworks systems.

SPRINGFIELD, MO.—The St. Louis & San Francisco Railroad Company, which has generating plants at both its south side shops and its new shops, has contracted with the Springfield Gas & Electric Company to supply all the energy to be used at its Springfield shops, stations and offices. A month ago the railroad began purchasing energy for mill and boiler shops at its new location, and the latest contract includes the other shops.

ALMENA, KANS.—The local electric-lighting plant was recently destroyed by fire. Plans are being made to rebuild.

HERINGTON, KANS.—Plans are under way for the installation of a white-way system in the business district here.

HESSTON, KANS.—The Commercial Club is devising ways and means to secure an electric-lighting system here.

HUTCHINSON, KANS.—Materials for the new transmission line to be built by the United Water, Gas & Electric Company northeast through Inman and Medora have been ordered and work on the erection of the line will soon be commenced.

MOUNDRIDGE, KANS.—City officials are considering plans for establishing a street-lighting system here.

WILLOWDALE, KANS.—Weiser & Albers are planning to install electric-lighting and ice plants here.

CAVOUR, S. D.—The Commercial Club is considering ways and means for the installation of a municipal electric-lighting plant.

WOONSOCKET, S. D.—Plans are being made to install an ornamental lighting system in the business district.

ANAMOOSE, N. D.—N. J. Walper, owner of the local electric lighting plant, is preparing to make a number of plant extensions. Additional generating equipment has been ordered and 24-hour service will be given.

CLEVELAND, N. D.—Ways and means for securing an electric-lighting system for this city are being considered.

LANKIN, N. D.—An election will soon be held to determine the question of issuing bonds for the installation of a municipal electric-lighting plant.

NECHE, N. D.—Plans are being considered here for the installation of an electric-lighting plant. Alex Rabowski, of Cherokee, Iowa, is preparing to install the plant.

DATES AHEAD.

Michigan Section, N. E. L. A. Annual convention cruise, Steamer *Arizona*, June 18-22. Secretary, Herbert Silvester, Rochester, Mich.

Tri-State Water and Light Association. Annual convention, Isle of Palms, S. C., June 21-23. Secretary, W. F. Stieglitz, Columbia, S. C.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Cleveland, O., June 22-23. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

Electrical Contractors' Association of Pennsylvania. Annual convention, Wilkes-Barre, Pa., June 21-22. Secretary, M. G. Sellers, 1518 Sansom Street, Philadelphia, Pa.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Secretary, C. A. Littlefield, Irving Place and Fifteenth Street, New York City.

Association of Iron and Steel Electical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

SOUTH CENTRAL STATES.

LEXINGTON, KY.—The new franchise drafted for the city by the Utilities Bureau, of Philadelphia, has been received and will be offered to the Lexington Utilities Company after it has been submitted to the city administration. The present franchise expires on August 10. A proposed franchise submitted two years ago to the people was defeated at a referendum.

MARION, KY.—Pending dissolution of the Marion Light & Ice Company is announced by S. M. Jenkins, president.

OWENSBORO, KY.—The Kentucky Electrical Company is asking for prices on a milling machine, a 24-inch lathe and a small four-spindle drill press.

PROVIDENCE, KY.—Members of the local Board of Public Works have resigned their offices, leaving construction of the municipal lighting plant under the supervision of Judge J. M. Reynolds.

DANDRIDGE, TENN.—The Dandridge Power & Light Company is again furnishing service to the city and is preparing to make a number of plant extensions.

JONESBORO, TENN.—The Jonesboro Supply House is in the market for used motors with a capacity of one or two horsepower.

KNOXVILLE, TENN.—The city has awarded to the Knoxville Railway & Light Company, at $9,000, the contract for installing the white-way system in the business district.

MEMPHIS, TENN.—A. B. Amos, of Little Rock, Ark., president of the Askansas Hydroelectric Development Company, is in this city to study the problem of transmitting electrical energy to Memphis and West Memphis. His company has undertaken the development of a water power site on the Little Red River and it is expected that enough power will be developed sufficient for supplying a number of municipalities near Little Rock.

JASPER, ALA.—The holdings of the Jasper Water, Light & Power Company have been purchased by the Alabama Power Company. The latter company will erect a transmission line from Magella to this city and energy will be supplied from the company's main transmission system.

MAGNOLIA, MISS.—The plant of the Magnolia Electric Light Company has been purchased by the McComb, Magnolia Light & Railway Company. The latter company is obtaining right of way for a suburban line which will connect Magnolia, Fernwood, McComb and Summit.

MONROE, LA.—Plans are being prepared by W. G. Kirkpatrick, engineer, Jackson, Miss., for rebuilding the electric-lighting plant here.

NEW WILSON, OKLA.—The city recently rejected all bids submitted for the construction of electric-lighting and water plants. Plans and specifications were prepared by the Benham Engineering Company, Oklahoma City, and included all equipment. Bids will be advertised for again.

TULSA, OKLA.—The Tulsa Interurban Railroad Company has financed its proposed interurban electric railway that is to be built between Tulsa and Wagoner, according to H. D. Pattee, the promoter of the project. The line will be 37 miles long and will run via Broken Arrow. The project involves the construction of an electric power station.

EL PASO, TEX.—Materials have been assembled at Fort Bliss for the erection of a radio station which will have a power plant of sufficient capacity to make communication with all border signal service camps.

MARBLE FALLS, TEX.—The National Hydro-Electric & Construction Company, which began the construction of a dam across the Colorado River at this place several years ago as a preliminary step towards the building of a large hydro-electric plant, has succeeded in financing the project and will carry it to early completion, according to the announcement of C. H. Alexander, of Dallas, president of the company. Mr. Alexander is negotiating with the City Commission of San Antonio with the view of furnishing that city with 20,000 horsepower. High-tension transmission lines will also be built to other cities and towns in this part of the state.

SAN BENITO, TEX.—The San Benito & Rio Grande Railroad is to be extended from its present terminus at Los Indios to Harlingen.

SAN ANTONIO, TEX.—The Houston, Richmond & Western Traction Company is placing contracts for materials for the construction of its proposed interurban electric railway that is to run between San Antonio and Houston. The contract for the construction of the electric power station will be awarded soon, it is announced. Captain Ed Kennedy is president.

SOUR LAKE, TEX.—The Sour Lake Ice, Light & Power Company has been incorporated with a capital of $50,000 by F. H. Carpenter, A. H. Tarver and T. F. Cruse.

WESTERN STATES.

BUTTE, MONT.—Articles of incorporation have been filed by the Montana Power Construction Company, naming capitalization of $50,000 and incorporators as Henry F. Kroyer, Stephen P. Hogan and M. E. Buck. Butte is given as principal place of business, and company announces intentions of constructing dams, reservoir and canals for the generation, storage and transmission of gas and electricity.

HYSHAM, MONT.—Bonds have been voted for the establishment of electric-lighting and water systems in this city and bids have been submitted by several contractors.

LEWISTOWN, MONT.—It is reported that the Montana Power Company plans the extension of its power transmission lines to Judith Gap and nearby territory. The plan has for its object the construction of a circle of power lines from Lewistown to Moore, to Judith Gap, to Harlowton and thence to Twodot.

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AULT, COLO.—An electric-lighting system will be installed here if the plans of G. H. Sethman, of Denver, are approved by the Town Board.

PUEBLO, COLO.—The Arkansas Valley Railway, Light & Power Company has ordered a 1,500-kilowatt frequency changer for installation in its power plant here. Transmission line poles between Crowley and Manzanola have been set and construction work is being done on the line to Olney Creek, after which the work of building a new line from Holbrook to Cheraw will be commenced.

ALAMOGORDO, N. M.—The formal transfer of the properties of the Alamogordo Light, Power & Water Works Company to the town of Alamogordo for a total consideration of $300,000 has just taken place. Improvements will be made to the electric-lighting and waterworks plant.

GLOBE, ARIZ.—The Globe Light & Power Company is preparing to add another complete generating unit to its electric light and power plant.

BOISE, IDAHO.—The American Smelting & Refining Company, which recently purchased the North Star and Triumph group of mines, has signified its intention of having a power line constructed from Hailey to the mines in order to use electricity in their operation.

COEUR D'ALENE, IDAHO.—The Washington Water Power Company has closed a contract with William Shannon, manager of the Four Timbers Mining Company, for the extension of its transmission lines to the mine.

COEUR D'ALENE, IDAHO.—The City Council recently passed an ordinance providing for an election to determine whether $280,000 in bonds will be issued for a municipal light and water plant, and A. Cook, manager of the Panhandle Abstract Company, has applied to the Supreme Court for an alternative writ of prohibition, asking the City Council to refrain from putting into effect the ordinance. The Consumers Company, which now supplies the city, offered to sell the local utilities, but the proposal was declined.

POCATELLO, IDAHO.—The City Council has created improvement district No. 15, which includes practically all the business and residential districts of the city, and has planned to install a new lighting system. A large number of ornamental standards is proposed. The estimated cost of the improvements is over $70,000.

POMEROY, WASH.—The Civic Improvement Club has agreed to contribute $700 toward the installation of cluster lights on Main Street, the cost of which would be about $1,800.

SPOKANE, WASH.—The establishment of a power plant is contemplated by the introduction in the Senate of a bill authorizing the Secretary of War to grant John E. Sherwood, of this city, the right to overflow certain lands in the Fort George Wright military reservation.

TACOMA, WASH.—The Tacoma Railway & Power Company has applied to the County Commissioners for a franchise to erect a power line along Lincoln Avenue on the tide flats.

HOMESTEAD, ORE.—It is reported that the Idaho-Oregon Power Company plans the construction of transmission lines to the Irondyke and Homestead mines to supply energy for the operation of electrical equipment which will be installed.

PORTLAND, ORE.—Bids for the installation of electric wiring and fixtures in the new auditorium under construction will be received by A. L. Barbur, City Auditor, at an early date. Plans for the installations are being prepared by Whitehouse & Fouilhoux, architects, Wilcox Building, Portland.

RIDDLE, ORE.—A. E. Frais has filed his formal acceptance of the franchise for establishing in Riddle an electric light and power system, and actual construction work will commence shortly.

BAKERSFIELD, CAL.—Lighting Expert Dickinson has submitted plans for the proposed electrolier system covering the downtown business district. His plans call for 149 lighting standards, and he estimates the total cost of installation at $28,310.

BERKELEY, CAL.—The Regents of the University of California have taken under advisement bids for furnishing and installing lighting fixtures in the library building on the campus. The bids ranged from $17,446 to $29,933 on one proposition, and from $11,653 to $17,546 on the other proposition.

FULLERTON, CAL.—Surveyors are mapping out right of way for the proposed extension of the Pacific Electric Railway from Brea to Fullerton.

QUINCY, CAL.—The Great Western Power Company is said to have purchased the reservoir site, ditches and water rights of the Oro Electric Corporation in Humbug Valley and along Yellow Creek to the north fork of the Feather River, where the Oro company had acquired a site for a power plant. It is understood the property will be used by the Great Western in the development of a series of power plants, the ultimate construction cost of which will be approximately $25,000,000, according to officials of the company.

LOS ANGELES, CAL.—The Board of Public Works is taking bids for lighting the East Hollywood District from July 1 to December 31, 1916.

LOS ANGELES, CAL.—The City Attorney has been authorized to institute proceedings in the Superior Court to acquire by condemnation a right of way over certain property for the purpose of constructing an electrical transmission line from a point in Inyo County to a point in Los Angeles County.

OAKDALE, CAL.—The Sierra & San Francisco Power Company suffered a loss estimated at $20,000 in a recent fire at its plant at the new Strawberry dam.

TULARE, CAL.—The Merchants Association has submitted a proposition to the property owners in the business district to install an electrolier system at a cost of 27 cents a front foot, the merchants to furnish the energy.

VENTURA, CAL.—Work is to begin shortly on the construction of two new substations here for the Ventura Light & Power Company.

Proposals

SIGNAL SUPPLIES.—Sealed proposals will be received at the office of the Chief Signal Officer, United States Army, Washington, D. C., until June 23, for furnishing metal T. I. bell boxes, transfer switch boxes, covers for pit firing signal box, T. I. switch panels, zone signal bells, etc.

LIGHTING FIXTURES.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m., June 28, 1916, for furnishing and installing lighting fixtures in the United States post office, custom house, and court house at Hilo, Hawaii. See proposal columns for details.

ELECTRICAL SUPPLIES.—Bids will be received until July 12 by the village of Keewatin, Minn., for the following material: Ten 14-foot cast-iron standards, 2,400 feet of 1.25-inch iron conduit, 34 90-degree bends, and 12 couplings; 2,400 feet of No. 6 lead-covered cable, tested at 5,000 volts; and 10 Lundin cutouts. C. W. Extrum, village clerk.

ELECTRICAL CONSTRUCTION.—Separate bids will be received until June 26 by G. W. Orr, secretary of the board of education, Lake Linden, Mich., for the electrical work, telephone system, and clock and signal system for a new high school at Lake Linden. Plans and specifications may be secured from J. D. Chubb, architect, 109 North Dearborn Street, Chicago, Ill.

LIGHTING SYSTEM.—Sealed proposals will be received June 30 for furnishing the necessary labor and material for a complete new lighting system for the streets, alleys, public buildings and public places at Washington, O., and to consist of approximately 41 100-candlepower bracket or center-suspension lamps and 36 250-candlepower bracket or center-suspension lamps with refractors. James J. Flynn, Clerk of the Board of Service-Safety Directors, Washington, O.

ELECTRIC ELEVATOR.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., at 3 p. m., July 5, for the installation complete of a new electric passenger elevator, including certain alterations, in the United States post office, courthouse, etc., at Troy, N. Y., in accordance with the drawing and specification, copies of which may be had at that office in the discretion of the Supervising Architect. James A. Wetmore, Acting Supervising Architect.

PANAMA CANAL SUPPLIES.—Sealed proposals will be received at the office of the general purchasing officer of the Panama Canal, Washington, D. C., until June 28, for furnishing, by steamer free of all charges, on dock at either Colon (Atlantic port) or Port of Ancon (Balboa, Canal Zone) (Pacific port), Isthmus of Panama, cast-iron lamp posts, base sockets, porcelain receptacles, transformers, panelboards, lighting fixtures, electrical attachments, conduit and fittings, electric cable wire, insulating tape, pipe-bending machines, cable-reel wheels, etc. Information regarding this circular (No. 1049) can be obtained at the above office or at offices of assistant purchasing agents: 24 State Street, New York City; Fort Mason, San Francisco, Cal., and 614 Whitney Building, New Orleans, La.

Financial Notes

The Eastern Oregon Light & Power Company, of Baker, Ore., has decreased its capital stock to $1,843,500.

Edison Electric Company, of Los Angeles, a subsidiary of Southern California Edison Company, has called for redemption September 1, $100,000 of its first and refunding bonds at 110 and interest.

The Massachusetts Gas and Electric Light Commission has approved an issue of 11,800 shares of common and 10,000 shares of $10 employees' stock by the Turners Falls Power & Electric Company.

It has been reported that the United Railroads of San Francisco is to shortly petition the California Railroad Commission for sanction to another bond issue by which all the bond issues will be gathered up in one mortgage.

The May gross earnings of Edison Company of Boston, were $657,660, an increase of $81,720, or 14.19 per cent over the corresponding month a year ago. In eleven months ended May 31, gross earnings were $7,667,090, an increase of $797,257, or 11.61 per cent over the same period last year.

Union Light, Heat & Power Company has called for payment, at 105, on September 1, through the State Bank, of Chicago, all its outstanding first-mortgage five-per-cent bonds due September 1, 1932. The company is a subsidiary of the Northern States Power Company of Minnesota, and the calling of the bonds is a part of the plan for consolidating the funded debts of all subsidiaries of the Northern States Power organization.

The California Railroad Commission has issued an order authorizing the Corona (Cal.) Gas & Electric Company to execute a mortgage on its properties as security for an issue of $58,500 six-per-cent 50-year bonds, and to issue these bonds. The proceeds from the sale are to reimburse the company for expenditures for additions and betterments, $33,339; to liquidate indebtedness owing the Nevada-California Power Company, $18,850; and to the Southern Sierras Power Company, $422.

The Santa Barbara (Cal.) Gas & Electric Company has been authorized by the Railroad Commission to issue $1,000,000 face

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 12.	June 5.
American Tel. and Tel. (New York)	129⅞	129½
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery common (Philadelphia)	65	64½
Electric Storage Battery preferred (Philadelphia)	65	64½
General Electric (New York)	171½	168½
Kings County Electric (New York)	130	130
Massachusetts Electric common (Boston)	6	6
Massachusetts Electric preferred (Boston)	34½	34
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	123	122
New England Telephone (Boston)	134½	134
Philadelphia Electric (Philadelphia)	27½	27⅞
Postal Telegraph and Cables common (New York)	81	80½
Postal Telegraph and Cables preferred (New York)	68¼	68
Western Union (New York)	94	94⅛
Westinghouse common (New York)	61¾	61¼
Westinghouse preferred (New York)	73	70

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value five-per-cent first-mortgage bonds, at not less than 91, under a deed of trust to the Los Angeles Trust & Savings Bank. Of the bonds, $210,000 will mature serially at the rate of $10,000 a year from 1920 to 1940 and the remainder in 1941. From the proceeds of the sale, $884,625 is to be expended to retire the company's outstanding issue of $824,500 of bonds at 105, and $25,375 to reimburse the company for capital expenditures made from income.

Narragansett Electric Lighting Company, of Providence, has purchased from Bodell & Company the controlling interest in the Westerly Light & Power Company, the latter firm having been in control of the Westerly property since 1912. The Narragansett company paid $95 a share for the stock and the same price is offered minority stockholders for a limited period. By the acquisition of the Westerly company Narragansett Lighting obtains control of the entire electric lighting and power situation south of Providence in Rhode Island and in southeastern Connecticut. The company pays dividends at the rate of five per cent on both its preferred and common stocks.

American Railways Company, controlled by National Properties Company, has advised the Public Utility Commission of New Jersey that it has acquired, subject to the approval of the commission, all the capital stocks of the Electric Company of New Jersey, the Penns Grove Electric Light, Heat & Power Company, the Woodstown Ice & Cold Storage Company, the Clementon Township United Electric Improvement Company and the Williamstown Electric Company. All the stocks of the companies are now under contract to purchase and in case approval is granted for their acquisition the companies will be consolidated, and the capital stock of the new company held by American Railways Company.

Dividends.

	Term.	Rate.	Payable.
Am. Pub. Utilities	Q	1.5 %	July 1
Buffalo Gen. Elec., com.	Q	1.5 %	June 30
Cal. Ry. & Pw., prior pf.	Q	1.75%	July 1
Cent. States Elec. Corp., pf.	Q	1.75%	July 1
Col. Elec., pf.	S	$3.00	July 1
Col. Ry., Pw. & Lt., Series A	Q	1.5 %	July 1
Col. Ry., Pw. & Lt., prior pf.	Q	1 %	July 1
Consum. Elec. Lt. & Pw., pf.	Q	1.75%	June 30
Dayton Pw. & Lt., pf.	Q	1.5 %	July 15
Duluth-Sup. Trac., pf.	Q	1 %	July 1
Eastern Pw. & Lt. Corp., pf.	Q	1.75%	June 15
Eastern Tex. Elec., pf.	S	$3.00	July 1
Eastern Tex. Elec., com.—		$2.00	July 1
Elec. Lt. & Pw. of Abington and Rockland	S	$4.00	July 1
Elec. Stor. Batt., pf.	Q	1 %	July 1
Elec. Stor. Batt., com.	Q	1 %	July 1
Elec. Secur. Corp., pf.	Q	1.5 %	Aug. 1
Elec. Secur. Corp., com.	Q	2 %	July 1
Ill. Traction, pf	Q	1.5 %	July 1
Inter. Rap. Tran.	Q	5 %	July 1
Montreal Lt., Ht. & Pw.	Q	2.5 %	Aug. 15
Niagara Falls Pw.	Q	$2.00	July 15
No. Ont. Lt. & Pw., pf.	S	3 %	July 15
Springfield Ry. & Lt., pf.	Q	1.75%	July 1
United Trac. & Elec.	Q	1.25%	July 1

Reports of Earnings.

J. G. WHITE COMPANIES.

The annual report of the J. G. White Companies, which includes J. G. White & Company, the J. G. White Engineering Corporation and the J. G. White Management Corporation, has been issued. The amalgamated balance sheet of the companies for the fiscal year ending December, 31, 1915, is as follows:

Good will, contracts, purchase of business, etc.	$1,515,540.19
Securities owned and syndicate participations	2,512,245.60
Bills receivable	346,560.60
Accounts receivable	475,453.18
Interest and dividends accrued	5,382.42
Deferred charges and sundries	11,876.27
Cash in banks and on hand	543,339.74
Working capital and cash in branch offices	10,621.51
Total assets	5,421,019.51
Common stock issued	1,500,000.00
Preferred stock issued	2,790,900.00
Bills payable	325,000.00
Accounts payable	147,416.32
Sundry stockholders for dividends on preferred stock	53,840.75
Surplus or undivided profits	603,862.44

NEW ORLEANS RAILWAY & LIGHT.

New Orleans Railway & Light Company, a subsidiary of American Cities Company, reports as follows for the three months ended March 31, 1916:

	1916	1915
Gross earnings	$1,835,159	$1,807,061
Net after taxes	724,393	732,947
Balance after miscellaneous deductions and underlying charges	562,225	578,880
Net income after interest on other bonds and notes	261,577	290,478
Surplus after renewal and depreciation reserves	203,474	244,288

Electrical Patents Issued June 6, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,185,630. Motor-Truck. W. C. Carr, assignor to Automatic Transportation Co., Buffalo, N. Y. Mounting and gearing of motor on three-wheel truck.

1,185,635. Automatic Telephone-Exchange System. G. Deakin, assignor to Western Electric Co., New York, N. Y. Selective ringing on party line.

1,185,645. Attachment for Converting Oil Lamps into Electric Lamps. J. H. Faw, assignor to J. H. Faw, Inc., New York, N. Y. Means for securing socket to oil-lamp structure.

1,185,646. Electrical Lamp-Socket and Switch. J. H. Faw, assignor to J. H. Faw, Inc. Details of structure for use with above.

1,185,648. Motor. F. H. Feraud, Granite City, Ill. Pawl and ratchet mechanism actuated by solenoid.

1,185,673. Electrically Heated Utensil. D. C. G. Hughes, Chicago, Ill. Special mounting of heating element in bottom of utensil.

1,185,680. Resonant Amplifying-Receiver. A. G. Keplinger, Kansas City, Kan. For radiotelegraph systems; electromagnetically operated diaphragm in special resonant chamber.

1,185,681. Lathe and Other Machine. H. G. Kienzle, Schwenningen-on-the-Neckar, Germany. Mounting of motor on spindle.

1,185,685. Vapor Electric Apparatus. C. A. Kraus and R. D. Mailey, assignors to A. A. Noyes, trustee, Boston, Mass. Anodes suspended in metal container with mercury in insulated cup at base, and curtain to prevent spattering.

1,185,690. Electric Switch. G. W. Lawrence, Cranford, N. J. Drum controller.

1,185,700. Insulator for Trolley Wires. B. C. Moss, assignor of one-half to C. C. Fritts, Kansas City, Mo. Elliptic spools secured together by side links.

1,185,703. Safety Railway Apparatus. J. L. Murdock, Roundbrook, N. J. Electromagnetic track device for block system.

1,185,711. Receiver for Wireless Telegraphy and Telephony. G. W. Pickard, assignor to Wireless Specialty Apparatus Co., New York, N. Y. Arrangement of inductance, telephone receiver and interrupter.

1,185,712. Isochronizing and Synchronizing System. P. M. Rainey, assignor to Western Electric Co. Method of isochronizing two rotatable members interconnected by a transmission line.

1,185,720. Recording-Target. S. A. M. Rose, Westminster, London, England. Electrically operated.

1,185,724. Shoe-Fitting Display-Stool. C. C. Schlax, Kansas City, Mo. Electrically lighted.

1,185,729. Electric Sad-Iron. N. E. Starr, Township 15, Douglas County, Neb. Resistor in two sections and special connections and switch for connecting one or both.

1,185,734 and 1,185,735. Measuring Instrument. S. Trood, assignor to Westinghouse Electric & Manufacturing Co., E. Pittsburgh, Pa. First patent: steam-flow meter; armature rotated according to velocity of steam and air gap between it and permanent magnet varied according to temperature and pressure. Second patent: liquid resistances controlled by velocity and pressure and resistor controlled by temperature of steam, in circuit of electric meter.

1,185,736. Fluid-Flow Meter. S. Trood, assignor to Westinghouse Electric & Manufacturing Co. Electric meter actuated according to potential of generator operated according to velocity of fluid and controlled in accordance with temperature and pressure.

1,185,738. Electropneumatic Brake. W. V. Turner, assignor to Westinghouse Air Brake Co., Wilmerding, Pa. Automatically held in applied position for predetermined time.

1,185,740. Combined Vehicle Lamp and Horn. N. B. Wales, assignor to Selaw Products Co., Saginaw, Mich. Electromagnetically operated diaphragm in base of reflector.

1,185,742. Spark-Plug. J. M. Walton, New Orleans, La. Has special provisions for cleaning and oil draining.

1,185,749. Oil-Switch. H. A. Yearick and E. Schreiber, Sunbury, Pa. Details of structure having lever-operated swinging contacts.

1,185,750. Bonding Device for Rails. A. A. Ziegler, Boston, Mass. Clip for bond wires secured by splice bar-bolt.

1,185,787. Shear. E. K. Ford, Detroit, Mich. Release for cutting member electrically controlled by sheet.

1,185,788. Secondary or Storage Battery. B. Ford, Philadelphia, Pa. Means for detachably connecting terminal with cover.

1,185,792. Seat-Indicator. H. J. Hansen, Seattle, Wash., assignor of one-third to H. P. Scheel and W. McArthur, Tenino, Wash. Movement of seats controls signal lights indicating occupancy.

1,185,796. Support for Lighting Fixtures. M. Herskovitz, Chicago, Ill. Ceiling attachment.

1,185,814. Electric Signal. J. F. McElroy, assignor to Consolidated Car Heating Co., Albany, N. Y. Signal lamp in multiple circuits of different resistance, and resistance in series with the branches.

1,185,836. Adjustable Bearing. F. Schneider, assignor to The Van Dorn Electric Tool Co., Cleveland, O. Thrust bearing for portable motor-driven tool.

1,185,839 and 1,185,839. Clamping Mechanism. W. T. Sears, assignor to Niles-Bement-Pond Co., Jersey City, N. J. First patent: cam for clamping rotating column in base operated by solenoid. Second patent: modification having cam holding dog operated by additional solenoid.

1,185,842. System for Controlling Electric Locomotives from a Distant Point. F. L. Sessions, assignor to The Jeffrey Manufacturing Co., a corporation of Ohio. Stationary controller connected with car motor through track and contact shoe engaging third conductor.

1,185,843. Selective Signaling Apparatus. M. Setter, assignor to American Electric Telephone Co., Chicago, Ill. Telephonic switching device actuated by operator's key.

1,185,849. Heater. F. C. Smith, Port Arthur, Tex. Electric heater in chamber at side of fluid pipe.

1,185,851. Electric Switch. O. T. Snyder, assignor to O. T. Snyder & Co., Columbus, O. Push-rod-operated snap-switch.

1,185,866. Photographic - Print-Exposure Apparatus. L. A. Bell, McMechen, W. Va., assignor of one-fourth to W. E. Hicks, McMechen, W. Va. Lamp circuit controlled by door of printing compartment.

1,185,877. Reproducing and Transmitting Apparatus. J. J. Comer, assignor to Automatic Enunciator Co., Chicago, Ill. Unitary structure having microphone on each side of diaphragm.

1,185,878. Telephone Amplifier. J. J. Comer, assignor to Automatic Enunciator Co. Particular connections of microphone with armature of electromagnet.

1,185,879. Telephone System. J. J. Comer, assignor to Automatic Enunciator Co. Circuit arrangements for connecting number of special transmitters to single battery.

1,185,893. Attachment for Electric Flash-Lamps. H. Ennis, Layland, W. Va. Valve-cleaning needle on side of case so that work is illuminated.

1,185,904. Lamp. L. E. Hendricks, Campbellsport, Wis. Apparatus for submerged illumination.

1,185,919. Signaling System. E. H. Long, Oakland, Cal. Details of switching mechanism, etc., for transmitting signals by reversing polarity of transmitted current.

1,185,920. Automatic Train-Stop and Recorder. J. H. K. McCollum, assignor to G. H. Gooderham and J. W. L. Forster, Toronto, Ont., Can. Air valves controlled by track obstruction and current trans-

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mitted to car through wheels and obstruction shoe.

1,185,921. Photographic Lighting Apparatus. E. Markley, Cairo, Nebr. Normally lighted electric lamps are put out when flash powder ignited.

1,185,931. Engine-Starter. J. B. Peters, assignor to Electric Auto-Lite Co., Toledo, O. Special electromagnetically controlled connection of motor with engine.

1,185,938. Telephone Exchange. C. L. Redfield, Chicago, Ill. Interconnected, magnetically operated, selecting-switch mechanisms.

1,185,958. Automatic Train-Controlling and Cab Signaling System. R. E. Thompson, Seattle, Wash. Details of block system.

1,185,959. Nickel Anode and Process of Manufacture. J. L. Walsh, assignor to The Prest-O-Lite Co., Inc., Indianapolis, Ind. Process of utilizing scrap anodes in electroplating.

1,185,978. Electric Hand-Lamp. C. F. Burgess, assignor to C. F. Burgess Laboratories, Madison, Wis. Lamp and battery of flashlight may be assembled before placing in case.

1,185,987. Light and Sound Distributing Apparatus. G. E. Emerson, assignor to Emerson Phonograph Co., Inc., New York, N. Y. Sound from phonograph in lamp base carried up through standard and discharged through lamp supporting arms under shade.

1,185,997 and 1,185,998. Indication Means for Light-Signals. C. O. Harrington, assignor to Union Switch & Signal Co., Swissvale, Pa. First patent: excess or deficiency of current in signal lamp circuit indicated in relay circuit connected by transformer. Second patent: lighting of one and extinguishment of other lamp of two-lamp signal indicated in relay circuit.

1,185,999. Indicating Means for Light-Signals. C. S. Snavely, assignor to Union Switch & Signal Co. Lighting of signal lamps indicated by means affected by phase reversals, accomplished by transformers, according to lamps lighted.

1,186,011 and 1,186,012. Alternating-Current Electromagnet. D. L. Lindquist, assignor to Otis Elevator Co., New York, N. Y. First patent: rivet of magnetic material through laminations of core forms closed secondary. Second patent: solid inductive bar inserted in core lamination symmetric to axis of core forms closed secondary.

1,186,016. Elevator. A. Magnuson, assignor to Otis Elevator Co., Jersey City, N. J. Electric cable to car wound on drum on hoist and tension maintained by connection between drum and counterweight.

1,186,023. Gun-Tampion and Means for Actuating the Same. W. V. Moore, New York, N. Y. Solenoid operated; gun electrically fired when tampion removed from muzzle.

1,186,024. Electric Heating System and Thermostatic Control. H. A. Mulvany, Berkeley, Cal. Number of units, each having primary and secondary heating coils, have primary coils controlled collectively and secondary coils individually.

1,186,028. Automatic Headlight Control. F. W. Opp, Santa Ana, Cal. Displacement of headlight lens electromagnetically controlled by steering mechanism of automobile.

1,186,049. Lock for Telephones. J. S. Stephens, Paterson, N. J. For locking receiver hook.

1,186,051. Machine Telephone Switching System. J. N. Wallace, assignor to Western Electric Co. Arrangement of non-numerical automatic switches, etc., for extending calling lines to connecting circuits.

1,186,057. Operator's Cord-Circuit with Reverting Busy-Test. C. S. Winston, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Arrangement of circuits, jacks, etc.

1,186,080. Ventilating Attachment for Bowls of Lighting Fixtures. A. Copeland, Chicago, Ill. For semi-indirect lighting; central support has ventilating passages.

1,186,081. Lamp. W. D. Crow, assignor to Hospital Devices Co., Inc., East Orange, N. J. Support reflector, etc., for combination of gas and electric lamps.

1,186,083 and 1,186,084. Primary Battery. E. M. Deems, East Orange, N. J. First patent: Support, insulation and structure of elements. Second patent: Modification.

1,186,090. Fuse-Plug. J. H. Hanson, Chicago, Ill., assignor of one-third to S. H. Loughman and one-third to M. Allan, Chicago, Ill. Structural details.

1,186,106. Electrochemical Apparatus. C. P. Landreth, Philadelphia, Pa. Has means for subdividing solids in liquid and disposing of resulting liquids, etc.

1,186,121. Switch-Plug. W. Murray and F. S. Murray, New York, N. Y. Details of construction.

1,186,122. Electric Signal Device. G. W. Norgate, assignor to Benjamin Electric Manufacturing Co., Chicago, Ill. Bodily movable housing for electromagnet is moved thereby against spring into contact with base.

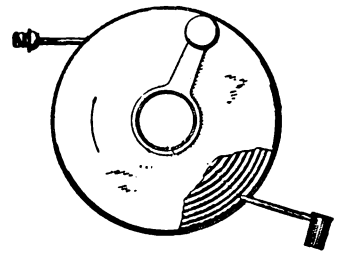
1,186,131. Cord-Reel. D. B. Replogle, assignor of one-third to F. M. Ray, Oakland, Cal. For housing service cord. (See cut.)

1,186,146. Indicator for Electrical Connections. O. C. Sutherland and E. M. McLaughlin, Richmond, Cal. Relatively movable members parts of diagrams, in different relations show different complete diagrams of electrical connections.

1,186,158. Means for Charging Storage Batteries. D. C. Anderson, Sewickley, Pa. Internal heat of battery effects step-by-step variation of charging current.

1,186,165. Reflector-Shade for Lamps. R. B. Benjamin, assignor to Benjamin Electric Manufacturing Co. Constructed to project light downwardly, avoiding bulb and shade.

1,186,197 and 1,186,198. Portable Electric Light. C. Hubert, New York, N. Y. First



No. 1,186,131.—Cord-Reel.

patent: Details of tubular flashlight. Second patent: Has lamp at side of battery casing.

1,186,217. Metal-Coated Iron or Steel Article. C. Mark and C. Mark, Jr., assignors to C. Mark, Chicago, Ill. Coating is electropositive to iron.

1,186,221. Spark-Plug. A. R. Mosler, New York, N. Y. Structure of insulator and mounting in shell.

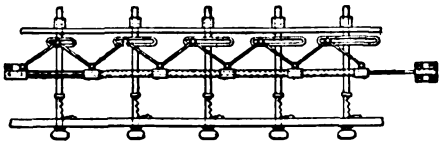
1,186,222. Method of Electrical Welding. T. E. Murray, New York, N. Y. Circular tube produced from two longitudinal sections.

1,186,227. Electromagnet-Mount. J. G. Peterson, assignor to Manhattan Electrical Supply Co., Jersey City, N. J. Details of securing magnet frame to support and insulating it.

1,186,246. Combined Ignition and Radio System. H. R. Van Deventer, assignor to Splitdorf Electrical Co., Newark, N. J. Ignition dynamo supplies and carries spark gap of radio signaling apparatus.

1,186,270. Means for Controlling Electric-Heater Circuits. A. F. Berry, assignor to General Electric Co. Schenectady, N. Y. Switching arrangement. (See cut.)

1,186,305. Telephonic System. E. A. Graham, W. J. Rickets and E. A. Sanftleben, Brockley, London, England. Arrangement of circuits having three-wire line between



No. 1,186,270.—Means for Controlling Electric-Heater Circuits.

stations, permitting voice call by transmitter or signal call to be selectively given.

1,186,305. Process of Extracting Metals from Their Ores. W. E. Greenawalt, Denver, Colo. Copper dissolved out by acid and precipitated by hydrogen sulfid, precipitate being electrolyzed to obtain copper and sulfur.

1,186,307. Automatic Alarm for Sprinkler Systems. L. A. Grimes, Orange, N. J. Special fluid-pressure-operated contact device.

1,186,323. Projecting-Lamp. C. A. Matisse and A. C. Matisse, New York, N. Y. Reflector structure.

1,186,335. Electrochemical Amalgamator. S. S. Rose, San Jose, Cal. Manner of making electrical connections in particular structure.

1,186,398. Detectophone. J. E. B. Holladay, assignor to The Holladay Detecto Co., Inc., Suffolk, Va. Arrangement of inductance, receiver and transmitter in circuit.

1,186,407. Direction-Indicator for Automobiles. F. O. Klock, Buffalo, N. Y. Movement of indicating member closes circuit of lamp and audible signal.

1,186,422. Electric Flashlight. J. C. Morgan, Los Angeles, Cal. Has spring-operated generator.

1,186,428. Electric-Light Bracket. H. J. Newman, Cavour, S. D. Number of sockets connected by ball and socket joints.

1,185,439. Machine-Oiler. G. M. Rogers, Chicago, Ill. Solenoid controls oil-feed opening.

1,186,450. Apparatus for Phonographically Recording Telephonically Transmitted Conversations. H. Starcke, assignor to the Firm of Walseck & Starck, Cologne, Germany. Record accomplished without aid of called station.

1,186,454. Miner's Electric Lamp. A. Toler, Berwind, Colo. For securing to cap.

1,186,455. Radiotelephony, Radiotelegraphy and the Like. W. Torikata, Akita, Eitaro Yokoyama, Sakai, and M. Kitamura, Tokyo, Japan. Apparatus for generating high-frequency oscillations.

1,186,459. Electric Apparatus for Driving Clocks or Similar Mechanism. H. E. Warren, assignor to Warren Clock Co., Portland, Me. Has inductively related free and restrained pendulums.

1,186,462. Measured-Service Telephone System. B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Assesses tolls of different values.

1,186,464. Telephone-Exchange System. G. Babcock, Rochester, N. Y. Metering arrangements.

1,186,471. Trunk-Selecting Switch. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. Structure of non-numerical, trunk-selecting switch for telephone system.

1,186,473. Automatic Switch. F. Funke, Independence, Mo. For generator and battery ignition and lighting circuits.

1,186,484. Pay-Station Telephone System. F. Lubberger, assignor to First Trust and Savings Bank, trustee, Chicago, Ill. Subscribers' lines automatically connected but cannot talk before payment, although can talk with switchboard operator.

1,186,494. Synchronizer for Talking-Pictures. J. B. Olinger, Milwaukee, Wis. Phonograph and motion-picture machine driven at approximately synchronous speeds are clutched together on speed variation.

PATENTS EXPIRED.

The following United States electrical patents expired on June 13, 1916:

626,661. Electric-Arc Carbon. D. Bacon, New York, N. Y.

626,667. Electric Sign. C. A. Chase, Chicago, Ill.

626,670. Electrical Burglar-Alarm. C. Coleman, Chicago, Ill.

626,684. Electrical Safe-Protection System. H. F. Freed, Harrisburg, Pa.

626,713. Self-Regulating Dynamo. M. Moskowitz, Newark, N. J.

626,723. Electricians' or Plumbers' Torch. H. C. Roberts, Philadelphia, Pa.

626,769. Apparatus for Electrically Annealing Wire or Rods. J. H. Preston, Joliet, Ill.

626,787. Electrode. W. E. Irish, Cleveland, O.

626,806. Selecting Instrument. A. Duppler, Jersey City, N. J.

626,809. Coin-Controlled Telephone-Register. T. J. Hock and E. Happersberge, San Francisco, Cal.

626,826. Telephone Circuit. P. G. Burgess, Mexico, Mex., and H. W. Wilder, Springfield, Mass.

626,832. Electric Meter. E. S. Halsey, Chicago, Ill.

626,833. System of Electric Metering. E. S. Halsey, Chicago, Ill.

626,835. Electric Block System for Railways. G. Knowles, Milwaukee, Wis.

626,848. Electrical Measuring Instrument. J. Wills, Niagara Falls, N. Y.

626,918 and 626,919. Electrical Switch. P. Medary, Cynwyd, Pa.

626,927. Incandescent-Lamp Socket. C. G. Perkins, Hartford, Conn.

626,940. Electric Cable. W. S. Smith, London, England.

626,942. Magnet Clutch for Brakes. J. B. Stewart, Haverstraw, N. Y.

626,972. Electrolytic Apparatus for Deposition of Metals from Solution. T. Carney, Bay City, Mich.

626,978. Electrical Arm Signal for Railway Crossings. W. H. Danalds, Berea, and A. E. Flickinger, Elyria, O.

626,979 and 626,980. Rail-Bond for Electric Railways. F. H. Daniels, Worcester, Mass.

626,983. Automatic Telephone-Exchange System. W. Decker, Owego, N. Y.

626,984. Combined Alternating Continuous-Current System for Electric Traction. M. Deri, Vienna, Austria-Hungary.

627,006. Electrical Burglar-Alarm System. H. O. Megaard, Chicago, Ill.

627,009. Storage Battery and Method of Preparing Electrodes Therefor. L. Paget, New York, N. Y.

627,054. Electrical Burglar-Alarm System. C. Coleman, Chicago, Ill.

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UNIVERSITY OF CALIFORNIA

ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

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EDITORIALS

INDEPENDENCE DAY CELEBRATIONS.

The old method of celebrating the Fourth of July through the medium of gunpowder in its various forms, owing to the large and growing number of fatalities which for many years accompanied it, has recently met with much opposition, and many communities have passed laws greatly restricting celebrations of that kind. Substitutes for the old methods are in demand and central-station men can do much in furthering the application of electricity in this connection. Electrical illuminations are a natural and popular substitute for the use of dangerous fireworks and, in addition to increasing the consumption of electric energy, they do much to advertise the more extended use of current. The Safe and Sane Fourth is making greater progress every year and it furnishes an opportunity which the local electrical manager or salesman may utilize with considerable benefit to both the community and the lighting company.

MUNICIPAL PLANT OBJECTS TO COMPETITION.

A rather novel incident has occurred in Terrell, Tex., where the city owns an electric light plant, and where there is also a privately owned electric light plant in operation. As is usually the case where there is competition in public-service enterprises, the two plants have had a spirited fight for several years, to the general detriment of service.

It is rather strange that a municipal plant, built supposedly to obtain the maximum benefit for the city, should object to any arrangement which might help the people, yet this is what the municipal plant in Terrell is apparently doing.

The privately operated plant in Terrell recently made arrangements with the Texas Power & Light Company for the building of a transmission line to Forney and Terrell, for the purpose of supplying electricity in wholesale quantity to said privately owned plant. The municipal plant in Terrell, fearing that the improved service which will be thus obtained by the private company will give the private plant an advantage, and fearing also that the private plant may establish a reduced rate for service, has started court proceedings to prevent the transmission line from being built.

This is another instance which shows the folly of a municipally owned plant when it is possible to obtain reliable service at less cost from a privately owned company.

LEAK LOADING OF TELEPHONE LINES.

The history of applied physics furnishes many examples to show that usually a development which admits of commercial application will receive a fuller and wider theoretical investigation than others. In the field of wire telephony the series loading of the line with inductors greatly enlarged the possibilities of long-distance telephony. In consequence this subject has been very fully investigated. What the fate of the loading coil would have been had a satisfactory telephone repeater been first made available it is not easy to say, but certainly developments would have followed a somewhat different path.

The leak loading of telephone lines has not proved to be of commercial importance and consequently has been comparatively neglected. At least little has been published upon this subject, although it is quite possible that the engineers of commercial or operating companies have fully investigated its possibilities from the theoretical standpoint. Lines of this character have been proposed for telephony and cable telegraphy, but their characteristics have not proved favorable. Upon other pages of this issue will be found an article by Prof. Arthur E. Kennelly, of Harvard University and the Massachusetts Institute of Technology, who has worked out the relations involved in leak loading and has developed two new formulas for expressing these relations. By taking advantage of the mathematical similarity of the expression for admittance as affected by leaks and the expression for impedence as affected by series inductance, he has reduced the two problems to calculations of the same kind. Numerical examples are given to show the application of the very simple formulas which have been derived.

Professor Kennelly is an ardent advocate of the use of hyperbolic functions in electrical computations and gives here a very good example of the great advantage and simplicity obtained by their application. In such a problem as this, unless hyperbolic functions are applied, the situation becomes very complicated and the amount of work necessary in carrying out numerical examples is tremendous.

Leak loading may in certain cases be advantageous and by reducing the attenuation may improve telephonic transmission, but the improvement only occurs within a certain narrow range of frequency. This inherent limitation of the method of loading by leaks or shunt resistances is pointed out by Professor Kennelly. A series-loaded line transmits a broad range of frequencies and thus has great advantages in practical application over the method of loading by leaks.

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THE GRADUATION SEASON.

The present month has seen several hundred graduates of courses in electrical engineering set out to make their way in the world. It is well understood by others, but not always so well understood by these young men themselves, that they are not yet engineers, but that they may be expected to have a better foundation upon which to build up the qualifications of an engineer than others who have not had the same educational advantages. What the technical graduate should have acquired during his college course is the knowledge of the fundamentals of engineering science, that is to say, the underlying principles of physics, chemistry, etc. This is the basis upon which, through a familiarity with engineering details such as may be acquired in actual experience with practical work, the real structure of a competent engineer may be built. The training given in good engineering schools is thorough and intensive and the graduate should have acquired habits of work and thought which will stand him in good stead in later life.

It is of the utmost importance that the man who aspires to become an engineer should not only know the basic principles underlying his profession, but that he should have the power to apply the knowledge which is in his possession. This is a qualification which is often unfortunately lacking in the college graduate. The best way to learn is by doing, and no information or knowledge which cannot be applied by the possessor is of much value in helping him to the accomplishments which go to make up success in life.

The engineer primarily is one who deals with the materials and forces of nature, and he understands how to handle *things*. In carrying out this work it is natural that he should specialize, but care must be taken that specialization is not too narrow. In accomplishing large things it is not sufficient merely to know how to handle the necessary materials, but it is essential to know also how to handle *men*, for this is one of the important things in all lines of accomplishment in organized society. To occupy a position of importance, the engineer must be able to speak and write effectively and convincingly. Here again is a point in which college graduates are often lamentably weak, and at the same time they often wonder why they are expected to study English in an engineering course. The ability to effectively use the English language both by tongue and by pen is an important qualification for the engineer as well as in nearly every other profession.

The college graduate in the raw state is of little value to the industry and is sometimes discouraged on this account. He should remember, however, that through application, and acquisition of experience, through contact with practical work, he is in a position to develop into a real engineer, and that the beginner starting out with the knowledge of principles which he should have acquired in college is in a far better position for reaching the ultimate goal of success than is the man who has not had such a preparation.

INTERCONNECTING POWER SYSTEMS IN ENGLAND.

In connection with the advice given by the Board of Trade to British electric supply authorities urging them to interconnect their respective systems wherever this can be done with convenience and with a view to national economy and efficiency, much interest is being taken in a scheme which is already in a forward state in one of the busiest centers of English industry. Under the auspices of the Municipal Electrical Association of Lancashire and Cheshire, a committee is at work preparing a scheme for connecting up the principal supply stations in the two counties. These comprise municipal and company light and power stations, also railway and tramway power stations. The area of the two counties has been divided up into six districts, for each of which a separate subcommittee is now at work collecting technical data, etc.

In the London district a number of interconnection schemes have already, during the war, been carried into effect, municipal and company undertakings in several places having working agreements covering such matters as mutual assistance for emergency demand, standby plant provision, and so forth, all of which is already making both for efficiency and economy. The movement is expected to have most important results in various parts of the United Kingdom, and it may lead on to the setting up of that Electricity Board which has lately been so much discussed by the Institution of Electrical Engineers. The ultimate outcome in London must be anticipated as one in which power generation will be centralized in a few large stations.

It may well be that the development may have one very desirable result which is not among the expressed intentions of either the Government Department which is advocating it, or the engineers who are studying it for the sole immediate purpose of coal economy and conservation. We refer to the possibilities of co-operative policies of a general character respecting the working and management of such undertakings being evolved and adopted. Through the medium of an Electric Supply Publicity Committee an attempt was made, spreading over several years, to co-operatively deal with publicity and advertising, and there was also an Electrical Development Committee whose function was to jointly encourage all sorts of commercial electrical applications. The former committee never accomplished all that was expected of it, and it is now no longer in existence. The latter committee has had its activities interfered with by the war, but it will find its hands very considerably strengthened by the present interconnection spirit when it is able to resume its activities.

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CULTIVATING FOREIGN BUSINESS RELATIONS.

In connection with the article published in the last issue covering the desirability of making present preparation for future trade in foreign countries and especially in Russia, it has come to our attention that many manufacturers are very delinquent in establishing a favorable reputation among foreign firms. In one particular case numerous inquiries have been received from foreign firms asking for quotations on prospective orders, but owing to the fact that the output of the factory for months to come has already been contracted for, the manufacturer is paying no attention to these inquiries and not even showing the courtesy of a reply stating his inability to quote prices.

This manufacturer is not only spoiling his own chances for business when the domestic trade becomes slack, but is also injuring the general reputation of American firms and making it harder for those desiring export business to create a good impression upon prospective customers. The American manufacturer is prone to devote his entire attention to the present and to make insufficient preparations for the future. Export trade may be given the cold shoulder when orders are too numerous for acceptance, but ill-mannered treatment of inquiries will not prove an easy path to the cultivation of such business at a time in the future when it may be greatly desired.

In connection with the matter of extending foreign credits and obtaining information upon which to base them, it would be well for electrical manufacturers to extend the practice which has been developed by the electrical credit associations of this country to the foreign field. An exchange of information between parties interested, or at least letting it be known when foreign firms are encountered who will abuse credit accomodations, would make it far easier for American electrical manufacturers to handle foreign business. It may be of advantage to know in this connection that for many years the Philadelphia Commercial Museum has been acting as a clearing house for information of this character and may prove of great benefit in this connection to electrical manufacturers and exporters. This is a situation where co-operation is very feasible and very effective.

THE EVIL OF THOUGHTLESSNESS.

On another page of this issue is published a communication from Mr. E. A. Bechstein, manager of the Sandusky Gas & Electric Company, Sandusky, O., relating to the harm that may be done through thoughtlessness upon the part of central-station managers in suggesting to traveling salesmen selling points based upon alleged dangers incident to electrical circuits.

Under certain conditions dangers may arise due to the proximity of electrical circuits and the utilization of electrical energy. Dangers may also arise from a great many other causes, but the dangers having an electrical origin are sometimes peculiar and the man selling an appliance devised to minimize accidents of an electrical nature is quick to grasp any suggestion which indicates even a remote possibility of the danger and spreads the suggestion broadcast in seeking to establish pertinent reasons for the installation of the equipment he is selling.

Mr. Bechstein's suggestion that central-station managers in particular be guarded in their statements is to the point. We do not counsel any evasion of definite issues, or the shirking of any responsibility, but we do endorse a policy of caution in establishing unnecessary suggestions. Alarming headlines and illustrations of sputtering wires, smoking irons and houses ablaze may be used to promote the sale of accident-prevention apparatus, but when these suggestions have the endorsement of electrical men they cannot be considered as constructive, nor as favoring the development of public confidence in electrical service.

INCONSISTENCY.

A committee of the City Commission, Jersey City, N. J., is endeavoring to interest neighboring municipalities in Hudson, Essex, Union, Passaic and Bergen Counties in bringing concerted action before the State Board of Public Utility Commissioners for a reduction in the rates for electric light and power service, as well as gas, now charged by the Public Service Corporation. This reduction is sought upon a basis of community population instead of the general territorial rate plan in force, it being held that the cost of generating and distributing electrical energy to the thickly populated sections is less per individual consumer than in the more sparsely settled districts.

This is self-evident and should, with utmost consistency, be operative and applicable to all phases of public-utility operations, if to any at all. Yet Jersey City, in connection with the railroad tax question recently at issue, apportioned high taxes on local railroad terminals with a claim that such terminals were made valuable only by the combined traffic of all the counties in the state, and in fact all states in the Union. Thus Jersey City is profiting through the railroad rates levied on all traffic on the railroad systems.

While this contention is in direct contradiction to the argument set forth for a readjustment of local lighting charges, if it holds true it would certainly seem to apply in the question of uniform lighting rates for all sections, and Jersey City, as one, should be willing to co-operate with neighboring and smaller municipalities, showing a spirit of reciprocity in allowing these communities the benefits and advantages of a low and uniform electric rate—the same as local inhabitants enjoy. A more generalized point of view is desirable in promoting a more general and less congested development of the territory.

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Happenings in the Industry

Michigan Section, N. E. L. A., Holds Annual Convention-Cruise and Discusses Important Utility Topics—America's Electrical Week Local Committeemen Appointed—Illinois Electrical Contractors Hold Annual Meeting at Rockford—Niagara Falls to Be Permanently Flood Lighted—Miscellaneous News Notes

UTILITY PROBLEMS DISCUSSED BY MICHIGAN SECTION.

Relations with Public Important Topic of Convention-Cruise —Section Considers Consolidation with Wisconsin Electrical Association.

The first sessions of the convention of the Michigan Section, National Electric Light Association, were marked by papers and discussion of public utilities, both private and municipal, and their relations with the communities served. In a paper on "The Utility and the Consumer," H. H. Crowell, of Grand Rapids, defined community and governmental functions, outlined the purpose of franchises and gave points of control and regulation of utilities. He spoke of municipal ownership of electric plants as a delusion and thought the best way to crowd out the public's tendency in this direction was for central stations to give good service and to do their best each day.

A paper entitled "Street Lighting Service by Municipally Owned Plants," prepared by A. C. Marshall and read by Secretary Silvester, presented some statistics on finances and service of municipal plants to show unprofitableness of them. Both papers were the subject of much discussion.

As customary in preceding years, the annual convention was in the form of a four-day lake cruise. The start was made from Grand Haven on the steamer *Arizona* early on the afternoon of Sunday, June 18, with a registration of 115, including members, friends and families. The whole was one big family bent on friendly enjoyment of the outing. A short stop was made at Mackinac Island, Monday morning. The next stop was Parry Sound. Here the party was transferred to the steamer *Waubic* for the trip through the Thirty Thousand Islands to Penetanguishene. Re-embarking on the *Arizona*, the run was made to Sault Ste. Marie, leaving there Wednesday for the return trip to Grand Haven.

The first session was called to order Monday morning by President S. A. Freshney, of Grand Rapids, who in the opening address briefly outlined the Section's activities during the year. He stated the membership was now over 40 Class A and 60 Class B. Various members discussed the need of greater co-operation with the National Association, bringing out the advantages of members referring problems to that body. Mr. Freshney spoke of the proposed affiliation with the Wisconsin Electrical Association to form a Great Lakes Section, and recommended the fusion. Appointment of committees on "safety first" problems was urged, as well as one on "electric ranges," the latter to secure member co-operation in promoting that field. He also recommended a committee on industrial heating.

Mr. Crowell's paper on "Utility and the Community" was the first to be presented. After stating the rights of utilities and communities, he said all interests should receive consideration. Depressing legislation is detrimental because of its effect on the investment market. It is necessary to convince public that conditions in financing utilities are satisfactory. Capital invested demands fair treatment. He was particularly insistent that municipal ownership was an unsuccessful creation which can be guarded against by giving public best service possible. "The corporation has a soul and must never furnish impersonal service," he said.

H. A. Fee, of Adrian, and J. A. Cavanaugh, of Benton Harbor, emphasized the personal element in service to the public.

R. W. Hemphill, Detroit, said that frankness is necessary in public relations and aloofness detrimental to a utility.

The second session was opened by a paper on "Troubles," by J. A. Cavanaugh. Central-station manager's troubles were cited in typical cases, laying emphasis on his dealings with customers. The struggles to satisfy customers were recounted. The manager's position is absorbing and interesting because of the diversity of demands on him.

J. W. Bishop, of Detroit, told of short-circuit in manhole that cost $25,000. R. E. Keller, Kalamazoo, laid emphasis on the necessity of maintaining efficient complaint department. George Lewis, Ann Arbor, cited cases of a loose armature on shaft that caused trouble.

W. J. Johnson, of Jackson, then read a paper on "Merchandising," by D. H. Thomas, Lansing. After outlining present-day practice, he said that merchandising should be based on service, incentive to salesman, intensive cultivation, market survey, appliance maintenance, capital and proper accounting. R. W. Hemphill called attention to distinction of central stations selling service instead of energy. H. H. Crowell said service constitutes a satisfactory return to customers for money expended. Mr. Johnson outlined sales methods in wiring campaign instituted by his company. J. E. Stanton, of Belding, and H. A. Fee also discussed various phases of merchandising.

A. C. Marshall's paper on "Street Lighting by Municipally Owned Plants" was of a statistical nature, tending to disprove successful operation of such plants. He gave an analysis of business of eight typical plants pointing to that conclusion. For privately owned plants it was advocated that low rates for street lighting with low margin of profit was good business. H. A. Fee agreed with latter statement, saying street lighting was a good by-product of commercial business. J. A. Cavanaugh added that a low rate decreases the likelihood of municipal competition. Remarks on this subject were made by Messrs. Keller, Hemphill, Crowell and Johnson.

Tree Trimming, Handling Credits, Voltage Standardization and Electric Heating were other subjects discussed. A brief report of these will be given in the next issue.

America's Electrical Week Local Committeemen Appointed.

Every city with a population of 20,000 or over will have a committee in charge of local arrangements for the America's Electrical Week campaign this Fall.

The National Executive Committee in charge of the big movement, of which Gerard Swope, vice-president of the Western Electric Company, is chairman, recently announced its appointments of chairmen and local committeemen. Over 1,200 representative electrical men have been appointed. The Executive Committee, through the Society for Electrical Development made every effort to have the list representative of the different electrical interests, the Jovian Order, the Rotary Clubs and Civic Associations where they rendered co-operation during the Electrical Prosperity Week campaign.

The committee realized that the success of the campaign to a great extent depends upon local committees, so the committees were named with the idea that the men selected would and could devote some time to making the national affair successful in their respective cities. A central-station representative was placed on the committee in every city. This was done because central-station support is necessary.

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Where representatives of other interests were not named by the National Committee, the chairman of the local committee was requested to complete the committee. The list is not considered final as new names and new cities will be added as the campaign progresses.

The committee list is most imposing. It contains the names of many nationally prominent men who have accepted the chairmanship of local committees, and who have pledged support to the big week. Following are some of the chairmen:

J. B. McCall, president, Philadelphia Electric Company.

John F. Gilchrist, vice-president, Commonwealth Edison Company, Chicago.

W. H. Atkins, general superintendent, Edison Electric Illuminating Company, of Boston.

John A. Britton, vice-president, Pacific Gas & Electric Company.

W. J. Barker, vice-president, Denver Gas & Electric Light Company.

Thomas A. Wynne, Reigning Jupiter, Jovian Order.

R. R. Young, commercial manager, Public Service Electric Company, Newark.

Frank R. Coates, president, Toledo Railways & Light Company.

W. E. Robertson, president, Robertson-Cataract Electric Company, Buffalo.

Franklin T. Griffith, president, Portland (Ore.) Railway, Light & Power Company.

A. W. Leonard, president, Puget Sound Traction, Light & Power Company.

The Jovians are expected to be especially active this year in supporting the campaign. Plans have already been formulated to bring about closer relations between the Society for Electrical Development and The Jovian Order. With this end in view, James M. Wakeman, general manager of the Society, Harry W. Alexander, director of publicity, and George W. Hill, of the field co-operative staff, have been appointed by Thomas A. Wynne, Reigning Jupiter, as statesmen-at-large. The America's Electrical Week local committees and Jovians will everywhere work together with the Society to make the campaign the success it is destined to be.

Throughout the late summer and fall, members of the Society's staff will visit different sections of the country to address the Jovian leagues, chambers of commerce, and to assist the committees in their celebration and sales plans.

Illinois Electrical Contractors Hold Annual Meeting.

The fourteenth annual meeting of the Electrical Contractors' Association of the State of Illinois was held at Rockford, Ill., on June 16 and 17. Headquarters of the association were at the Nelson Hotel, but the meetings were held in Reco Hall. The convention was attended by quite a number of contractors who brought their families with them, it partaking of the nature of an outing whose enjoyment was somewhat spoiled by unfavorable weather, however.

On Friday afternoon the first session, which was an open meeting, was called by President J. N. Pierce. An address of welcome was made by Judson S. Joslyn, president of the Chamber of Commerce of Rockford, who commented upon the emphasis now being given to accurate accounting in all lines of business. He cited statements made by the Federal Trade Commission on the great necessity for American business men to have accurate knowledge of the costs of conducting business. A number of short addresses were also made by representatives of jobbing, manufacturing and other interests. The association then held a closed meeting. On Saturday morning another closed session concluded the actual business of the convention.

Among the matters that came up at these business sessions was the question of concentric wiring. This was freely discussed and the matter referred to a committee with S. N. Tideman, chairman. This committee will look into the subject further and co-operate with other organizations that are considering this matter; the report on this subject is to be presented at the next semi-annual meeting to be held in Chicago next January. The subject of co-operation between central-station companies and electrical contractors was also discussed; eight reports were received from different cities regarding the nature of co-operation in existence. This matter also was referred for further action at the next semi-annual meeting when it is hoped that more complete reports on the subject will be available. Reports were received from various officers and other purely association business matters were taken up. Election of officers of the association for the ensuing year resulted as follows:

President, J. N. Pierce, Chicago. Vice-president, J. T. Marron, Rock Island. Secretary-treasurer, L. B. Van Nuys, Peoria. Directors, L. C. Crawley, Peoria; E. F. Pendergast, Rockford; M. N. Blumenthal, Chicago. State delegates to the National Association of Electrical Contractors, R. W. Poelma, Chicago; William McGuineas, Chicago; and E. F. Pendergast, Rockford.

Entertainment features of the convention consisted of a boat trip on the Rock River on Friday evening, an automobile ride about Rockford on Saturday afternoon, and the association banquet on Saturday evening. For the ladies attending, there were special automobile and launch rides on Friday afternoon and Saturday morning.

Niagara Falls to Be Flood-Lighted.

The City Council of Niagara Falls, N. Y., has authorized an expenditure of $10,000 for the illumination of Niagara Falls. The money is to be devoted to carry out the flood-lighting scheme submitted by the American Lighting Company, Chicago For some weeks Will J. Davis, president of the company and inventor of the flood-lighting system of the American Lighting Company, has been making arrangements to illuminate the falls, and for several nights previous to the action of the City Council a battery of 25 flood lights was turned on the American Falls and the rapids of the Niagara River.

The effect created was so far beyond the expectations of the promoters of the project that the expenditure was enthusiastically approved, and it is now planned to double the number of lamps in service and from time to time to add to the battery as new lighting effects are desired.

Paul A. Schoellkopf, commissioner of the Niagara State Reservation, is particularly enthusiastic over the demonstration, and it is due to his efforts in great measure that the City Council has taken such definite action with regard to the illuminating scheme. Mr. Schoellkopf has expressed the belief that the illumination of the falls will insure the stopping over in Niagara Falls, N. Y., of many transients who would otherwise remain only for a few hours during the day. It is proposed to light only the American falls, making it a purely American proposition. Mr. Schoellkopf has tendered the services of the employees of the Hydraulic Power Company free of charge to the city, and it is understood that the Niagara Falls Power Company is to donate the power necessary to operate the lights.

With the flood-lighting system employed there is no dark center or wings in the light-beam, and the falls are smoothly and softly lighted. The beam is powerful enough to penetrate the densest parts of the rolling mist, and owing to the intensity of the flood lighting the entire illuminating scheme is carried out on a very economical expenditure for energy.

The representatives of local newspapers, after viewing the partial illumination, were enthusiastic in their endorsement and have all applauded the action of the City Council in voting the appropriation.

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Miscellaneous NEWS NOTES

Electrical Engineering Class at Illinois.—Out of the total of 222 degrees granted students in the College of Engineering at the University of Illinois, 43 were the degrees of electrical engineering. This number was only exceeded in the department of mechanical engineering, there being 44 degrees granted in this branch.

Electric Cooking School in Portland.—A free cooking school was recently opened by the Northwestern Electric Company, of Portland, in the Pittock Block in that city. The school is in charge of Mrs. L. M. Hayes, who has an enviable reputation in the Northwest. It is understood the school will be a permanent institution.

Interesting Lectures Before Trenton Electric Club.—W. A. Moore, switchboard specialist of the General Electric Company, tendered an interesting address on switchboard work before the Trenton (N. J.) Electric Club, June 5. William L. Doyle, Trenton, head of the insulated wire department of the Roebling Company, addressed the club on June 19.

Seattle Municipal Plant Active.—Superintendent of Lighting J. D. Ross reports that during the month of May the municipal lighting department of Seattle, Wash., signed 500 new contracts for city light. To date, according to Superintendent Ross, the total number of contracts held by the lighting department is 43,000. The municipal lighting department recently installed a display room in the new city-county building where exhibits of electrical cooking apparatus are on display.

Inventory of Colorado Utility to Be Made.—A complete inventory of the Colorado Springs (Colo.) Light, Heat & Power Company is to be made by order of the State Public Utilities Commission. When the commission revised the electric rate schedules, which became effective last March, the company was notified that the new schedule would be in force until March 1, 1917, at which time the company would be expected to present its books and complete inventory of its property to the commission.

Employees of One Company Save $350,000 in Four Years.—In a report presented on June 16, before the annual convention of the New York State League of Savings and Loan Associations at Elmira, N. Y., it was shown that the employees of one company alone had in four years saved $350,000. This record in saving was made by the New York Edison Savings and Loan Association, an employees' organization of the New York Edison Company. It was started in 1912 with 550 members and only $17,000 in deposits. There are now 2,611 members all of whom receive from 5 to 6.5 per cent dividends, semi-annually on their investment according to class of shares. The organization is unique in that the Company bears the entire cost of operation and stands behind the Association.

British Electricity Board Suggested.—It is generally recognized in Great Britain that during the war no practical steps can be taken to secure definite co-ordination of electricity supply systems and service in that country. Though London's schemes are in a state of suspense, that has not prevented the Institution of Electrical Engineers devoting an evening to profitable discussion of a question of which London's problem is but a small, though important, part. E. T. Williams introduced the matter on April 13, by proposing that steps be taken for setting up a large Electricity Board for the control of the electricity supply of the whole of Great Britain, and for co-ordination of the various electrical interests, assisting existing undertakings, whether municipal or company owned, and taking upon itself only those functions of generation and distribution which are essential to the furtherance of wise development and a supply at the lowest cost. Reference was made to the success obtained by the Ontario Hydro-Electric Commission in co-ordinating the electricity supply systems in the Province of Ontario, Canada.

Annual Meeting of New York Electrical Society.—At the annual meeting of the New York Electrical Society held at the Hotel McAlpin on June 14, the following officers were elected for the ensuing year: Putnam A. Bates, president; C. E. Scribner, Edwin B. Katte, and W. C. Whiston, vice-presidents; George H. Guy, secretary, and Thomas F. Honahan, treasurer.

Preparedness at Los Angeles.—At the meeting of the Los Angeles Jovian Electric League, Wednesday, June 14, the subject under discussion was "Preparedness" and addresses were given by George S. Patton and General Harrison Gray Otis.

Possible Municipal Competition Contested.—The Central Indiana Lighting Company, operating at Columbus, Ind., and vicinity, has brought action against the City of Columbus and the Sanborn Electric Company, of Indianapolis, for a permanent injunction to restrain the municipality from purchasing electric equipment from the Sanborn company. The lighting company holds that the city has intentions of engaging in commercial lighting work in competition with its local system, and upon which territory a 20-year franchise is held. The complaint also sets forth that the recent contract made by the city with the Sanborn company for electric equipment for a new plant at a cost of $15,000 is illegal under the terms of its franchise, and moreover, that the city does not require such extensive equipment to replace any feature of the present lighting system.

Illuminating Engineering Lecture Course.—Referring to the course of lectures to be given at the University of Pennsylvania in September under the auspices of the Illuminating Engineering Society, G. H. Stickney, a former vice-president of the Society, recently said: "The 1916 lectures will be of great value to those interested in the design of lighting installations, whether as purchasers, salesmen, engineers, constructors, physiologists or artists. Beyond the value rendered to those fortunate individuals who attend the course, there is a broader value which is bound to be realized, the same as in the 1910 course. The course will have a marked influence in advancing the art of illumination. Through its influence a better standard of lighting will be secured throughout the country. Inartistic and glaring light will be strenuously condemned and misconceptions rectified. The precious power of sight will be more carefully conserved. What a boon it would be to the public if the architects and others throughout the country, responsible for lighting, were to receive the instruction here to be offered!"

Decision in Portland, Ore., Valuation Case.—The Railroad Commission of Oregon has set the reproduction cost new of the property of the Portland Railway, Light & Power Company at a total of $45,337,000. Deducting depreciation, the value on the property was placed at slightly less than $41,000,000. Formal hearings on the valuation began on January 25, 1915. Last October the company filed its final brief in the case. In that document the company contended that a just and fair valuation lay somewhere between $61,795,629 and $62,134,542. The former figure was given as the value of the property as determined by its original cost plus subsequent increments. The latter figure was given as the value of the property as determined by the reproduction analysis, considering the going value of the concern. From the company's original claim of $61,000,000 which included going value, water rights, etc., the commission eliminated about $6,250,000 of property, contending that it was non-operating. Also the commission eliminated the company's claim for going value on the contention that the company did not compute such value correctly. An opportunity, however, will be given to the company to present additional testimony on this.

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Electricity in Boiler and Radiator Manufacture

Plant Rehabilitation Involves the Installation of Electric Drive to Facilitate Labor-Saving Methods and Proper Sequence of Operations, Increasing the Production and Reducing Costs

Industrial Power Series—Article No. 168.

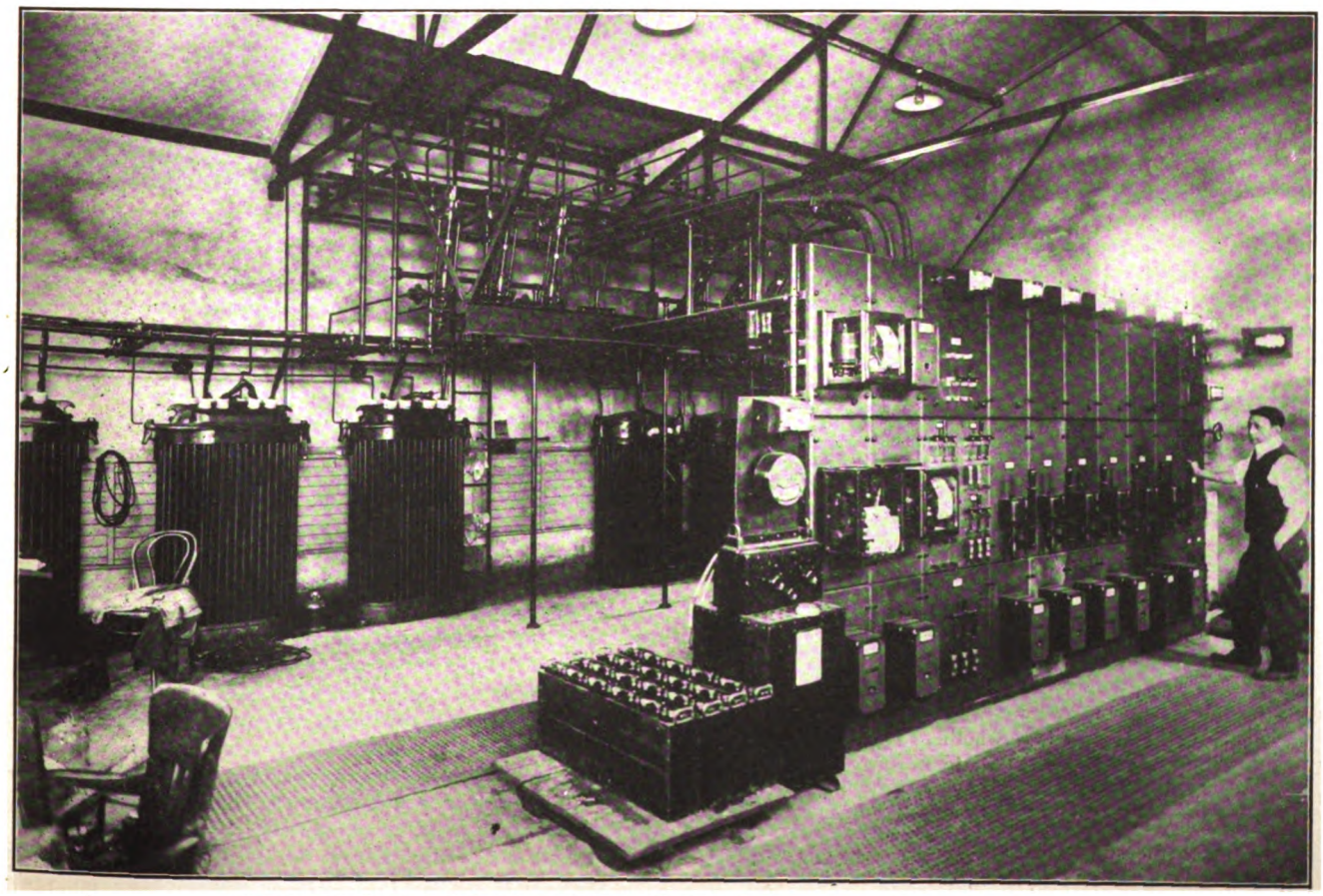
THERE are many established companies throughout the country who adhere to old equipment and methods until reorganization, but when a more progressive element is introduced manifest changes in manufacture take place. This is true of the Pierce, Butler & Pierce Manufacturing Company, Eastwood, N. Y. This company manufactures boilers and radiators for heating purposes and, in line with a new policy, not only have departments been rearranged to facilitate production, but general improvements in the buildings and surroundings have been made. Line shafting has been largely eliminated and electric drive is used entirely.

The location of the equipment has been arranged so as to facilitate logical sequence of operations, and labor-saving devices introduced which decrease operating expenses and increase production. The rehabilitation of the plant has been accomplished under the supervision of E. S. Deane, plant manager, who is an ardent advocate of electric-motor drive and has had extensive experience in the electrification of manufacturing plants.

Much of the work carried on in this plant depends upon foundry processes, and every effort has been made to increase production and quality with modern devices. As the cast parts are of comparatively small size, it is essential that they be handled expediently and moved in a general direction to obviate rehandling raw and finished material as much as possible. In the machine departments, as well as elsewhere, individual drive predominates, and where there is group drive the shafts are short. The machine equipment has been installed with a view of performing the operations with high speed and with as little handling of the material as possible; consequently, many of the machines perform much of the work in duplicate. That is, a boring machine, for example, will bore out and face several holes in boiler headers or radiator columns at one time.

By the use of individual drive, the operating expense of each machine ceases as soon as it is stopped, and, furthermore, individual machines or departments can be crowded to pick up certain lines of work that may be dragging behind other departments. The ease of control of individual machines increases their production and improves the quality of the work. It may be interesting to note here that with the present cost of energy at 1.5 cents a kilowatt-hour that the bills are less than they were under an old contract when the energy cost 0.875 cent a kilowatt-hour. This is due to improved production methods and increased use of electric drive, together with largely eliminating power transmission by mechanical methods, with its attendant friction loss.

At the present time the company is operating 66 induction motors, exclusive of the direct-current crane motors, the former aggregating over 900 horsepower. The induction motors are the squirrel-cage type, equipped with standard pulleys where belt drive is used. The direct-current crane motors are supplied by a motor-generator set, consisting of an induction motor driving a 250-volt, direct-current generator. The majority of the motors are General Electric make, with some Allis-Chalmers and Westinghouse motors.



Interior of Service Substation, Pierce, Butler & Pierce Manufacturing Company.

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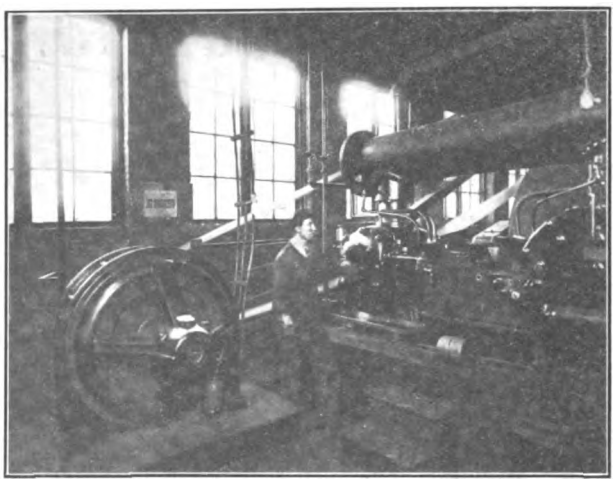
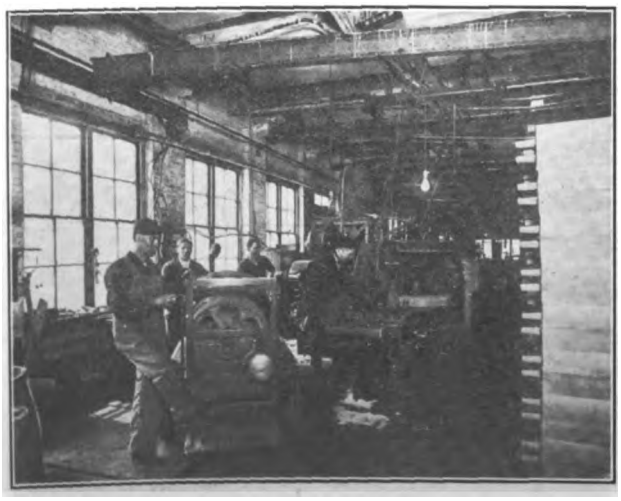


Air Compressor Driven by 200-Horsepower Induction Motor.

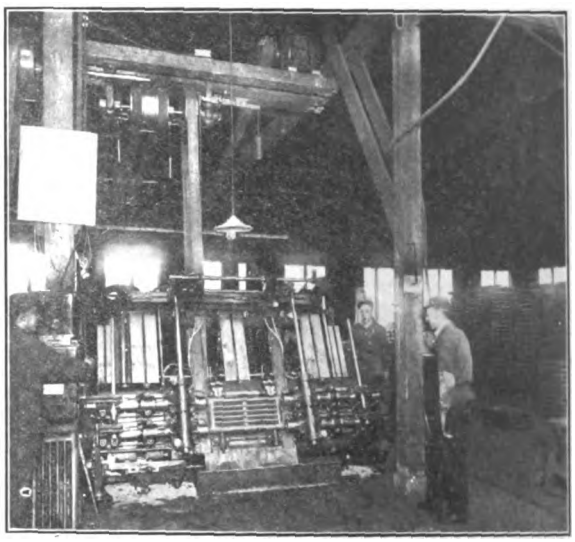
Service is supplied by the Syracuse Lighting Company from its 11,000-volt, three-phase, 60-cycle power distribution system. The line comes overhead and is supported outside of the transformer substation by a pole containing the lightning arresters and choke coils. The transformer building is of tile, brick and concrete construction and is located centrally in the group of buildings composing the plant. There are two banks of oil-insulated, self-cooled transformers, each unit having a capacity of 100 kilovolt-amperes. The voltage is reduced from 11,000 to 220, the latter being the operating voltage throughout the plant. The high-tension bus-bar structure and circuit-breakers are located above the transformers. There is a large switchboard containing feeder panels and totalizing panels. One totalizing panel is maintained by the central station and one by the company and are provided with both integrating and graphic wattmeters. By suitable switch connections various departments can be connected with the local graphic meter and the power consumption checked. At the left-hand side of the switchboard there is a Westinghouse mercury rectifier for charging the batteries of an electric truck used for the transportion of material about the shops. All power feeders are run in underground ducts and all wiring throughout the building is being rapidly changed from open to conduit construction.

In the foundry there are a large number of pneumatic hoists for handling molds and castings. These are being displaced by electric cranes as fast as possible. Air for the pneumatic hoists is supplied by an Ingersoll-Rand Imperial 12 by 16-inch and 13 by 16-inch air compressor, belt-driven by a 200-horsepower induction motor operating at 600 revolutions per minute. For emergency use, there is an Ingersoll-Rand Imperial 14 by 12-inch and 8 by 12-inch air compressor, belt-driven by a 50-horsepower induction motor with a speed of 850 revolutions per minute. The most of the water used about the plant, including that used for testing purposes, is drawn from a pond fed by springs. There are two pumps, one for day use of the triplex type, geared to a 20-horsepower induction motor operating at 850 revolutions per minute, and a second pump for night use of the same type, geared to a 5-horsepower motor. During the day a 100-pound water pressure is maintained, and at night the pressure is reduced to 40 pounds. The motor-generator set for supplying the cranes consists of a 35-horsepower induction motor driving a 22.5-kilowatt direct-current generator with an electromotive force of 250 volts and operating at 1,700 revolutions per minute. All pig iron is handled with a lifting magnet, energy for which is provided by a 220-volt generator driven by a steam engine on a 15-ton Brown locomotive crane.



Motor-Driven Grinding Machine. Electric Truck in Foreground.

Taking up the different departments of the factory in their logical order, the pattern shop for wood patterns has a machine equipment consisting of two wood lathes group-driven by a 3-horsepower, 900-revolutions-per-minute motor; a surface and a pony planer group-driven by a 10-horsepower, 900-revolutions-per-minute motor, a band saw bolted to a 2-horsepower motor, and a circular saw belted to a 3-horsepower motor. For metal patterns there is a 2-horsepower motor driving an engine lathe, and a group of machines, consisting of an engine lathe, four drill presses, planer, shaper and grindstone, driven by a 10-horsepower motor with a speed of 900 revolutions per minute.



Motor-Driven Boring Machine for Radiator Columns.

Air for the foundry cupolas is furnished by three Root blowers, chain-driven by a 75-horsepower, 720-revolutions-per-minute motor, a 55-horsepower, 514-revolutions-per-minute motor, and a 40-horsepower, 675-revolutions-per-minute motor, respectively. The second motor is being replaced by a 75-horsepower, 720-revolutions-per-minute motor. The foundry is divided into different departments for different products. All core sand is sifted by a sand sifter driven by a 10-horsepower, 900-revolutions-per-minute motor. For supplying small molds, there is a sifter consisting of a gyratory riddle traveling on a trolley and operated by a 0.25-horsepower motor. This sifter will handle all the sand that can be shoveled into it by two men and can be moved to accommodate the work. There is a portable sand sifter mounted on a truck for serving larger molds, which is driven by a 10-horsepower motor. For the facing sand in the radiator foundry there is an equipment of a sand sifter and a bucket elevator group-driven by a 20-horsepower motor. The sand, after being sifted, is raised to overhead bins ready to be drawn off when needed.

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Motor Data Sheet—Boiler and Radiator Manufacturing.

Pierce, Butler & Pierce Manufacturing Company, Eastwood, N. Y.
Service from Syracuse Lighting Company—11,000/220-volt, three-phase, 60-cycle system.
Squirrel-cage induction motors with standard pulleys for belt drive.

No.	Horse-power.	Speed, R. P. M.	Kind of Drive.	Application.
1	200	600	Belt	Ingersoll-Rand air compressor. Supplies compressed air to air hoists, sand blasts, etc.
1	35	1,700	Direct-connected	Direct-current generator, 22.5 kilowatts, 250 volts. Supplies direct current to electric traveling cranes.
1	20	850	Gears	Triplex water pump.
1	5	900	Gears	Triplex water pump.
1	50	850	Belt	Ingersoll-Rand air compressor. Emergency use.
1	20	900	Group	Six tumblers.
1	55	514	Chain	Root foundry blower.
1	20	900	Belt	Tumbler.
1	40	675	Chain	Root foundry blower.
1	5	.....	.....	Jarring machine for tamping sand in molds.
1	10	.....	.....	Portable sand sifter.
1	3	900	Group	Two wood lathes.
1	10	1,610	Group	Surface planer and buzz planer.
1	2	900	Belt	Band saw.
1	3	900	Belt	Three circular saws.
1	2	900	Individual	Engine lathe.
1	10	900	Group	Engine lathe, four drill presses, planer, shaper, grindstone.
1	75	720	Chain	Root blower, foundry type.
1	10	900	Belt	Tumbler.
1	20	900	Group	Bucket elevator, sand sifter.
1	0.25	.....	Individual	Sand sifter.
1	10	900	Individual	Core sand mixer.
1	20	900	Belt	Machine for cleaning radiator castings.
1	3	900	Group	Three emery grinders.
5	5	900	Individual	Five boring machines for radiators.
2	10	900	Individual	Two radiator presses.
1	3	900	Group	Five small drill presses.
1	10	900	Belt	Boring and tapping machine.
1	3	900	Belt	Cross-cut saw.
1	3	900	Group	Drill press and grindstone.
1	3	900	Group	Two circular saws for box making.
1	20	900	Group	Boring mill, two pipe machines, drill press, grinder, punch.
1	5	900	Group	Three hand lathes, drill press, three emery grinders.
1	5	900	Group	Three drill presses.
1	5	900	Group	Four emery grinders, drill press.
1	10	900	Group	Three engine lathes, drill press.
1	20	900	Individual	Face grinder.
1	3	900	Individual	Radial drill.
1	1	900	Individual	Bolt machine.
2	5	900	Individual	Two boring mills, multiple type, for boiler side and top headers.
1	3	900	Individual	Drill press.
1	5	900	Individual	Multiple threading machine for nipples.
1	10	900	Individual	Boring machine.
1	10	900	Individual	Multiple machine for finishing nipples.
1	10	900	Individual	Multiple boring and tapping machine.
1	0.5	.....	Individual	Emery grinder.
1	3	900	Individual	Multiple miller.
1	10	900	Individual	Planer.
1	3	900	Individual	Radial drill.
1	7.5	900	Individual	Radial boring and threading machine.
1	5	900	Individual	Radial boring and threading machine.
1	1	900	Individual	Ring grinder.
2	10	900	Individual	Two machines for boring and tapping headers.
1	20	900	Individual	Grinding machine.
1	3	900	Individual	Radial drill.
1	10	900	Individual	Milling machine.
1	7.5	900	Individual	Automatic elevator.
1	10	900	Group	Miscellaneous small machines.
1	10	900	Group	Miscellaneous small machine tools.

Monthly kilowatt-hour consumption for one year—May, 1915, to April, 1916, inclusive.

Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.	Month.	Kilowatt-Hours.
May	31,360	September	39,860	January	50,460
June	32,910	October	42,690	February	53,800
July	35,830	November	45,340	March	57,420
August	37,770	December	37,600	April	60,440

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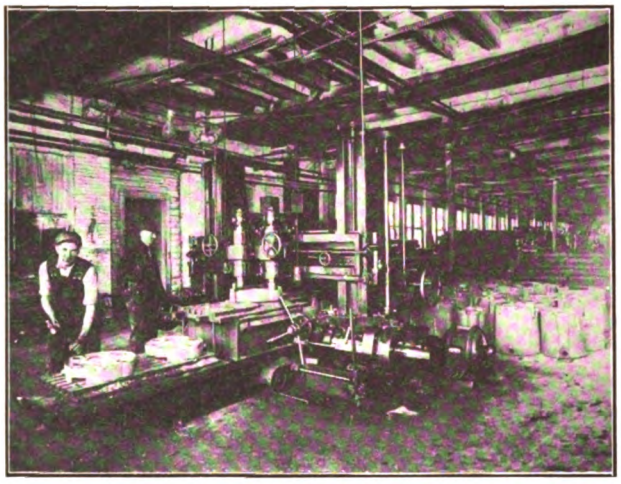
Very little hand ramming of the sand in the molds is done. Pneumatic and electrically-operated jarring machines are substituted, which consist of a platform on which the flask rests and which is vibrated by a suitable mechanism. The electrically operated machine is driven by a 5-horsepower motor. For cleaning the small castings there are several



Motor-Driven Boring Machine.

motor-driven groups of tumblers. The radiator columns are cleaned by a machine which passes the columns under revolving wire brushes. This machine is driven by a 20-horsepower, 900-revolutions-per-minute motor.

Radiator columns and boiler heaters are cast with a core and the former are joined by nipples with a pressed fit. There is an equipment of five radiator boring machines, which bore and face the column openings, each individually driven by a 5-horsepower, 900-revolutions-per-minute motor. The radiators are assembled on a pressing machine and the several columns through pressure are joined by the nipples. There are two pressing machines, each driven by a 10-horsepower, 900-revolutions-per-minute motor. There are, of course, numerous other boring and tapping machines included in the equipment. There are extra, assembling, millwright and tool departments, all equipped with electric drive. One machine in particular demands especial attention. It is a grinding machine for finishing the surfaces of the work and displaced 13 machines and over 200 men. It is individually driven by a 20-horsepower, 900-revolutions-per-minute induction motor.

Piano Moving by Electric Trucks.

There is perhaps no trade to which the electric vehicle is better adapted than to piano delivery, a business in which skill as a piano mover must be combined with that of a chauffeur. Steinway & Sons, who are one of the largest users of electric vehicles in this service, have displaced all of their horse-drawn vehicles with electrics, and are now operating a fleet of five, varying from 3,000-pound to 5,000-pound capacity. When in 1910, Steinway & Sons, after thorough investigation decided that motor equipment would materially reduce operating expenses as well as increase the effectiveness of their delivery system, they were but living up to a tradition which was formed when Henry F. Steinway laid the foundation of Steinway & Sons in 1853, by insisting that in business methods as well as in pianofortes the name of Steinway should always stand second to none.

Almost every Steinway piano which has left the factory within the past six years, has made part of its journey in a power wagon, for a regular shuttle service is operated between the Long Island City factory and the Fourteenth Street branch in Manhattan. The pianos are built and assembled in Long Island City and are then shipped to Fourteenth Street where the cabinet work and crating are done. The two machines in this service make three, sometimes four round trips a day, each trip approximating six miles. These two transfer cars are housed in a garage adjoining the factory and are attended in every particular by their drivers.

The three other electrics which are used for actual delivery purposes in the city are in active service for nearly 12 hours a day, their runs varying from 40 to 60 miles. At the shipping office in the New York building, a charging plug has been provided which is used to "boost" the batteries while the machines are being loaded. This "boosting" not only makes possible the long mileage accomplishments but serves to keep the batteries at very nearly full charge most of the time.

The electrics average approximately 15 deliveries per day with an average cost of 20 cents per mile which includes every possible expense in their upkeep and operation.

Development of Electric Irrigation in Colorado.

During the past two years the Arkansas Valley Railway, Light & Power Company has been encouraging the use of electricity for pumping irrigation water in the large territory served by its lines in central and southern Colorado. More interest is being taken in the subject this year than ever before and many large electric pumping plants are being installed. Not only are electric installations used for irrigating private ranches using water secured from wells, but in several instances electric pumps are used for pumping water seepage from irrigation ditches back into the ditches—thus conserving water which would otherwise go to waste. Owners of the irrigation ditches also use electric pumps for furnishing a steady flow of water when the headgates of the Arkansas River are closed. A new irrigation company has been recently organized in Pueblo, which will utilize water from wells pumped electrically. Among the advantages of an underground water supply for irrigation it is claimed that the use of the cold water increases the acre production over that secured from the use of warm ditch water. More than 1,500 acres have been put under irrigation so far this year by private ranchers operating from the electric lines of the Arkansas Valley company, and the demand for service of this nature is growing steadily.

New Power Contracts in Louisville.

Several isolated lighting plants are to be displaced in Louisville and other motive power supplanted by central-station service under contracts which have just been closed by the representatives of the Louisville Gas & Electric Company. The Todd Building, the first of the steel-construction office buildings in Louisville, with two elevators, hydraulic, has contracted for two 500-volt, direct-current, Otis electric cars and will supplant the isolated lighting plant with central-station service. Heat will also be supplied from the central station. The requirements of this building, with others which were supplied from it, call for a connected load of 100 kilowatts. The Columbia Building, with four hydraulic elevators, the first ten-story building in the city, built before the days of steel construction, will supplant its steam pump with a centrifugal pump to be electrically operated on central-station power, while the lighting load also will be taken over.

The electric company has obtained the contract for serving the new factory of the Louisville Oak Flooring Company. The waste problem at this plant will not be serious since it will operate on dimension stock with a minimum of wastage, all of which will be used to supply heat for the dry kiln. The load at this plant will be 200 horsepower.

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Formulas for Lines With Uniform Leak Loads

By A. E. Kennelly

New formulas are given for leak-loaded lines, and a comparison in parallel columns is presented of the respective formulas for series-loaded and leak-loaded lines, indicating their similarity.

Uniform smooth conducting lines may be regularly loaded at uniform intervals, either with impedance, or with leaks. A loaded line of the former type is commonly described as a series-loaded line (Fig. 1) and of the latter type, as a leak-loaded line (Fig. 2). Series-loaded lines are well known in wire telephony. Leak-loaded lines, which were suggested by Prof. S. P. Thompson, of London, in 1893, are but little known, although their properties may yet be utilized. It is proposed to present in this article two seemingly new formulas for dealing with leak-loaded lines, and then to draw a comparison between corresponding formulas for the two types of loaded line, since a remarkable parallelism runs between them, which assists the student to apprehend and to remember both.

We may consider the case of continuous-current steady-state lines of uniform linear conductor resistance and dielectric

Fig. 1.—Series-Loaded Line.

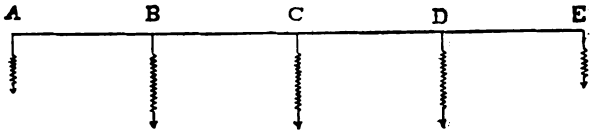

Fig. 2.—Leak-Loaded Line.

leakance. The results so obtained are then immediately applicable to alternating-current steady-state lines subject to a single frequency, by interpreting the formulas vectorially; or in complex quantities. We may, therefore, add an angle sign $\angle$ to the units of the formulas, to indicate their capability of being used with complex quantities.

Let a uniform single conductor A B C D, be operated by steady continuous currents, supplied, say, from storage batteries, to ground or zero-potential return. Let this line have uniform linear conductor resistance of z ohms per wire kilometer, and a uniform linear leakance of y mhos per wire kilometer. Then its propagation constant, or linear hyperbolic angle, is known to be:

$$\alpha=\sqrt{zy} \text{ hyperbolic radians per kilometer or hyps./km. } \angle \quad (1)$$

and its characteristic or surge impedance:

$$z_0=\sqrt{z/y} \text{ .....ohms } \angle \quad (2)$$

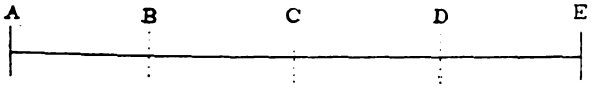

Fig. 3.—Uniform Smooth Line in Sections of Equal Length.

If now the line is arranged in sections AB, BC, CD, etc., of equal length L kilometers; then the angle subtended by each section (Fig. 3) is

$$\theta=L\alpha=\sqrt{ZY} \text{ .....hyps } \angle \quad (3)$$

where Z is the total conductor resistance, per section, in ohms, and Y the total dielectric leakance, per section, in mhos.

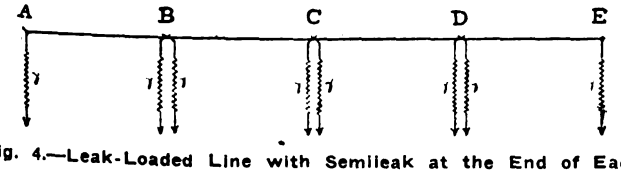

Fig. 4.—Leak-Loaded Line with Semileak at the End of Each Section.

If a leak of $\Gamma=2\gamma$ mhos is applied at each section junction A, B, C as in Fig. 2, then each loaded section may be regarded as a line of θ hyps, and surge resistance z_0, loaded at each end with a leak of γ mhos, as in Fig. 4.

The behavior of the line before and after loading may be imitated, at section junctions, by an artificial line in the laboratory, consisting of Π sections. The equivalent Π of an unloaded section[1] (Fig. 5), may be produced, by known methods, with a certain architrave resistance ρ'' ohms, and a leak in each pillar of g'' mhos. A line of such Π-sections will simulate exactly the behavior of the actual unloaded line at section junctions A, B, C. . . . . When therefore we apply a leak of 2γ mhos to the actual line at each junction, we require to add γ mhos to the g'' mhos in each pillar of the equivalent Π, in order to produce the equivalent Π of the loaded line. In other words, the equivalent Π of a loaded line section differs only from that of the unloaded line section by having a conductance of $g''+\gamma$ mhos, instead of g'' mhos, in each pillar.

The angle θ_1, subtended by a loaded line section, between section junctions, is known[2] to be derivable also from the formula:

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)} \text{ .....numeric } \angle \quad (4)$$

where δ is an auxiliary hyperbolic angle, defined by:

$$\tanh\delta=\gamma z_0=\gamma/y_0 \text{ .....numeric } \angle \quad (5)$$

y_0 being the characteristic admittance of the unloaded line, or the reciprocal of its characteristic impedance z_0.

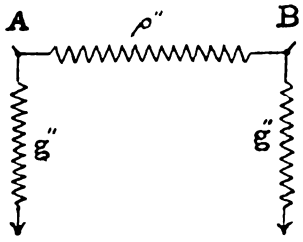

Fig. 5.—Equivalent Π of a Single Section Prior to Application of Leak Loads.

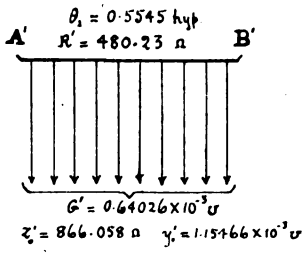

Fig. 8.—Reversion to Equivalent Smooth Section, Taken Between Midleaks.

But it may be shown that another formula for deducing the loaded-section angle is

$$\cosh\theta_1=\cosh\theta+(\gamma/y_0)\sinh\theta \text{ .....numeric } \angle \quad (6)$$

which bears an evident analogy to Campbell's formula[3] for the corresponding loaded-section angle of a series loaded line, see (13).

Moreover, it is known[2] that the characteristic impedance of the loaded section can be found from the formula:

$$z_0^1=\frac{z_0}{\sqrt{\left(1+\frac{\gamma}{y_0}\tanh\frac{\theta}{2}\right)\left(1+\frac{\gamma}{y_0}\coth\frac{\theta}{2}\right)}} \text{ .....ohms } \angle \quad (7)$$

But it may also be readily shown that this is equivalent to:

$$y_0^1/y_0=\sinh\theta_1/\sinh\theta \text{ .....numeric } \angle \quad (8)$$

which is a much shorter and simpler formula.

1 "Artificial Lines for Continuous Currents in the Steady State" by A. E. Kennelly, *Proceedings American Academy of Arts and Science*, Vol. 94, p. 97, November, 1908.

2 "The Application of Hyperbolic Functions to Electrical Engineering Problems" by A. E. Kennelly, London University Press, 1912, p. 46.

3 "On Loaded Lines in Telephonic Transmissions" by G. A. Campbell, *Philosophical Magazine*, VI. Vol. 5, p. 313, March, 1903.

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As an example of the use of the formulas in the direct-current case, we may consider a uniform single line with a linear resistance of $z=10$ ohms per kilometer, and a leakage of $y=2.5\times10^{-6}$ mho per kilometer, with a leak of $\Gamma=0.5\times10^{-3}$ mho, applied at uniform intervals of 50 kilometers. Required the section angle and surge impedance of the line before and after the loading.

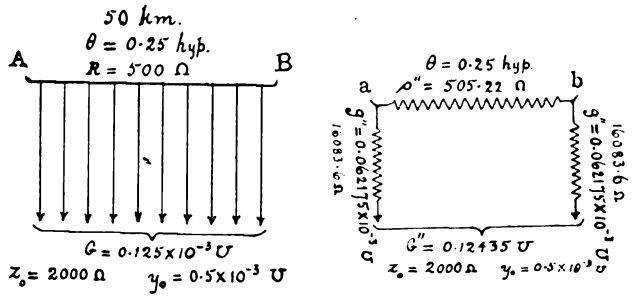

Fig. 6.—Section of Unloaded Line and Equivalent Π of Unloaded Section.

Fig. 6 shows the diagram of a 50-kilometer section of the smooth line before the application of the leak loads, and also the equivalent Π which is its external counterpart. The architrave ab has a line resistance 505.22 ohms as against 500 ohms in the line section AB, and each pillar has a leak of 0.062175 millimho, giving a total leakage of 0.12435 millimho, as against 0.125 millimho in the smooth line AB. The angle subtended by either the smooth line AB, or the Π ab, is $\theta=0.25$ hyp. and the surge impedance of each is $z_0=2{,}000$ ohms, corresponding to a surge admittance $y_0=0.5$ millimho.

If now a half millimho of leakance is applied at each section junction, we obtain the conditions shown in Fig. 7, where the total leak applied at each junction is divided into halves, and one such half-leak is added to each end of the section AB.

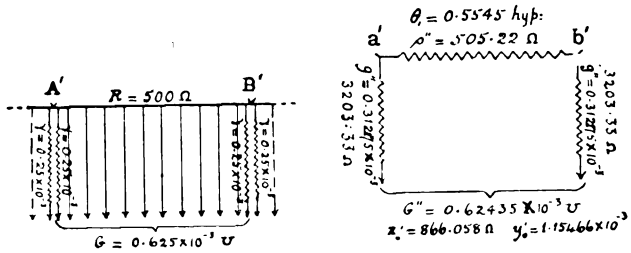

Fig. 7.—Section of Leak-Loaded Line and Equivalent Π of Loaded Section.

Fig. 7 gives the equivalent Π, $a'b'$, of the section after the addition of these terminal half-leaks; and also the equivalent smooth line $A'B'$ corresponding thereto. It will be seen that the architrave resistance $a'b'$ remains the same as at ab in Fig. 6, but the pillar leaks are each increased by 0.25 millimho. The equivalent smooth line is indicated at $A'B'$, Fig. 8 with an angle θ of 0.5545 hyp., a surge impedance z_0' of 866.058 ohms, and a surge admittance of 1.15466 millimho. The total conductor resistance in such a section would be 480.23 ohms with an associated leakance of 0.64026 millimho.

Using formulas (4) and (5),

$\delta=\tanh^{-1}(0.25\times10^{-3}/0.5\times10^{-3})=\tanh^{-1}0.5=0.549307$ hyp.

also $\tanh(\theta_1/2)=\sqrt{\tanh 0.125 \,.\, \tanh 0.674307}=\sqrt{0.12435\times0.58780}=0.270357$; whence $\theta_1/2=0.27725$ and $\theta_1=0.5545$ hyp., the leak-loaded section angle.

Again using (8), $y_0'/0.5\times10^{-3}=\sinh 0.5545/\sinh 0.2500=0.58367/0.25261=2.30931$, and $y_0'=0.5\times10^{-3}\times2.30931=1.15466\times10^{-3}$ mho, corresponding to $z_0'=866.058$ ohms. Here the effect of loading the line with leaks at section junctions has been to increase the section angle from 0.25 to 0.5545 hyp. and to diminish the surge resistance from 2,000 to 866.058 ohms.

As an alternating-current case, we may consider a smooth line with uniform sections 2.607 kilometers (1.62 miles) in length, having the following constants:

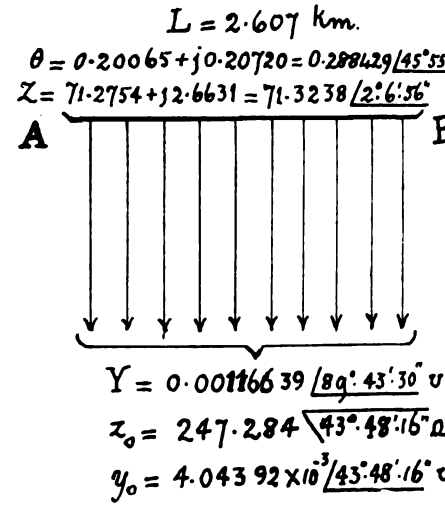

Fig. 9.—Unloaded Smooth Section.

$r=27.34$ ohms per wire kilometer (44 ohms per wire mile)

$l=0.202\times10^{-3}$ henry per wire kilometer (0.325×10^{-3} henry per wire mile)

$g=2.15\times10^{-6}$ mho per wire kilometer (3.46×10^{-6} mho per wire mile)

$c=0.08948\times10^{-6}$ farad per wire kilometer (0.144×10^{-6} farad per wire mile) and with an impressed frequency, at the sending end, of 796 cycles ($\omega=5{,}000$).

A single smooth and unloaded section of this line is indicated in Fig. 9. Let a leak of 7.5 ohms and 0.15 millihenry, i. e., of impedance $7.5+j750=750.04\angle89°25'37''$ ohms, or, of admittance $\Gamma=(0.0\ 3332-j1.3332)10^{-3}=1.33327\times10^{-3}\angle-(89°25'37'')$ mho, be applied at each section junction throughout the line. This means adding a half-leak

$\gamma=(0.006666-j0.6666)10^{-3}=0.666635\times10^{-3}\angle-(89°25'37'')$ mho to each pillar of the equivalent Π $A''B''$, Fig. 10, bringing the loaded Π into the condition A_2B_2 shown in Fig. 11. The

Series-Loaded Line.

Load at junction, $\Sigma=2\sigma$ ohms $\angle$.
Angle subtended by loaded section, θ.
Surge impedance unloaded, z_0.

Surge admittance unloaded, $y_0=1/z_0$.
Auxiliary angle of load, $\delta=\tanh^{-1}(\sigma/z_0)$.
Angle subtended by loaded section, θ_1.

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)}$$

$$\cosh\theta_1=\cosh\theta+(\sigma/z_0)\sinh\theta.$$
$$=\cosh\theta+\tanh\delta\sinh\theta.$$

Surge impedance of loaded line measured at any junction,
$$z_0'=1/y_0'.$$
$$z_0'/z_0=\sinh\theta_1/\sinh\theta.$$

Leak-Loaded Line.

$\Gamma=2\gamma$ ..... mhos $\angle$ (9)
θ hyps $\angle$
z_0 ohms $\angle$

$y_0=1/z_0$ ..... mhos $\angle$ (10)
$\delta=\tanh^{-1}(\gamma/y_0)$ ..... hyps $\angle$ (11)
θ_1 hyps $\angle$

$$\tanh\frac{\theta_1}{2}=\sqrt{\tanh\frac{\theta}{2}\tanh\left(\frac{\theta}{2}+\delta\right)}\quad\text{(12)}$$

$$\cosh\theta_1=\cosh\theta+(\gamma/y_0)\sinh\theta\quad\text{(13)}$$
$$=\cosh\theta+\tanh\delta\sinh\theta.$$

$z_0'=1/y_0'$ ..... ohms $\angle$ (15)
$y_0'/y_0=\sinh\theta_1/\sinh\theta$ ..... numeric $\angle$ (16)

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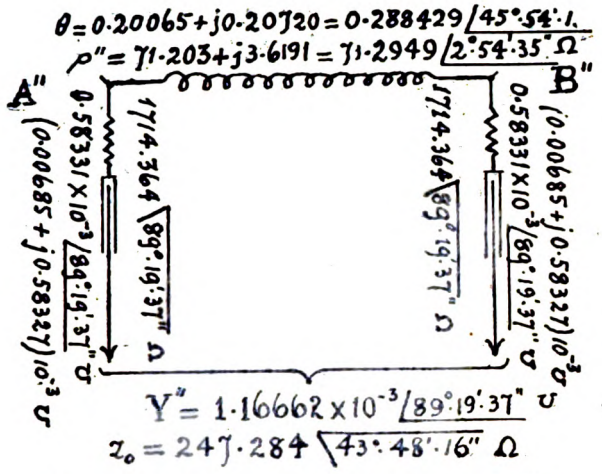

Fig. 10.—Equivalent Π of Unloaded Smooth Section.

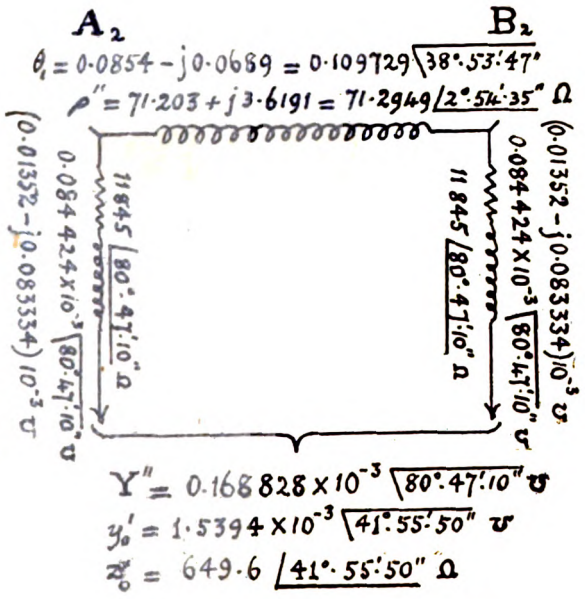

Fig. 11.—Equivalent Π of Loaded Section.

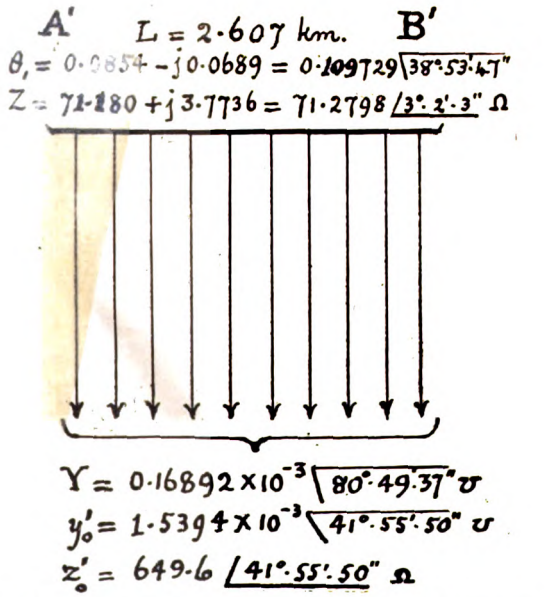

Fig. 12.—Reversion to Equivalent Smooth Section Taken Between Midleaks.

smooth line to which Π A_2B_2 of Fig. 11 reverts, is shown in Fig. 12. It will be observed that, at this particular frequency, the effect of the uniform leak loading is to reduce the section angle from 0.20065+j0.20720 hyp to 0.0854—j0.0689 hyp; while changing the surge impedance from 247.284 ∠—(43° 48′ 16″) to 649.6∠41° 55′ 50″. The attenuation on the loaded line is less than that on the original unloaded line; but this improvement only occurs within a certain range of frequency. In other words, this line will transmit alternating currents, of the particular frequency 796, much farther, when loaded with these leaks, than when unloaded; but the improvement due to loading extends only over a relatively small range of frequency.

The results shown in Fig. 12 are also obtainable from either formulas (4) and (8), or (6) and (8).

Collecting the series-loaded and leak-loaded line formulas we have the table on the preceding page.

Formulas (12) and (16) are the most suitable for use in alternating cases, when tables and charts of complex hyperbolic functions are available. It will be seen that the formulas for determining θ_1, (12) and (13), are similar; whereas, those for determining z_0' and y_0' (16) are also similar, but mutually inverted.

The arithmetical procedure for determining the characteristic constants θ_1 and z_0' of a regularly loaded line is therefore the same, whether series or leak loads are used. First, the loaded section angle θ_1' is found by (12) or (13), and then either z_0' or y_0' is found by (16).

Scientific Men and Industrial Development.

Another of the series of meetings arranged in connection with the movement for better organization of British electrical and engineering industries has been held, at which Professor Marchant, of the Liverpool University, urged once more the all-importance of science and scientific methods in order to maintain efficiency in industry. Especially is it the case that the scientific use of material and scientific design will lead to successful development in electrical engineering. The quality of the product must be maintained, and to that end highly trained technical men are essential, and in order that the right type of men should be available, there must be close and continual intercourse between manufacturing firms and engineering schools. The relations between the two should be most intimate and cordial.

Professor Marchant referred to the immense value to the engineering schools and colleges of knowing from the men who employed their students how they acquitted themselves. It was of equal value to the manufacturer to know what kind of men he could obtain and where he could get them. He described the satisfactory working of this arrangement in connection with the Liverpool University Engineering School for some time past, leading representatives of big manufacturing firms having acted in co-operation with them. The School could have placed twice as many well-trained men as it had available. The usefulness of such relations in connection with industrial research was also referred to, special mention being made of the scheme which has been in operation for several years in connection with the University of Pittsburgh. Professor Marchant advocated strongly a grant for such purposes of $250,000 per annum, to be made to the Institution of Electrical Engineers and to other engineering institutions, to enable research work to be carried out in suitable laboratories in different parts of England. He believed that it was in this matter of industrial research work that England had fallen behind, but it would be lamentable if pure scientists were to forsake their pure science to attack industrial problems, as both kinds of research are necessary.

If progress is to be made, highly trained technical men are the first necessity—not only to occupy technical positions, but to act as directors and leaders of industry, to know when and how to take advantage of new discoveries.

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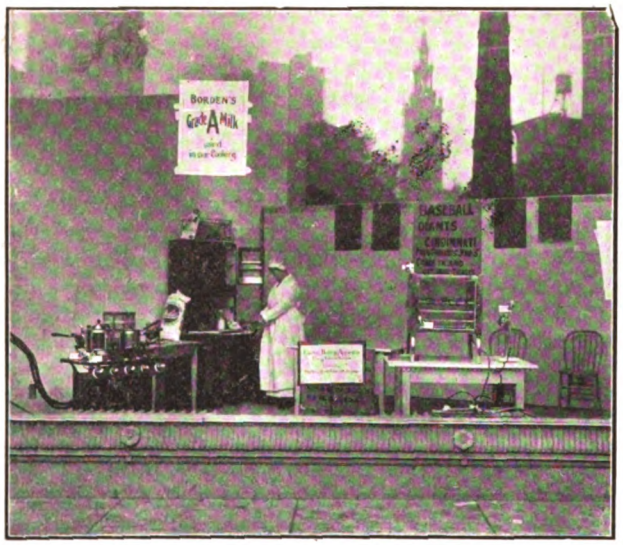
COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Suffragists Boost Electric Cooking in New York.

While electric-range selling campaigns have been going on in various parts of the country, New York City has had an interesting and impromptu demonstration of electric cooking. It came about through the opening of the new State suffragist headquarters in the Albermarle Building, Broadway and Twenty-fourth Street.

The suffragists decided to give a free piece of chocolate



Electric Cooking Demonstration by Suffragists in New York Show Window.

cake to every one buying a ticket for the baseball game between the Giants and Cincinnati at the Polo grounds on suffrage day, June 3. They also wanted to have a cooking demonstration going on in the window to tempt passers-by and lure them inside to taste the delicacies. So they called on the New York Edison Company for suggestions and aid. C. N. Lewis, manager of the Heating Bureau, provided them with the latest type of electric range and with a glass oven in which it is possible to watch the cake baking.

Large crowds were always on the sidewalk watching the cakes baking in the glass oven. The other electric equipment of the kitchen consisted of a chafing dish, double-boiler, tea-kettle and egg-beater.

Company Offers Electric-Fan Service Free to Invalids.

The Nevada (Mo.) Utilities Company is performing a charitable service in Nevada that not only wins it many compliments, but calls attention to the great utility of the electric fan. A few days ago it advertised in the local newspaper as follows:

"During the hot weather this company will render electric fan service free to invalids unable to pay for it, upon receipt of proper advice from the attending physican. This offer, of course, is available to buildings adjacent to our present located lines."

There was no immediate demand for the service, and no large demand is anticipated. But the manner of presenting the value of the electric fan has undoubtedly won favor for the company.

Low-Price House-Wiring Campaign in Lowell.

The Lowell (Mass.) Electric Light Corporation is conducting a house-wiring campaign on the specially low price of $24.92, covering a one-light, drop-fixture in the front hall, a two-light chandelier in living and dining rooms, and a one-light straight pendant in the kitchen. The price includes lamps and shades. The small initial payment of $4.92 and $2 a month for ten months, covers the installation. Four contractors share in the contracts, at established unit prices.

Electric Gifts for the Newly Wed Advertised by Boston Company.

The Boston Edison Company, ever on the alert to improve an opportunity to extend the uses of electric current, is featuring the attractiveness of electrical household devices as timely and useful gifts for brides of the season.

These appliances as well as table lamps, which are also suggested as welcome, are today made in such attractive patterns that their merit of usefulness is scarcely more

Timely Appliance Advertisement of Boston Company.

to be considered than their beauty as house ornaments. Coffee percolators and chafing dishes are sure to be acceptable gifts for the "newly weds" of whatever rank and station. The accompanying illustration shows a typical advertisement of the series.

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The Personal Element in Advertising

By Charles H. Seaver

To obtain the maximum results from central-station advertising it is essential that every employee of the company familiarize himself with the copy and work in harmony with the advertising department, particularly should there be close co-operation between sales and advertising departments. Various suggestions for co-operation are given in this article, which is the fourth of a series dealing with central-station advertising and publicity. Another article will be published in an early issue.

The "All Together, All the Time, For Everything Electrical" of the Jovian Order is as valuable a motto for the central-station advertising man as it is for the man who actually goes out and brings in business. It means team work, and team work of a concentrated kind. It means that the departments getting business through a personal contact with the public and by the printed appeal, keep an interest in what each other is doing. The advertising man who neglects to pay careful attention to the work of the salesmen is as much at fault as the salesman who does not keep track of the advertising campaign.

With divided responsibility for advertising, this co-operation can hardly be hoped for. Whether there is enough work to keep one man busy of not, some one man should be entirely responsible for the advertising. Well-directed effort can not be secured where there is conflict of authority. If no capable man who can give sufficient time to this branch of development work can be found within the organization, it will pay to get some one who has the ability and the knowledge to write copy that brings business—to direct the publicity methods of the company.

There can be no question as to whether it pays or not. Live copy properly placed will bring business. Circular letters with the right folders will put prospects on the path to better light and better power. The only excuse a station might feel for neglecting advertising would be that the field is fully developed. Yet it is doubtful if any field is fully developed—or ever will be. If it is, the same reason might be advanced for doing away with the business-getting organization altogether.

It is easy to see how a field might be over-developed at certain points, making the peaks higher, but the real valuable advertising, like other valuable new-business work is the kind that makes the peak extend over a longer period or brings up the valleys until they are paying profits. Improved diversity-factor, and more off-peak loads have been the rewards of companies that have intelligently worked and advertised. The two greatest off-peak loads, the ice-plant and the public garage, have been developed by many central stations. Many others are beginning to see that their load curves can be advantageously raised at a comparatively small expense. It is not entirely a matter of advertising, but it is advertising properly co-ordinated with salesmanship.

The matter of knowing just what to advertise and just when to push hardest can not always be settled by any one man. Again, conditions alter so rapidly, that at times any plan must be changed. Things arise that cannot always be foreseen. The sudden breaking down of a plant, shortage of an ice supply, or change of policy may demand immediate attention and may necessitate close co-operation of the advertising head with the heads of other departments. The "committee plan" of figuring out each week just what copy should be used the following week has a good deal of merit. It makes the advertising manager no less responsible and has the advantage of securing valuable co-operation. As valuable as the co-operation of these members of a committee, is the unified work of the men on the street or at the counter. If utensils are being pushed, or electric signs exploited, each man in the business organization should know of it. Whether the major part of his efforts are employed in other directions or not he can help make the campaign a success. This co-operation or lack of it decides the value of a vast amount of advertising. It can be secured only by advertising the campaigns or advertising matter within the organization.

A novel scheme of one company designed to make every one in the company employ read current newspaper advertising is to give a dollar to each employee finding a mistake. The amount, possibly, is small, but it does the work. The fact that very few mistakes made were not caught by some one speaks very well for the stimulus this action gave in the way of keeping the employees posted.

Thus every man in every department should, in some way, be made to feel an interest in the advertising—for every department has in a measure the power to greatly increase or perhaps entirely take away the value of the best publicity. Courteous treatment on the telephone, accurate information, prompt response in sending representatives to give estimates and adjust difficulties is essential. Above everything else the central station is selling "Service." Courteous treatment of the public by the employees is a feature worthy of much publicity—but it must be backed up by facts. The customer is quick to resent any such contradiction of advertised suppositions, and actual conditions. Discourteous answers to seemingly foolish questions would destroy the value of the most careful advertising or selling campaign ever planned.

The following extract is taken from the employees' handbook of a company operating a large central station. It throws some light on the causes for discourtesy in people undoubtedly courteous in their social life.

"An eminent physician, Dr. Cabot," says the booklet, "has called attention to a psychological fact which should be constantly kept in mind by those who have to do with public service, which he calls, 'The Illusion of Routine,' and describes as follows:

"You are perhaps an orderly, stationed in a certain part of a great institution to answer questions. People drift by your corner at such and such a rate and ask you questions, many of which are very foolish questions. Human nature being what it is, those questions come to be very much alike in any given month or any given year, and before you have been there very long you have been asked the same foolish question by at least a hundred people. The point to which I want to direct your attention is that when the hundredth man asks you a question which is no more foolish than it was when it was asked you the first time, your impression is, and you act upon it, that you have been asked the same foolish question a hundred times by the same man.

"In this connection, it should be remembered that questions which on the face appear to be foolish to those familiar with our business, are not foolish to the person asking them, and should be answered fully and courteously."

It suffices to say that where such advice as this is carefully and consistently followed, the point of service is well worth featuring in the newspaper advertising and such featuring is really "worth while" advertising.

The advertising manager who wants to put forward such friendly phrases as "Our experts are at your service," or

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"An estimate will incur no obligation," should first find out whether the services of experts are really so easily had, and whether the prospect is actually made to feel no obligation through too close or too long a follow up. Even the most enthusiastic attempt to turn inquiries into actual business should stop short of the point where it becomes a nuisance.

When attention is directed one way keep it there—at least long enough to feel that the expense of getting further business in that direction is unwarranted. The first call on a man using an engine instead of a motor to drive his machinery might be entirely unsuccessful, but when that man has received booklets, figures, and perhaps a friendly letter or two he is apt to be in an entirely different mood. If his curiosity has been aroused, if he does not believe that electric drive can be so cheap, there is at least an opening for the solicitor to get down to "brass tacks" with him.

Like the valuable advertisement, the valuable campaign is one that not only directs attention in one way, but keeps out every diverting factor. One point at a time—the "bull's eye" method, very often succeeds admirably. At least the body of the advertisement, the main portion of the booklet, the principal part of the billboard, should hit hard. A few scattering shots, a line about electric service in general will do no harm and may get some results, but it should be secondary to the principal object of the campaign.

Contests among customers often bring good results and add interest and direction to a campaign. The Commonwealth Edison Company, of Chicago, at one time offered a washing machine as a reward for most closely estimating the saving made in a year by employing that machine in a small family. Attention to this contest was first aroused by circulars mailed to a large list. Later, newspaper advertisements appeared. Sheets folded and inserted in envelopes labeled "Washing Machine, Free" were distributed from points where electric light bills were payable. After the award was made, a follow-up advertisement in the newspapers announced the name of the winner, and the yearly saving possible with the use of an electric washing machine. In this case the contest was especially valuable as it directed general attention to the economy of the thing exploited.

The Denver Gas & Electric Light Company caught the public attention and directed it specifically in one direction for a month one summer; long enough to reap the benefits. Twelve groups of household appliances were made up, consisting of a vacuum cleaner, toaster and flat iron; vacuum cleaner, percolator and toaster, and so on. Each set was valued at $50. Coupons with a face value of eleven dollars to apply on the purchase of any set were then issued. In the circular sent out each set was well illustrated and described. To make purchase easier, installment payments were arranged for.

Keeping attention directed in one way for even so long a period as a month is no easy matter, yet if it be skillfully done it is almost certain of success if the scheme is a sound one. The many different media, the bulletin board, booklet, newspaper, circular and so on are so different in aim, and subject to such different treatment that the deficiencies of any one are made up by the good points of the others. Hammering steadily, aggressively with all of them, and explaining in every way, and from every angle how the reader will increase his income, or his comfort or cut his expense in some way can hardly fail to make an impression on a good percentage of the many who read the various messages. Co-operation, boosting and always presenting the best side and backing up advertising with facts is bound to win out.

Except in the advertising that makes an absolutely definite offer, it is too much to expect that the results will be immediate or that they will bring in a very large amount of new business. It is only in such cases, or where a campaign on house-wiring, store-window lighting, or something equally specific is being carried on that results can be traced at all. The inquiries come in; the solicitor is helped to a certain extent, and much valuable information is given out through booklets and newspapers. These might be called the primary results of advertising.

Test of Battery-Charging Equipment for Garage Shows High Efficiency.

In the Electrical Review and Western Electrician of January 1, 1916, there was described the electric garage of the Stroh Brewery Company, Detroit, Mich., in which are housed, charged and cared for a large fleet of electric trucks and delivery wagons used by this progressive company. It will be recalled that the charging current is supplied by the Detroit Edison Company as three-phase, 4,600-volt current at 60 cycles and this is stepped down in three Westinghouse single-phase transformers to about 148 volts; from the secondaries the current passes through two Allis-Chalmers 200-kilowatt rotary converters which supply the direct-current charging buses. The voltage of the direct-current circuit is regulated by means of a Westinghouse induction-type three-phase regulator which is connected between the supply source and the step-down transformers and serves to boost or buck the voltage supplied to the alternating-current end of the converter; thus the direct-current voltage can be varied during the progress of the charge from about 180 to 230 volts. The charging circuits are arranged as a three-wire system so that between either outside wires and neutral there is available 90 to 115 volts. This equipment has been operating with complete satisfaction.

A test was made in this garage a short time ago to determine the over-all efficiency of the entire charging equipment from the Edison supply cables to the direct-current battery-charging buses. This test was made by the input-output method for the sake of simplicity. The input was measured by two induction wattmeters connected to the high-tension service leads through current and potential transformers. The output was measured by two direct-current switchboard ammeters and by the station voltmeter. During the test the neutral was disconnected, so that the two ammeters read in series and therefore gave an excellent check on each other. The probable accuracy of the test was within one per cent. The load was kept constant and was obtained by the use of five water rheostats connected in parallel which thus corresponded exactly with the storage batteries of the trucks. By the use of the potential regulator the charging busbar voltage was varied from 179 to 226 volts corresponding to charging voltages between outside leads and neutral of 89.5 to 113 volts. Readings were taken at practically full load and at different voltages with the following results:

Direct-Current Voltage.	Input Kilowatts.	Output Kilowatts.	Actual Efficiency Per cent.
179	173.3	153.9	88.8
190	180.9	161.1	89.0
199	187.2	169.1	90.3
209	198.7	177.6	89.4
211	200.1	179.4	89.6
220	209.3	187.0	89.3
226	212.6	192.1	93.0

These efficiencies correspond almost exactly with the guaranteed efficiencies of the equipment. They also show the very high efficiency obtained by the use of such battery-charging equipment in comparison with the more common method of using motor-generators. The tests were made by Fred J. Postel & Company, Fisher Building, Chicago, who designed the installation.

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POWER ENGINEERING

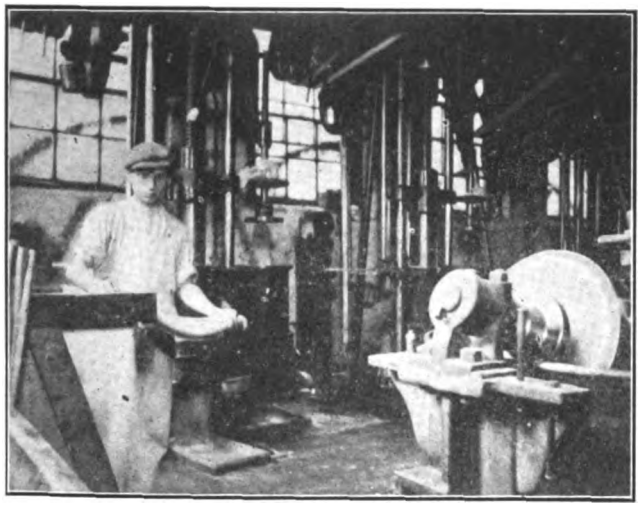
Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

MOTOR DRIVE IN THE MANUFACTURE OF MACARONI.

Details of an Interesting Installation in Denver.

By Frank D. Burr.

An industry which has had a very rapid growth in Denver, is that of the Denver Macaroni & Noodle Company. The sales of macaroni in its various forms have been



Motor-Driven Kneader and Presses in Macaroni Factory.

remarkably increased by the above company, which has educated all classes of people to the advantages obtained from its numerous uses.

The manufacture is commenced in the basement of a two-story building where a 15-horsepower 220-volt three-phase motor running at 1,130 revolutions per minute drives a macaroni dough mixer, kneader, three macaroni presses, a dough brake and noodle cutter. These machines are shown in the accompanying illustrations.

The mixer is in appearance a vertical cylinder containing a volume of 75 gallons. In the center is driven a vertical shaft, through the center of, and at right angles to which is fastened steel rods, spaced eight inches apart, which are at right angles to each other and of sufficient length to nicely fit inside the cylinder. When the shaft rotates, the steel rods pass midway between similar rods, fastened at the inside of the cylinder. Flour and water is poured into the mixer of sufficient amount to make 100 pounds. The mixture being formed into a dough is continually turned by being forced between the steel rods and in this way it is possible to get the best effect of the starches and glutens after a mixing of ten minutes.

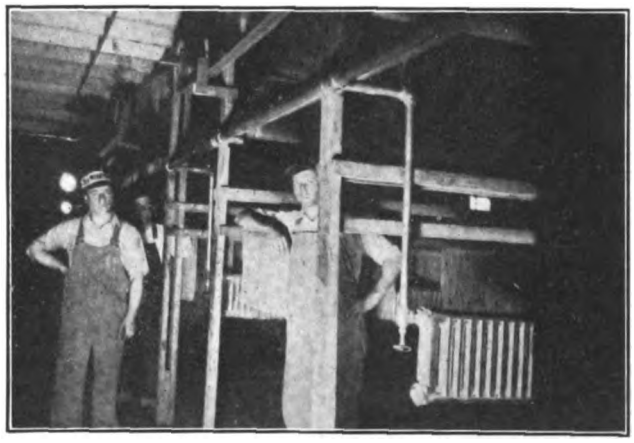
All old country people demand that the macaroni be made of macaroni wheat, called Durum. The flour produced from this wheat is granular, resembling fine white corn meal. When noodles are made eggs are added to the mixture.

After the paste is thoroughly mixed the dough is placed in the kneader where it is worked for fifteen minutes. This consists of a revolving pan, four feet in diameter at the side of the mixer, in which revolves at diametrically opposite sides the conical rollers, one of which is corrugated, the other plain. The dough passes under the corrugated roller, thus working it into a series of undulations, and after being pasted around beneath the other roller which is smooth, it again works the dough, flattening out the undulations. Just before the dough reaches the corrugated roller again a plow share scrapes the dough from the bottom of the pan, standing it on edge so that it runs under the corrugated roller in that position and thus continues until properly worked. The dough is then cut into suitable cakes so as to be readily forced into the cylinder of the macaroni press.

The press consists of two vertical cylinders, one of which is being filled with dough while the power-driven screw press pushes the dough through the macaroni die at the bottom of the other cylinder. The cylinder being loaded is packed with the dough being pushed into a homogenous mass by putting in one layer at a time and forcing it together by means of a hand-driven screw press.

When the flexible macaroni tubes have issued below the die into lengths of about 40 inches they are gathered together by the operator of the machine and cut off at the die. They are then folded over one of the drying sticks, four feet long by three-fourths of an inch in diameter, and adjusted to one layer in depth so that they may readily dry. The ends below the stick are then trimmed by means of cloth-cutting shears to a length of 19 inches and are then carried to the fan room and placed on racks so that the sticks are parallel in racks at a distance of six inches apart.

The macaroni is left in the fan room for one hour, when it is properly dried.



Drying Room Equipped with Fan.

The fans consist of blades or paddles 36 inches long clamped at the middle to a horizontal revolving shaft 15 feet long. The blades are fastened at right angles to each other one foot apart. A line of steam radiators extends below the entire length of each shaft, the steam being supplied by a small steam-heating plant operated at 15 pounds pressure. Four of these fans are belted to a

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5-horsepower 220-volt three-phase motor running at 1,800 revolutions per minute. There are three similar sets of fans and motors.

After being dried the sticks are taken from the racks to a truck and taken to the damp room where the macaroni is kept for three hours. Brick stalls are built in this damp room, four feet in width, so that the macaroni sticks can be arranged there symmetrically and parallel.

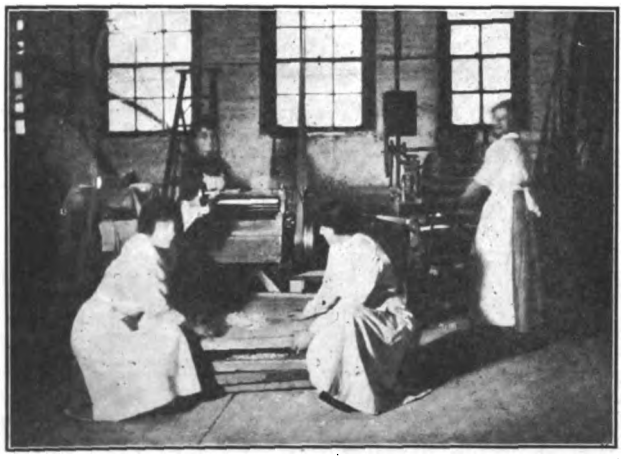
Just previous to the placing of the macaroni, the brick walls covered with burlap, are sprinkled with water. After the macaroni has been placed it is covered with a cotton blanket to retain the dampness.

After the macaroni has become damp and pliable again it is returned to the dry room where it is dried out in an hour and a half. It is then again taken to the damp room where it becomes damp and pliable in another three hours, after which it is taken up stairs on the elevator which is driven by a five-horsepower 220-volt three-phase motor running at a speed of 1,700 revolutions per minute, where it is dried for about a week. It is then taken to the packing room where it is cut into suitable sizes for packing by means of a cross-cut saw, driven by two-horsepower 220-volt three-phase motor, 1,800 revolutions per minute.

Spaghetti is produced by the same process excepting that the dough is forced through dies having smaller holes and vermicelli is produced by forcing through dies having much smaller size holes.

Elbow cuts, which are short pieces to be used in soups and stews, etc., are made by means of a knife revolving below the die of the macaroni press, at such speed that it makes one revolution by the time the macaroni has been pressed through about an inch in length; these pieces are then collected into a canvas bottom pan and taken to a fan room where it continues in the same process as the other macaroni.

Over 1,200 tons per year are produced by this factory,



Noodle Cutter and Other Motor-Driven Machines in Macaroni Factory.

the sales force of which distributes the output from Montana to Mexico and from the Pacific coast to the Missouri River. This product complies with all of the regulations of the pure-food law, containing no adulterations or coloring matter and the factory is kept thoroughly sanitary and clean because of the use of electricity.

Large Power Contract with Gas Company.

The Merchants' Heat & Light Company, Indianapolis, has closed the largest power contract ever closed by a central station in that city. The contract is with the Citizens' Gas Company and calls for $30,000 annually for the use of power. Heretofore the isolated plants of the gas company have provided their own power.

SECURING POWER BUSINESS FROM LARGE FACTORIES.

Louisville Company Takes Advantage of Every Opportunity to Establish an Entering Wedge and Then Has Systematic Follow-Up.

It is often true that the power salesman will come to the conclusion, when he considers a big factory with a large and well-equipped steam plant, that there is no chance for him to do any business there. The same situation applies in a large measure to the enterprises which are generally considered to be closed doors to the power man, where necessity of disposing of waste or requirements in the way of heat, or steam or water seem to make electricity —at least central-station service—out of the question.

In many such cases, naturally, it is an impossible chance that the power salesman can interest the owner in a proposal to throw out his elaborate steam and transmission equipment and adopt central-station service. Even when a new project is being built from the ground up the power salesman will usually find that he is encountering real opposition from representatives of the older systems. One way to capture a city is to overwhelm it all at once. This is sometimes a good way, although again it is often undertaken at prohibitive cost in life and endeavor. Another way to capture a city is to send one hardy scout over or through or under the wall in disguise and have him blow up the arsenal and spike the cannon. Then the rest of the army simply walks in and occupies the place.

So when the proposition in the aggregate looks like a forlorn hope or when it is a forlorn hope, there is very often a good opening in the wall through which the power salesman can send his scout. Then he has driven an entering wedge. He has a good thing and sooner or later he will, if he keeps pounding on the wedge, drive a bargain that means a big order and constantly increasing business. Or even if he can get no further than the original contract, there is every reason to conclude that all the other "hopeless propositions" on his books will offer him similar opportunities, and in the aggregate that kind of business is worth going after.

Opportunities in Flour Mills.

There is an instance of this kind to be noted in Louisville, Ky., where a big milling company which two years ago was scarcely on the books of the Louisville Gas & Electric Company is now a customer with an aggregate consumption of about 35,000 kilowatts a month. The company is the Ballard & Ballard Company, flour millers, with one of the biggest milling plants south of the Ohio River and with a modern, efficient and well operated steam power plant of 1,400 horsepower, which is still running and has an expectancy of a long and useful life. Coal for steam purposes is very cheap in Louisville, and there is a spur from the main line of the Louisville & Nashville railroad which runs into the plant.

A year and a half ago the Ballard & Ballard Company found that it would require additional power. At this mill, as at all others, there is a proportionately large accumulation of waste which is cleaned from the grain before it goes into the flouring process. This had been disposed of in one way or another without showing a profit of any importance. The management of the company determined to put into operation a machine which reduces this waste to a high grade feed, at the same time grinding the weed seeds so that there is no possibility of their getting back to the land. This machine was to be erected at a point where it would be rather inconvenient to reach with a shaft or belt.

At length the company decided on electricity and had even purchased a generator which was to be belted to the steam engine. That, however, was when the representatives

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of the Louisville Gas & Electric Company got in their work. It was not that the generator in itself was not all that could be required, but the position of the company's representatives was that since the new machine was more or less experimental, since this generator would have had to be supplemented later and since by the means proposed electricity would hardly get a fair trial, central-station equipment was what was wanted.

In due course the new feed-grinding machine was put to work, connected to a 25-horsepower motor. That was a year and a half ago. The machine proved itself. Now, ranged by the side of it are six other machines of identical construction each operated individually by a 25-horsepower motor. This one item offers a practical and concrete suggestion for the power salesman, for milling plants are everywhere and many of them are so rich in the waste they accumulate that they could be directly served by addition of such equipment to their plants. The fact that the waste is often discharged, also, at a distance from the power plant suggests also that electric drive could be provided for in numerous cases.

About the time that the trial was made with the first grinding machine at the Ballard & Ballard mills the city was finishing a large undertaking in the way of improving Beargrass creek, which flows past the mills and from which the plant gets its condensing water. These improvements included deepening and straightening of the channel, until the head of water is lowered and it became necessary for the company to pump its water. Once having discovered the advantages of electricity by actual use the company installed a centrifugal pump about 200 feet from the boilers and connected it to a 40-horsepower motor.

The creek named is sometimes subject to floods, although this objection is being largely done away with through the improvement the city has made. Still there are likely to be times when the water will break its artificial bounds, as it used to break the natural bounds. In former years the company found it necessary to keep steam up at flood times so as to be able to operate a pump located at the lowest point in the plant. Now this danger is amply taken care of by a pump at the low point, to which a 30-horsepower motor is connected. It is all ready to operate by the simple process of throwing a switch. Like other flouring mills this one operates more or less intermittently. Now, whatever the water danger, there is no need to keep steam up for possible pumping. It may be noted that in the year and a half this flood water pump has not been needed once.

A city block or more distant from the main plant of the company is the warehouse, additional storage and elevator accommodations, etc., where a year and a half ago a separate steam plant was maintained to operate the various equipment requiring power and, also, to pump the water from a deep well for the boilers of both plants. This was not such an elaborate plant, naturally, and its cost was rather heavy. One of the next steps was to throw it out altogether. Now there are 125 horsepower of electric motors connected up in this warehouse building and in addition still another 40-horsepower motor drives the deep-well pump.

Like other industrial enterprises the management of this company is always on the lookout for opportunities to extend business. In former years all of the product of the big plant was packed into barrels or into bags. The demand for flour, plain or prepared, special kinds of flour, etc., packed in pasteboard cartons, has been increasing, especially under the influence of the prevailing high prices on flours, and the Ballard & Ballard Company determined to go after some of this business. There were no facilities for operating such a department under the existing arrangement. Power and equipment were needed. Now the carton department has two 10-horsepower motors, one 15-horsepower motor and one 20-horsepower motor, driving packing machines, conveyors, etc.

Eventually, of course, the Ballard & Ballard plant will be changed over altogether to the electric drive, as will other manufacturing plants. This record of additions to the power to the advantage of electricity certainly shows that the business which has resulted in the short space of a year and a half, will increase as time passes. It all started from the first installation. The bulk of the selling was done then. When he drove the entering wedge at this plant the representative of the Louisville Gas & Electric Company started something. How worth while it is can be determined from the volume of consumption.

The Axton-Fisher Tobacco Company, a new plant, operating electrically but with an isolated plant, has also been added to the power customer list of the local central-station company. Steam and water are essentials in tobacco handling. If the leaves become dry and shatter they are gone. This was a case where more power was needed and where in order to get it unaided the isolated plant would have had to be extended. Still no more steam or water was required. The requirements do not balance that well in a tobacco factory, nor in many other power-using plants.

A recent lumber publication advocated installation of motor-driven equipment in some cases and instanced the application of the principle to a cut-off saw. Lumber mills, with their excess of waste, are usually deemed impossible. Here is a way to make a beginning. The cut-off saw is the one which works at right angles to the grain of the lumber and is used to even boards and reduce slabs to chunks. The lumber expert makes the observation that the great bulk of woodworking operations are performed on the material while it is in motion and traveling in the direction of its length. Cut-off operations, on the other hand, offer a distinct retarding effect upon the movement of the stock through the factory, as the material is momentarily held up during the time the saw passes across the board.

Not only is this true but the fact that the arbors of the surfacing machinery and the cut-off saws must necessarily operate at right angles, requires that the latter be driven at right angles to the main driving shaft through a quarter-turn belt or other device, or the installation of a motor-driven unit. This writer advocated installation of the cut-off saw out of doors, on the conveyor, and points to the desirability of the electric drive.

Electric Shovel at Coal Mine Shows Economy Over Steam.

A half-dozen or more big-type electric shovels are now building or have been contracted for in coal-stripping operations, on the strength of the showing made by a pioneer installation since the first of the present year. Mention was made several months ago of such equipment being installed by the Piney Fork Coal Company, of Columbus, O., at its mining operations in the Pittsburgh No. 8 seam, near Steubenville, O.

The Piney Fork plant went into regular commission in January. Its performance has exceeded the hopes of the company which made the experiment. The daily power expense under normal conditions has been less than that estimated for steam. It is a curious fact that a shovel engaged in coal production and standing upon a seam of coal, no farther away than the length of the boom, cannot utilize this fuel for its own operation as cheaply as it can supply itself with electricity generated—as in the case of the shovel in question—30 miles away. A large expense of the former is that of getting the coal from the seam to the shovel. The shovel being necessarily portable, no permanent device can be constructed. With electricity the energy is secured from a near-by transmission line and connected in a few minutes.

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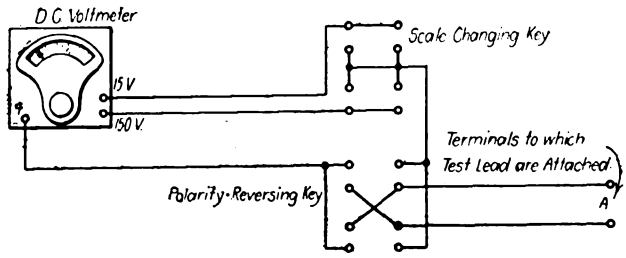
ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

A METER CARRIER, A HANDY CONTRIVANCE IN ELECTROLYSIS SURVEYS AND TEST WORK.

By L. E. Darling.

In electrolysis surveys, cable tests, and similar work, it is usually necessary to carry a voltmeter from place to place to get test readings. The ordinary method of transporting the meter is to have it incased in a small wooden frame and hung by a strap to the shoulder. At each manhole the meter must be unslung, laid flat on the ground,



Wiring Diagram of Meter Box.

in dust or mud as the case may be, and connected up with the test leads running to the cable or other object under investigation.

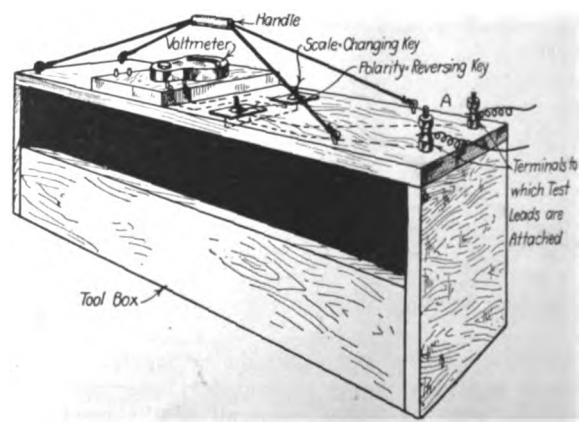
All this is time-consuming and laborious, as well as hard on the meter's mechanism. In addition, frequent connecting up of wires speedily results in the ruin of binding posts. Frequently the leads have to be reversed after once put on, for the reason that the meter is reading in a backward direction. Then again, if the meter has more than one scale, further manipulation is necessary to connect up to that one best fitted for the voltages under observation. If the streets be crowded, passing horses are likely to step on the meter in its unprotected position adding still further to the troubles. If too much time be consumed in the various manipulations, the operator is likely to bring down the wrath of the corner policeman at the obstruction of traffic he is causing. Altogether the arrangement is unhandy and inefficient.

To obviate these difficulties, investigators working on an electrolysis test of telephone cables recently devised a meter carrier which proved decidedly practical and convenient in use. A long narrow box was obtained, to one end of which the meter was attached. The sheer size of the box, about 30 inches long by 8 or 10 inches high, was sufficient to attract the attention of passing teamsters, and to keep them from guiding their horses into it while the operator was down in a manhole or otherwise engaged. To eliminate the necessity for changing wires about on the binding posts of the meter, two double-throw switches were installed. Since a voltmeter takes but a very small current, the kind of switch used on a telephone board known as a "ringing and listening" key, was found to be particularly satisfactory for this purpose, and better than heavy knife switches which might have been used.

The two keys were connected in on the meter circuit as shown in the accompanying diagram. One key served as a "polarity reverser," and the other as an agency for bringing into play either one of the voltmeter's two scales at will. At the opposite end of the box two heavy binding posts were securely attached, these serving as anchors for wires which led from the meter box down into a manhole or other locality being tested. As can be observed from the diagram, the wiring circuit leads from these two posts, through the polarity and scale switches and thence to the meter.

In use, the test wires were left permanently attached to these heavy binding posts, eliminating entirely the necessity for pausing in the middle of a crowded thoroughfare to connect up the meter. All that was necessary was to connect up the loose ends of the wire to the cable being tested and proceed with the readings. If the meter read backward, the trouble was promptly remedied by throwing the polarity-reversing key over to the other side, causing the meter indicator to move over the scale to the right as it should. If the high-reading scale of the instrument proved too large for the voltages encountered, the other could immediately be brought into play by moving the scale-changing switch. Ease of manipulating the keys in this manner was a particularly handy feature in neighborhoods where voltage fluctuations were large. Quick moving of the keys would enable the operator to keep up with the changes as fast as they occurred.

The box with meter attached was easily transported from place to place by means of a handle composed of four pieces of wire attached to convenient points on the framework. The interior of the box proved a convenient receptacle for pliers, screwdrivers, and such tools, as well as tape, rolls of wire, and record books needed in the work. With this arrangement the bottom of the box got all the knocks which the meter would ordinarily receive if carried around alone and laid flat on the ground, as was formerly done.



Handy Meter Carrier with Wiring for Making Tests.

Passersby, whose feet sometimes got tangled up in the leads running to the object being tested, worked no injury to the meter itself, for the heavy binding post at the end of the box caught all the strain due to accidental pulls. Throughout three months night and day use the apparatus proved entirely practical and a timesaver.

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Alternating-Current Motor Windings—II

By Justin Lebovici

This is the second installment of a series of articles dealing with the windings of alternating-current motors. The present article deals with winding diagrams and single-phase windings. Subsequent articles will discuss wave connections, lattice connections, skein windings, polyphase windings of open and closed types, mechanical construction of windings, etc.

Arrangements of Conductors.

In most low-voltage machines and machines of industrial sizes a slot arrangement of conductors is employed that is shown in Figs. 18 and 19.

In this case the conductors *T*, lying nearer the bottom of the slot, form part of one coil and the conductors *B*, nearer the top of the slot, form part of another coil. Where many small conductors are required the arrangement shown in Fig. 18 is commonly used; the wires *W* may be round or rectangular. If the wires *W* are in series, round wire is to be preferred, as

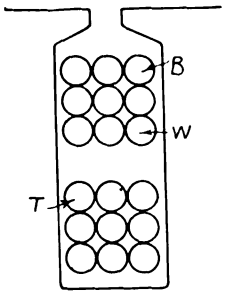

Fig. 18.

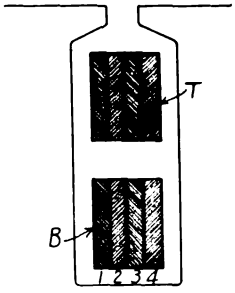

Fig. 19.

square wire easily twists, resulting in short-circuited coils. In case the wires *W* are small and the wires are not arranged to form layers, we speak of promiscuous or mush winding. The rectangular wires wound *on edge* in Fig. 19, or *flat* in Fig. 20, utilize very efficiently the slot space and have the only drawback that special dies are required to draw the conductors and this copper cannot be obtained on the market at short notice.

The arrangement of conductors shown in Figs. 18 and 19 is known as *double-layer winding* to distinguish it from the arrangement shown in Fig. 20, used in induction motors operated at high voltage or in alternating-current generators.

The arrangement of wires shown in Fig. 21 is sometimes used in small induction motors having so-called *basket* and *skein* winding, a subject to be treated when the different types of windings are discussed.

The wires 1, 2, 3, 4, in Fig. 19, for instance, will be considered, depending upon the case, either as one coil-side, or as four coil-sides of four distinct coils lying in the same slot.

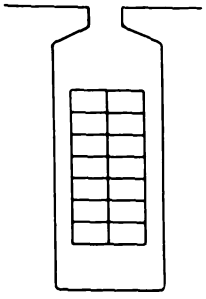

Fig. 20.

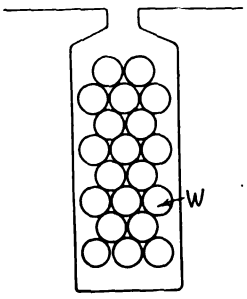

Fig. 21.

The arrangement of conductors in concentrated field coils, as shown in Fig. 22, is self-evident and needs no further explanation.

The insulation of the conductors from each other and from the slots or ground will be taken up separately.

Winding Potential Diagram

A better understanding of the connection diagrams, to be described, will be had if the winding potential diagram is thoroughly understood. Fig. 23 represents a bipolar field which may be excited from a source of direct current. *AB* represents an armature coil moving with the armature in the direction of the arrow *v* at a constant peripheral speed *v*.

The distribution of the flux around the armature periphery in a direction perpendicular to the conductor is given by Fig. 24 and is assumed to be a sine-shaped curve.

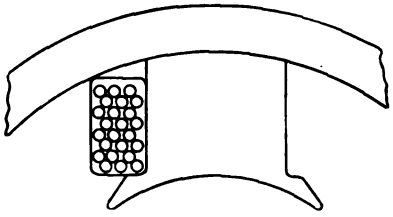

Fig. 22.

The abscissa M_1N_1 in Fig. 24 is proportional to the length *M A N* in Fig. 23 and represents the pole pitch, as explained previously. The ordinates *B* in Fig. 24 represent intensity of the field in maxwells per square inch in a direction perpendicular to the conductor *A* when the same takes the different positions from *M* to *N* and back to *M* in Fig. 23.

Suppose that we call zero the time when the conductor *A* coincides with *M* in Fig. 23 and that *t* seconds later it occupies the position *A* shown in Fig. 23. If the line *OA* describes an angle ω degrees in one second, then in the time *t* it will have described the angle ωt and the angle *MOA* equals ωt degrees. The

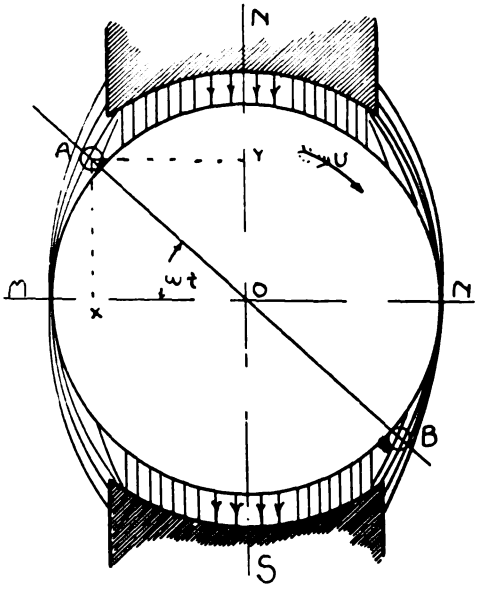

Fig. 23.

distance M_1A_1 in Fig. 24 is made to correspond to the angle ωt, and B_A corresponds to the intensity of the field at the point *A*.

Since we assumed that the curve in Fig. 24 is a sine curve, we have

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$$B_A = B_{max} \sin \omega t.$$

The electromotive force (e) induced by the rotation of the conductor A in the field is at every instant proportional to this field, proportional to the active length (l) of the conductor and proportional to the constant peripheral velocity (v), or, for the instant shown in Fig. 23,

$$e_A = B_A lv = B_{max} lv \sin \omega t = \text{constant} \times \sin \omega t,$$

and since the line $AX = OY$ in Fig. 23 is proportional to sin ωt, it also represents the voltage generated in the conductor A at every instant.

Noting that sin ωt is a value which varies between 0 and 1,

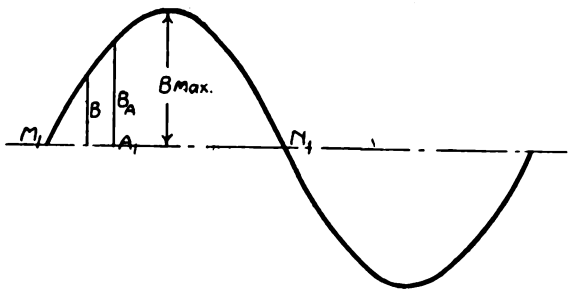

Fig. 24.

it is at once apparent that the constant $B_{max} lv$ in the last equation corresponds to the maximum instantaneous voltage generated in the conductor A in its travel around the armature and we will mark this value e_{max}. Then the equation can be written

$$e_A = e_{max} \sin \omega t.$$

e_A becomes equal to e_{max} when OA coincides with the center line of the magnetic poles, NS in Fig. 23.

If we draw a line PP perpendicular to AB and equal to e_{max}, as is done in Fig. 25, we see that since the angle PPP_1 equals angle AOM or angle ωt, $PP_1 = P_2P_2 = e_{max} \sin \omega t$, or the *projection of PP on the horizontal line MN gives us the instantaneous value of voltage generated in the conductor A for any position of A relative to the poles NS.* The instantaneous value P_2P_2 (or e) in Fig. 25 becomes equal to $PP = e_{max}$ when during the rotation of A the line PP becomes parallel to the horizontal MN, or in other words when the conductor A travels under the center of the pole. We will apply the above to the case of the ring-wound armature shown in Fig. 26.

Assume the armature to carry six conductors; the voltage induced in each of these conductors is given for any position

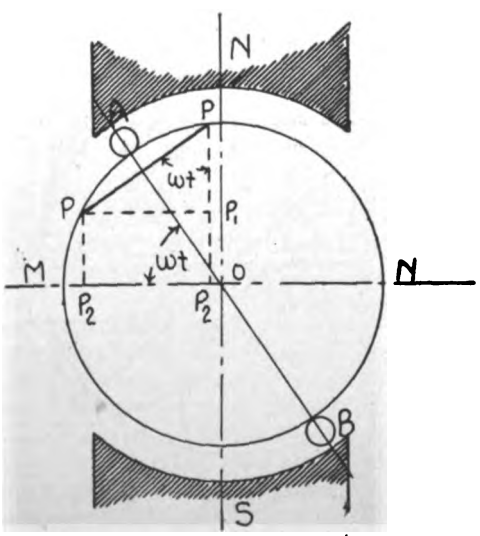

Fig. 25.

of the armature by the projection of the lines e_1, e_2, etc., on the horizontal, as shown in Fig. 27. All six conductors are represented as connected in series in Fig. 26. Arrows b in Figs. 26 and 27 correspond to each other.

The voltage generated in conductor 1 at the instant shown in Fig. 26 is given by the projection AB_1 in Fig. 27. The maximum voltage or the amplitude of the voltage generated in conductor 1 is given by the line AB.

The amplitude of the voltage generated in conductors 1 and 2 when connected in series is given by the line AC in Fig. 27. The instantaneous value for the position shown in Fig. 26 is given by the line AC_1. The amplitude of the voltage generated in conductors 1, 2 and 3 in series is given by the line AD in Fig. 27. Similarly the line AE represents the maximum value of the voltage induced in conductors 6 and 5 in series or in conductors 1, 2, 3 and 4 in series.

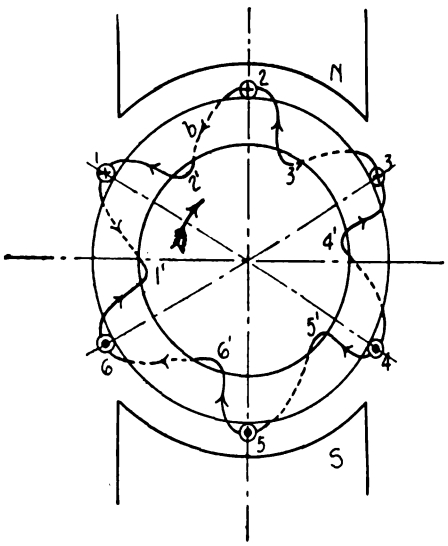

Fig. 26.

For the instant shown by Figs. 26 and 27 the voltage of conductors 1, 2 and 3 in series is equal to AD and is a maximum, the voltage of 1 and 2 in series is equal to AC_1 and is smaller than AC. After the armature has turned further through an angle ωt_1 (shown in Fig. 27) the voltage in 1 and 2 will have reached its maximum value. We express this by saying that voltage e_1 e_2 reaches its maximum later than e_1 e_2 e_3, or the voltage AC *lags* behind the voltage AD by an angle $\omega_1 t_1$. Similarly AD reaches its maximum $\omega_3 t_3$ degrees later than AE and we say that AE *leads* AD by an angle $\omega_3 t_3$. The angle $\omega_1 t_1$ is called the angle of phase difference, or simply the *phase difference* between the voltages AC and AD.

If the points 1′, 2′, 3′, 4′, 5′, 6′ in Fig. 26 would be brought to the segments of a six-bar commutator, the voltage AB, AC, etc., in Fig. 27 could actually be measured around the commutator by means of a voltmeter. The diagram shown in Fig. 26

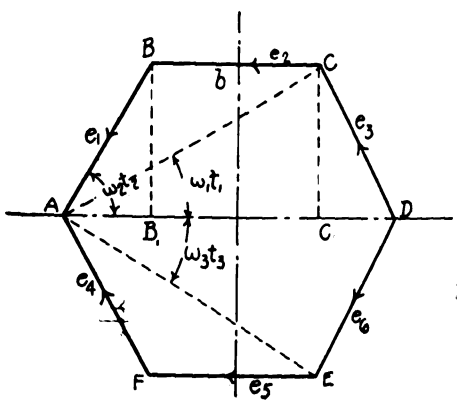

Fig. 27.

gives us the potential between the various points around the commutator, and hence the name of potential diagram or winding potential diagram.

Let the points 1′ and 4′ be brought to two slip rings and the voltage between the slip rings be read at instants correspond-

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ing to the different positions of the points 1′ and 4′ with reference to the stationary poles *NS*. The projection of the line *AD*, Fig. 27 (which we imagine revolving with the armature) on the horizontal gives us then the instantaneous voltage between the slip rings. This voltage is a maximum when the points 1′ and 4′ are in the position shown in Fig. 26, and equal to the line *AD* in Fig. 27. When the points 1′ and 4′ have

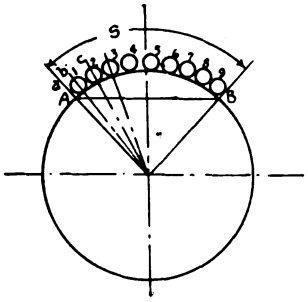

Fig. 28.

moved to a position corresponding to the axis of the poles *NS*, the projection of *AD* on the horizontal is zero and the voltage between slip rings is zero.

The electromotive force generated between points 1′ and 4′ is an alternating voltage.

It is evident from Fig. 27 that the maximum voltage of conductors 1 and 2, or *AC*, is smaller than the sum e_1+e_2. The ratio

$$AC/(AB+BC)=f_w$$

is called the winding-factor and is a quantity always smaller than 1.

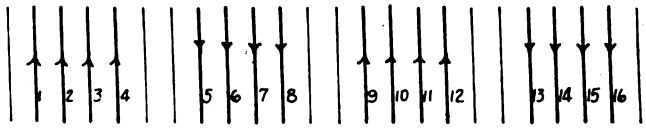

Fig. 29.

Assume now the conductors to be closely spaced, as shown in Fig. 28, then the chords a_1b_1, etc., representing the maximum values of the voltages generated in the different conductors 1, 2, ... 10, coincide with the small arcs *ab*, *bc*, etc. The total voltage generated in the conductors 1 to 10, if connected in series, is equal to the chord *AB*, while the arithmetical sum of the voltages e_1, e_2 ..... e_{10} is represented by the arc *S*. The winding-factor or breadth coefficient

f_w=length of chord *AB* divided by length of arc *S*.

The winding-factor of the group of coils uniformly distributed over half the circumference of a two-pole armature is the

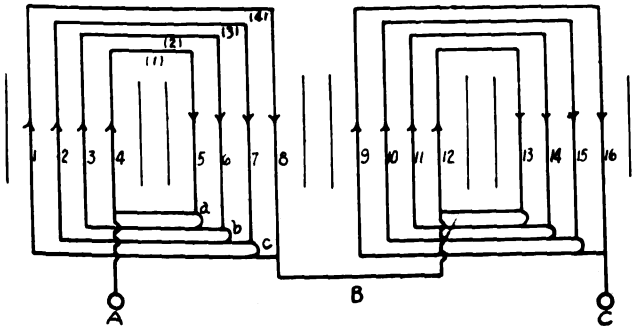

Fig. 30.

ratio of the diameter of the circle to half the circumference, or

$$f_w=2/\pi=0.637.$$

Calling the spread of the coil *S* (see Fig. 28), then we have for different ratios of coil spread to pole pitch the following winding-factors.

WINDING-FACTORS FOR UNIFORMLY DISTRIBUTED WINDINGS.

S/τ	1/6	1/3	1/2	2/3	1
f_w	0.988	0.955	0.90	0.827	0.637

Single-Phase Windings.

Generally in a single-phase winding only a part of the total slots in the pole pitch are filled with conductors. It is com-

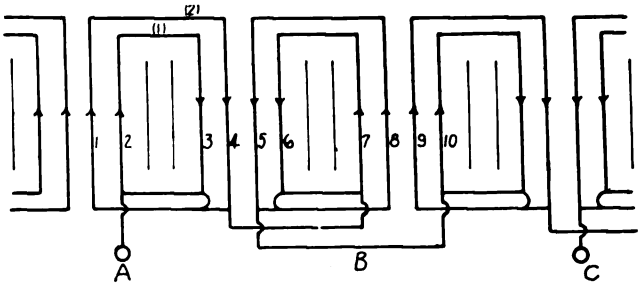

Fig. 31.

mon to wind two-thirds of the slots in the pole pitch, although any other fraction and even the full pole pitch may be used for winding.

Assume the conductor diagram shown in Fig. 29, which represents the diagram for a four-pole machine with six slots per pole pitch, two-thirds of which (or four slots) are wound.

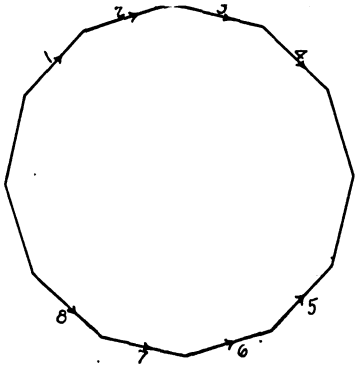

Fig. 32.

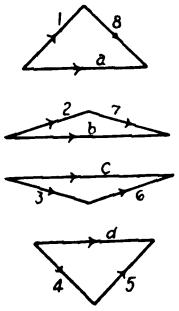

Fig. 34.

We may connect any one conductor passing under a north pole to any one conductor passing under a south pole. The following end connections are more commonly found in single-phase practice:

(a) Concentric connections.
(b) Wave connections.
(c) Lattice connections forming wave or lap windings.
(d) Skein windings.

Concentric Connections.

To connect conductor diagram shown in Fig. 29 to a concentric winding, we proceed as shown in Fig. 30, which shows one way of connecting the conductor diagram Fig. 29 to a concen-

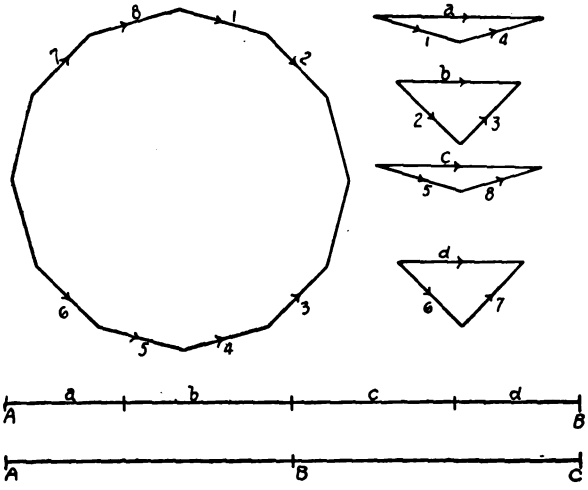

Fig. 33.

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tric winding. The winding shown in Fig. 30 requires in the case of a wire coil, four coil forms and the brackets have to accommodate four winding ends. *a, b, c* indicate the cross connections between coils (1) (2) (3) (4).

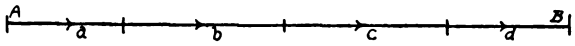


Fig. 35.

It will be found more advantageous to connect the conductor diagram Fig. 29 to the concentric winding shown in Fig. 31. In the case of more than one-turn coils only two forms would be required and the brackets would have to accommodate only two winding ends (1) and (2).

In Figs. 30 and 31 all the conductors have been connected in series between the leads *A* and *C*. The winding potential diagram for Fig. 30 is shown in Fig. 32 for the two poles utilizing conductors 1 to 8. The potential diagram for conductors 9 to 16 is identical with the one for conductors 1 to 8. Voltages

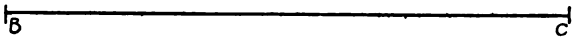


Fig. 36.

1 and 8, 2 and 7, 3 and 6, 4 and 5 combine as shown in Fig. 34. The voltages shown in Fig. 34 combine again to the resultant voltage shown in Fig. 35, where *AB* is the resultant of the voltages generated in the conductors 1 to 8.

An equal voltage is generated in conductors 9 to 16; the line representing the voltage *BC* is equal and parallel to *AB* (see Fig. 36). The amplitude of the voltage generated between the leads *A* and *C* is given by the line *AC* in Fig. 37, drawn to a different scale than Figs. 35 and 36.

In Fig. 34 the lines 1 to 8 are equal and parallel to lines 1 to 8 in Fig. 32. In Fig. 35 the lines *a, b, c, d* are equal and parallel to lines *a, b, c, d* in Fig. 34. The voltages 1 to 8 and *a* to *d* are simply added geometrically like forces.

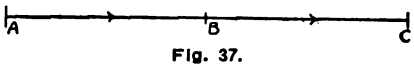


Fig. 37.

The winding potential diagram for two poles of the winding shown in Fig. 31 is given in Fig. 33. The total resultant voltage is the same as for the connections shown in Fig. 30. In fact the resultant voltage is independent of the connection diagram and only dependent upon the conductor diagram, Fig. 29, as long as the conductors are so connected that the arrows follow each other without bucking each other. Fig. 33 is similar to Figs. 32, 34, 35 and 36 and needs no further explanation.

(To be continued.)

Electrical Wiring on River Boats to Be Modified.

Contractors for electric lighting have found their prospective business extended and are following up the new order of the United States Department of Commerce relating to the character of electric-lighting equipment on boats which ply the rivers. The order provides that electric-lighting installations on all vessels contracted for after June 30, 1916, must be in keeping with the best modern practices. It is argued by some contractors that the same provisions should be carried out by the owners of older boats.

Code Standard for Wiring in the Northwest.

A proposed new electrical ordinance introduced at the suggestion of the Washington Surveying and Rating Bureau is before the city council of Puyallup, Wash., at this time. The ordinance—which is much more stringent than the one now in use—provides that all work must conform to the National Electrical Code; that a permit be taken out for every job; and that a fee of $1 or more must be paid for inspection. According to reports, there is considerable opposition to the proposed ordinance because of the heavy cost of installing small jobs.

All-Metal Conduit Requirement Satisfactory in Louisville.

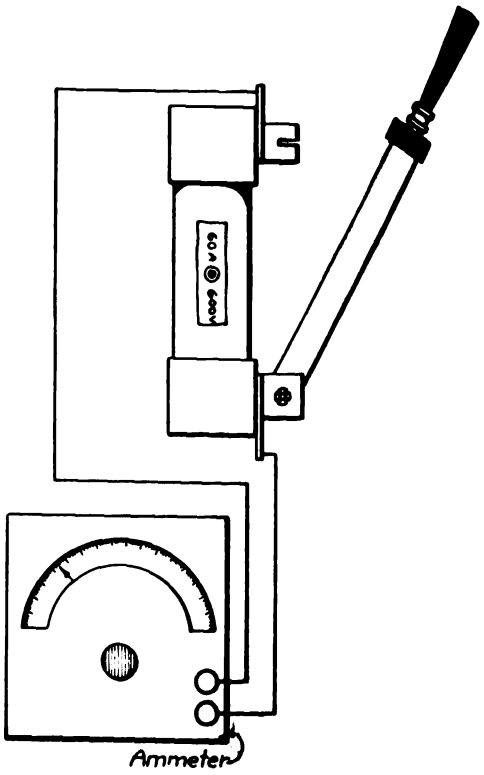
After nearly two months of operations under the new building regulation by which wiring installations in Louisville and Jefferson County, Ky., are required to be all-metal-conduit construction, the contractors of the city report that things are working out exactly as had been expected and that they are well pleased with developments. Business lagged for a time after the new regulation went into effect, but that is stated to have been due largely to the fact that contractors were busy executing orders received in the rush before the first of May. The manner in which the electrical contractors in Louisville and the civil and insurance officials have worked out a plan of co-operation has been attracting attention in other parts of the state and it is stated that in the near future representatives of the Louisville trade will go to Lexington where an Electrical Clearing House will be organized among the contractors of that city, in the interests of standardization of the work.

HANDY CURRENT-TESTING DEVICE.

By W. Morris.

A very convenient testing device can be made from the body of an old blown-out cartridge fuse, to the ferrule ends of which the hinge and clips of a knife switch are securely soldered. Secured to the switch terminals there should be flexible wires of sufficient current-carrying capacity to permit making the test on the circuit. These wires are connected to an ammeter.

This device is especially handy when it is necessary to test a lot of motors in a shop. All that it is necessary to do is momentarily to short-circuit one of the fuses by putting a jumper around its terminal clips, then pull out the fuse and in place of it insert the device shown. Now by opening the switch the current taken by the motor will be read on the ammeter and this without interrupting



Handy Current-Testing Device.

the operation of the motor at all. When ready to replace the fuse, first short-circuit the terminals again, then pull out the testing device and put the fuse back before removing the jumper.

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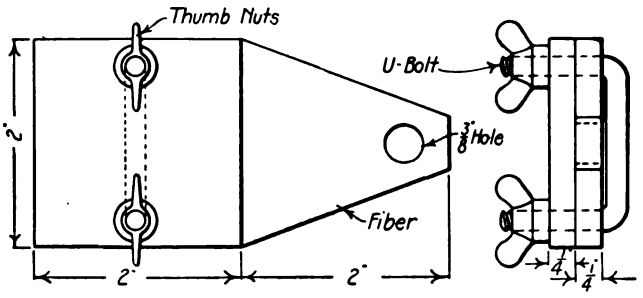
DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

A Handy Armature-Banding Vice.

A convenient little vice for holding the wire used in banding an armature can be made as shown in the accompanying sketch. It is made of two pieces of fiber, the lower one of which has an extension with a hole through it. By tying a piece of wire or rope through this hole, it can be



Armature-Banding Vice.

secured to any convenient part of the lathe or motor frame. By using a U-shaped piece of rod threaded on each end as a U-bolt, the thumb nuts will not readily become loosened. Any desired tension can be put on the wire by tightening these nuts.

R. L. Hervey.

Plugging Holes in Slate Switchboards.

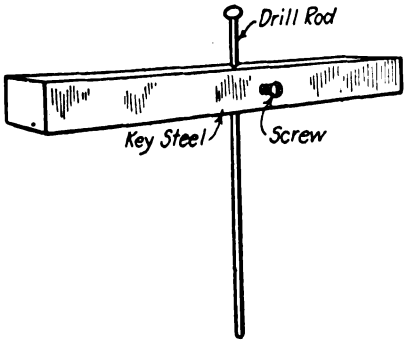
I had an old slate switchboard to repair. The repairing consisted of remounting an ammeter and a voltmeter and removing a battery rheostat. This work left a number of holes in the board which spoiled its appearance. I filled the holes with a mixture of one part plaster of paris and two parts black putty, which gave the board a very good finish, the old holes being inconspicuous.

M. J. Moriarty.

Simple Depth Gauge.

A very convenient depth gauge can be easily made from a piece of five-sixteenths-inch square key steel about three inches long, which has been carefully trued on the long sides. Drill a one-sixteenth-inch hole in the center of this piece and at right angles to it from the adjoining side drill and tap for a No. 4-36 machine screw. Take a piece of one-sixteenth-inch drill rod about six inches long, slip it through the hole and tighten it with the screw.

F. A. Grohsmeyer.



Simple Depth Gauge.

Easing Snake Through Long Conduit Runs.

The sticking of a snake in a long run of conduit is often a troublesome matter, as it requires hard work to get a long snake through numerous bends and couplings. To remedy this take a rag soaked in kerosene oil and pass the snake through it as it is fed into the conduit. This makes the snake slide in easily and as much as 200 feet of snake can be pushed through as easily as 50 feet without using kerosene as a lubricant.

James McCartin.

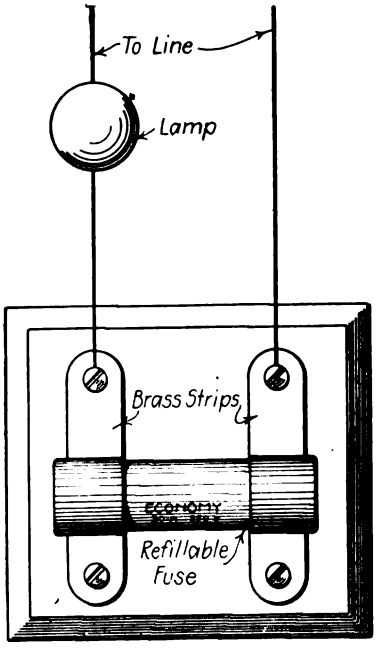
Wire Scraper.

I find that when running bell wires, electricians find much trouble from scraping the wires by means of a sharp knife in order to remove insulation. Very commonly this cuts the wire almost entirely in two and in nearly all cases greatly reduces the effective cross-section. To avoid this, I have made a wire scraper from a piece of an old hack-saw blade, using the back of this to scrape the insulation. This works very satisfactorily and does not damage the wire in any way.

W. Morris.

Simple Device for Testing Fuses.

A very simple device for testing refillable cartridge fuses is shown herewith. A lamp is connected in series with the line and the two line wires are brought down



Fuse-Testing Device.

to a block of wood to which two strips of brass are fastened. The fuse is merely placed across these two strips. If the lamp lights, the fuse is still good, but if it does not the fuse must be properly refilled.

M. Schwam.

Cleaning Stranded Wire.

Probably all who have had to clean stranded wire in preparing for a splice or tap, find it very difficult to clean out the insulation between the wire strands. If one will take a file card such as is used in cleaning out the particles of metal which choke up a file, it will be found to do the work quickly and easily. In fact I believe it will be a very agreeable surprise to any wireman who has never tried it. These file cards may be purchased for a small sum at any good hardware or machine shop.

Arthur S. Nickerson.

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THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

REVIVING BANKRUPT AND OUTLAWED ACCOUNTS.

Suggestions for the Electrical Dealer to Aid in Reducing Losses from Bad Accounts.

By W. B. Parker.

Accounts against men who have gone through bankruptcy, as well as those that have been allowed to outlaw, are usually considered absolutely worthless. Therefore any plan that holds out a promise of reviving even a small percentage of this class of accounts is of decided interest to those who are unfortunate enough to have any on their books. It is true that in the case of bankruptcy there is practically nothing that can be done at the time to secure any better adjustment than will be secured without effort should the assets prove sufficient to allow of any dividends for the creditors at all. The forwarding of the claim to an attorney will usually avail nothing except that there will be an extra and entirely unnecessary collection fee to pay out of whatever dividends may be declared.

But the experience of a large electrical jobbing house proves that it is possible to collect a reasonable percentage of this class of accounts after the lapse of sufficient time. While such an account is not recoverable in a court of law, no matter how much the former debtor may be worth, there is no law against asking him to pay it, and if the method of asking is properly diplomatic some results are sure to be obtained. In the particular case mentioned it so happened that one of these former bankrupts was again on his feet financially and was possessed of the kind of conscience that demanded the payment of all his former indebtedness regardless of the lack of legal liability. So he wrote to this house, inclosing a draft for the amount of his old bill as well as interest to date. This led to renewed interest in the subject of the so-called dead accounts, many of which had been long since charged off to profit and loss, and they were again looked up and listed. Then a letter was prepared, somewhat as follows:

> Mr. Bankrupt Debtor,
> Chicago, Ill.
> Dear Mr. Debtor:—
> This morning we were very much surprised and gratified to receive a draft from an old customer of ours, who, like yourself, was compelled to take advantage of bankruptcy proceedings through no fault of his own. The draft covered the full amount of his old account and interest to date.
> This led us to believe that there were probably others who felt equally as kindly disposed to us, and in this connection your name occurred to us as that of an old and valued customer with whom our relations had always been most pleasant.
> We trust you are again meeting with the success you certainly deserve and would be very glad to hear from you and renew our former pleasant acquaintance. If we can be of service to you at any time, just let us know.
> The writer will look forward to hearing from you soon, even if only a few lines, and is enclosing stamped return envelope for your convenience.
> Yours very truly,
> A. DIPLOMAT,
> President, Jobber & Company.

This letter, with such alterations in wording as was necessary to make it fit outlawed as well as bankrupt accounts, was sent out to the entire list. While many did not answer, yet a number did and made some arrangements to take care of the old account by installment payments. Those who did not answer received several follow-up letters, or rather notes, merely referring to the previous letter and asking the favor of an answer. The following will indicate the style of follow-up used:

> Mr. Bankrupt Debtor,
> Chicago, Ill.
> Dear Mr. Debtor:—
> Our president is very anxious to receive at least a line or two in answer to the note he personally dictated to you some days since. He wants to say that he fully understands you are probably quite busy just now, but that he will consider it a personal favor if you will spare a couple of minutes to write him.
> Assuring you of our desire to serve you in any possible way, we remain
> Yours very truly,
> JOBBER & COMPANY.

Four of these follow-up notes were sent before the account was given up for the time being. But such satisfactory results were obtained from the list as a whole that it is the intention to attempt a similar plan every year or two. It not only brought in the money that would not otherwise have been received, but the by-product of restored good will is considered to be of much value. Whether unconsciously or not, the average human being feels antagonistic to one he has long been indebted to and is inclined to do him an injury whenever the opportunity offers. It therefore follows that even where it is not desired to have any further business dealings with a debtor under any circumstances, yet it is very much worth while to have his good will on account of possible influence with others with whom the creditor does want to do business.

Redeemable Coin to Introduce New Branch Office to Electrical Consumers.

To make known its new branch office at Broadway and Eighty-ninth Street, New York, and interest consumers in the purchase of electric appliances, the United Electric Light & Power Company has issued a nickled coin, about the size of a half-dollar, for general distribution among its customers and others.

On the front side of the coin is the word "United," reading directly across the center in letters one-quarter inch high, and with staggered flash lines leading to the edge. Around the edge, in smaller letters, is the company name and location of general offices at 130 East Fifteenth Street.

The reverse side of the coin reads: "One only good for 50 cents on an appliance purchase at our United Electric Shops until October 1, 1916—Souvenir of the opening of Branch Office, Broadway at Eighty-ninth Street."

This coin with its two-fold purpose is bringing highly satisfactory results to the company. Many have been redeemed for the purchase of electric goods.

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Selling 1500 Vacuum Cleaners in Six Weeks

Electric Shop of Kansas City Light & Power Company Demonstrates What Can Be Done by a Comprehensive Effort—Motion-Picture Films an Important Factor

The Kansas City Light & Power Company, of Kansas City, Mo., sold 1,500 vacuum cleaners in six weeks. And it wasn't an extraordinary effort, just a sort of a test of what might be done. The most extensive feature of the effort had to do with the advertising. The sales force made a record of 99.5 per cent of sales where demonstrations were given. There was no attempt to cover the entire city.

Twelve hundred electric carpet sweepers were sold in the period, and 300 vacuum cleaners. The former were regularly on sale previous to the campaign at $19.75; the sale price was $15. There was no reduction on the vacuum cleaners, which went at the usual price of $50 and $60. The company received no payment on delivery, and gave the customer six months in which to pay.

The advertising for the campaign was very carefully planned, and quite as carefully was the work of solicitors planned to get the maximum value from the advertising. The newly organized publicity department of the company had its first big chance in this campaign—and it "made good."

The advertising was of five kinds—display window, motion pictures, street-car cards, newspaper space and monthly bills.

The company had planned to make its drive on vacuum cleaners coincident with the usual spring clean-up in Kansas City, which is set for some time in April, and is preceded by several weeks of agitation by the city health department and various civic organizations. Ordinarily this city campaign makes its first appearance about March 1, and plans were therefore made to start the advertising at that time. On the February bills sent to customers, were printed advertising coupons bearing the offer of the cleaner at $15, and they went into the hands of customers on March 1. A few orders came in. The real campaign, however, began March 15. The bill-coupons have always been considered valuable advertising, for every customer has to see what they say, as he tears them from the bill, or glances at the statement to observe the charge.

On these coupons appeared for the first time the "slogan" of the campaign, "It Will Help Mother." And it was used on every bit of advertising, often being repeated one or more times, for emphasis.

YOU CAN DO IT

By means of a carefully planned campaign 1,500 vacuum cleaners were sold in a period of six weeks by the Kansas City Company.

Two cleaners were featured and only on one was there a slight reduction from list price.

What this company has done can be accomplished by any live dealer without undue expense.

The show window of the Electric Shop was used during the entire period for the display of sweepers and cleaners, the display being changed three times, and the window in two cases containing other devices also. The displays were arranged with the usual taste of the manager of the Shop. Cards, "It Will Help Mother," were placed by the cleaners.

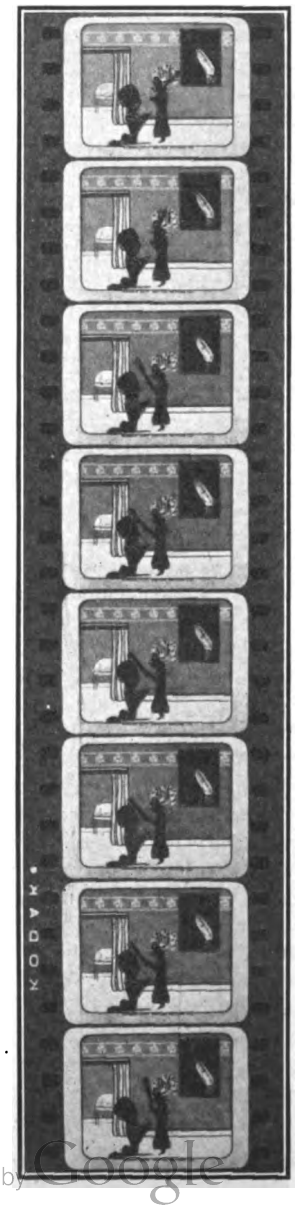
Advertising cards were placed in the street cars March 15, bearing the offer of the sweeper for $15. For two weeks previous, however, "teaser" ads had been run on these cards. The first ones bore only the words "It Will Help Mother." Then cards appeared with the added phrase, "It's a vacuum cleaner at $15." For six weeks, then, the cards bore the full advertisement, and a picture of the machine.

Newspapers were used only on Sundays, starting March 19. The three Kansas City newspapers had half-page advertisements on three Sundays. The largest response, in inquiries, came on Mondays following the appearance of the newspaper advertising and this factor shares with the motion pictures the credit for the larger Monday sales.

There had, however, been a preliminary notice of the approaching cleaner sale, in the newspapers of March 6. The company had used large space in hooking up its sales of household appliances with Baby Week, and a part of this space was employed to refer to the sale of vacuum cleaners.

Motion-Picture Advertising.

The most important publicity feature, however, was the advertising films. Five different films were prepared, two by one company making them in Kansas City, three by another. The scenarios were composed by representatives of the film companies, the publicity department of the light company, and men and women in the lighting sales department. One of the pictures showed a procession of animated brooms; the terrific dustcloud; a housewife throwing up her hands, exclaiming that she is tired of it and wants a vacuum cleaner; a vacuum cleaner enters, and cleans a room without dust. Another picture showed a man sweeping, the woman standing by holding a club over his head, saying "I've endured this drudgery long enough;" he hastily brings her a vacuum sweeper.



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In each of the pictures, the slogan, "It Will Help Mother," was the closing feature of the display.

Twenty-five motion-picture houses were used. Five of

Advertisement on Monthly Bill.

these were down-town, the largest and best houses in the city. The five pictures were shown at these houses near the beginning of the campaign, and again at its close. The business-district shows are repeated 11 times a day.

In the suburban theaters, each house hand the films one week. Every Saturday evening the films were changed to other theaters, the week's display having given all the picture patrons of the particular communities an opportunity to see the films. The light company selected the theaters and planned the booking.

The large number of telephone inquiries received Monday mornings were directly traceable to the motion-picture advertising; most of them came from the districts where the advertising films had been seen for the first time on Saturday night or Sunday, in the community theaters.

Each of the five films was 30 to 50 feet. The cost was $3 per foot per week, including manufacture and exhibition.

A sales force of five men was assigned to the electric carpet sweeper and vacuum cleaner campaign, young men taken from the lighting sales department, but without special experience with the cleaners. They had, however, been given a short course in demonstrating the devices, and had been coached in sales talks. These young men made a house-to-house canvass, always in the communities where the advertising films were being shown. On Mondays the salesmen transferred their activities to the district to which the films had been transferred, adjusting their work as the campaign progressed. For instance, only two suburban theaters had the films the first week; all five worked in those two districts. The next week, three suburban theaters had the films, and three of the men went to those districts, while two remained in the first communities where the films had been shown. The salesmen did not carry cleaners with them; and this was considered an important point. They could not gain audience, much less entrance into the houses, with cleaners in their hands. They merely sought prospects, asking for the opportunity of demonstrating the cleaners. During the first few days of the campaign, the men made definite effort to work for a continuous period soliciting. But soon it became impossible—and unnecessary—to set aside any time for this detail. The requests for demonstrations were secured while going from one demonstration to another. Frequently enough such requests were obtained from neighbors during demonstrations, to fill the next day. The men were able to make about 10 demonstrations a day, and the estimated time spent in seeking prospects was an hour a day. The chief handicap in piling up sales was in the time lost between demonstrations. Each housewife was allowed to choose her own time for having the machine shown in action. The concentration of the solicitation kept the prospects localized, but frequently gave far longer periods for demonstrations than were necessary.

The average of prospects solicited who asked for demonstrations was nearly 30 per cent.

Telephone Requests for Demonstrattions.

The telephone calls into the office, asking for demonstrations, kept three women from the Electric Shop "on the jump." These calls were a difficult matter to handle, because they came from widely scattered districts of the city. Some were from districts five miles and more from the central office, and two or three miles from a motion-picture show, but in most cases the prospects had seen the films somewhere. Other calls were from the districts of the films, but many blocks from the sections being worked by the salesmen.

While the selling effort was concentrated on the cleaner at the bargain price of $15, nearly 25 per cent of the demonstrations resulted finally in the sale of a more expensive machine. The request for information on the higher-priced cleaners was always spontaneous—but was of course met promptly by the salesmen and salesladies.

The cases in which demonstrations, either of the bargain

Sample Newspaper Advertisement Used During Campaign.

cleaners or the more expensive ones, did not result in sales, were negligible, excepting of course the return of a cheaper for a better machine.

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CORRESPONDENCE AND DISCUSSION

A Reader's Page Wherein Opinions on Topics of General Interest May Be Expressed

Faulty Chicago Electrical Code Rule on Battery Testing.

To the Editor:

On page 111 of the 1916 Electrical Code of the City of Chicago there appears as Section *i* under Rule 38C, relating to garages, this clause: "No battery shall be tested except by means of a voltmeter." This clause does not say what the Electrical Department means, in my belief. It is my opinion that the electrical men of the city wished to make a rule to prevent the ignorant garage man from putting an ammeter across the terminals of a battery.

The rule should, however, be worded differently, because, as it stands, literal interpretation would prevent the use of a hydrometer in the operation of a battery. The hydrometer by no means should be excluded from the operation of batteries, nor should the impression be conveyed that a voltmeter is all sufficient to their proper operation (see Armour Engineering, May, 1909, article by Flanders, "The Hydrometer in the Operation of Storage Batteries"). This rule should be brought to the attention of all garage men as well as of the city's electrical inspectors.

H. E. Weightman.

Chicago.

Disposal of Refuse from Woodworking Establishments.

To the Editor:

With reference to the article on wood waste in your March 11 issue, study of the problem brought me to the definite conclusion that the time has not come when we can advance any general plans for the successful disposition of wood waste. Such mills and factories where wood waste can be utilized, are exceptions. I do not intend to advance the idea that wood waste is being profitably disposed of wherever possible. On the contrary, a careful study indicates conclusively that many factories could turn losses into profits, were they alive to the possible utilization of their wood waste.

H. S. Sackett, formerly in the employ of the Government Forest Service, with Forest Crissey, wrote an excellent article for the *Saturday Evening Post* on the "Utilization of Wood Waste," dwelling chiefly upon the mechanical phases of the problem. He cited many instances where waste had been converted to profit by bringing together the producer and consumer.

Much emphasis was placed on the importance and difficulty of bringing the supply and market together. Could this be done the situation would be vastly improved, but still far from being on a working basis. I thoroughly agree with Mr. Sackett's views, but it is my opinion that, having discovered and classified all of the users of wood waste, the production would still be vastly in excess of the amount disposed of.

The use of briquetting machines for the manufacture of compressed wood fuel, does not seem to have increased to any great extent. Sawdust used as a binder in the manufacture of composite board, flooring and similar material, has opened a big field, but for this purpose only a selected list of woods may be used. One reads of sawdust used in the manufacture of cattle food. It is the principal ingredient in a certain class of cleansers. But, notwithstanding, these and other avenues for disposal, the wastage is enormous.

In the South there are great possibilities for the utilization of slabs, and refuse from the lumber mills. Turpentine, resin, etc., are extracted in a destructive process and the residue, a cellulose fiber, is used for making a cheap kind of box-board paper. In some of the Northern States, distillation processes are used for the manufacture of alcohol, acetone, potash, charcoal, etc. There are also destructive processes where the wood is first macerated and then treated for the extraction of certain chemicals. No such process can be put to general use nor has it proved commercially practicable.

If we could place a central chemical plant to take the entire refuse output for a certain district, we would have a satisfactory solution of the wood-waste problem. Until we find it necessary to resort to measures of economy not hitherto foreseen, the development of these processes will of necessity be very slow. The natural resources of our country are still too plentiful to make it profitable or even desirable to conduct any research along these lines.

This fact should not be overlooked: The woodworking manufacturer is usually too busy to give much attention to the waste pile. The alert power solicitor can often find an outlet.

William S. Taussig,
General Electric Company.

Chicago, Ill.

The Evil of Thoughtlessness.

To the Editor:

I had an experience recently, which I thought might be of value to central-station companies in general.

A fire extinguisher salesman came in to demonstrate his extinguisher. About the first thing he tried to explain was how easily you could combat a fire between partitions, where electric wires started fires. I immediately put the question to the salesman, suppose the fire started from some cause other than electric wire between the partitions, what kind of an extinguisher would it be necessary to use then, and why do you refer to fires between partitions as originating from electric wires? His answer was that a central-station man in Pennsylvania told him how handy his extinguisher was for this purpose. I took the position that there may be many reasons for fires starting between partitions, and that I thought it was a mistake for anyone trying to sell his equipment to central stations, who are combating daily with the erroneous statements in newspapers and comments from Fire Departments, and the public in general, about fires being caused through electric wires, when in fact, they don't know the cause, to feature this point, and especially as coming from a central-station man.

This being such a concrete example of how much harm can be done innocently, I believe mention, through electrical journals to electrical men, of a specific case as this being made, may be of benefit to the industry.

E. A. Bechstein,
Manager, Sandusky Gas & Electric Company.

Sandusky, O.

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QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 344.—Life of Gas-Filled Lamps at Various Voltages.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

No. 350.—Power Supply for Traveling Crane.—In the case of traveling cranes where either direct current or alternating can be purchased, which kind of power supply would be better adapted for the purpose?—C. J. E., Toledo, O.

No. 351.—Annunciator Trouble.—I have some trouble with an automatic set-back annunciator system in a fine residence. It has a ground, but I do not want to take up any floors or tear into walls to find it. Could someone suggest a simple way to locate this ground and some way to overcome the trouble? There are steam pipes and gas pipes in the house.—R. L. G., Reynolds, N. C.

Answers.

No. 345.—Demagnetizing Iron Castings.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

The specific request in this question is for some way of demagnetizing castings so that they would not affect the calipers or other measuring instruments. The answers already published of course dealt with the problem of demagnetizing, but it has occurred to the writer that the cheaper and more practical solution of this trouble is to use calipers made of some nonmagnetic material, such as brass or bronze. Certainly, if elimination of measuring difficulties is the only reason for demagnetization, it can be secured most readily in the way suggested.—J. M. P., Salt Lake City, Utah.

No. 346.—Electric Arc for Cutting Scrap Metal.—What voltage should be used in cutting up old boilers with an electric arc? Of what material and shape should the electrode be? What safety device is most practical for preventing overloading transformers used in such work?—L. G. C., Lincoln, Neb.

The voltage employed will depend upon whether the electrode is of carbon or metal. For a carbon or graphite electrode the voltage will vary between 30 to 70 volts, and the current from 150 and 250 amperes. For a metallic electrode the voltage will be between 20 and 30 volts and the current from 50 to 150 amperes. The carbon electrode will have a diameter of 0.25 to 1.5 inches, according to the class of work, and the rate at which it is desired to do the cutting, that is, the current employed. The carbon or graphite electrode is used for cutting, because it is superior to the metallic electrode as regards speed of cutting and cost of operation, and is far more stable and hotter. In cutting, the arc should be kept short, so that the heat will be concentrated where required. Welding or cutting is accomplished by means of a heavy current at a low voltage. If this current is obtained from the ordinary supply circuit the excess voltage must be consumed by the insertion of resistance—an inefficient method—since the major portion of the total energy is dissipated in this rheostat. To overcome this it is customary to use motor-generator sets consisting of a motor designed for commercial supply voltages driving a low-voltage direct-current generator. These sets may be stationary or may be made portable for carriage from job to job, for example, about the foundry or railway shop. The large electrical manufacturing companies make these sets. Before connecting them to the power supply, fuses or circuit-breakers should be installed to prevent damage to the set should abnormalities develop in the line. The motor-generator sets are either specially designed to protect themselves against short-circuit, or else relays are installed to accomplish the same purpose. One form of motor-generator set is equipped with a relay that cuts resistance in between the terminals of the generator and the arc, if the electrodes are placed in direct contact for more than a definite length of time. As soon as the current is interrupted the relay cuts the resistance out of circuit. Another type of outfit utilizes a compound-wound direct-current generator with the series and shunt field windings wound differentially with regard to each other, and when the current approaches short-circuit the voltage drops to such a value that the current does not exceed a safe amount. Such a generator is a variable-voltage machine, that might almost be called a constant-heat machine, since it gives a constant current, and supplies exactly the voltage required at the arc. The welding outfit should be designed or adjusted to care for short-circuits at the arc, and the main fuses or circuit-breakers ought to operate only as a last resort in case of accident at places other than the arc. Otherwise there are liable to be numerous shutdowns at inconvenient times, increasing the cost of performing the work. For heavy work, the electric arc is often most economical; it is the only solution for cutting metal above about seven inches in thickness. For light and thin work, the oxy-acetylene flame will often be found to be more economical than the electric arc. In many cases the use of electricity where oxy-acetylene was indicated has resulted in the arc coming into bad repute. Speaking generally, the gas flame is indicated for light work, and for heavy work the electric arc. With the oxy-acetylene flame the metal is heated to incandescence and pure oxygen is then turned on and the metal burns away. With electricity the metal is melted off. If there is very much cutting to be done, the lower operating costs might favor the use of electricity, but where the apparatus will be called into use but seldom oxy-acetylene cutting will be found more economical in all probability because of the lower initial cost, etc.—K. R., Chicago, Ill.

The carbon arc, since it generates heat energy at a higher rate than the metallic arc, is the best adapted for cutting of iron or steel or for use in any other place where a large mass of metal is to be heated. It would appear from the question as asked, that alternating current was being considered as a source of power for the arc itself in this case. The use of alternating current at the arc should be avoided, if possible. It is very hard to maintain an alternating-current arc in welding or cutting processes in the first place and nothing but poor results can be expected. Where the initial source of power is alternating curent it is by far better to use an induction motor-generator set built especially for welding purposes. There are several very efficient welding or cutting sets on the market, all having the necessary safety devices for protection against overloads which occur quite frequently during these operations. These sets can be obtained in sizes suitable for a great variety of work even when the amount of welding or cutting is small. The current furnished the arc by these sets is direct and the average voltage generated is about 75 volts. This allows the operator to maintain a steady voltage at the arc ranging from 35 to 60 volts, depending upon the length of the arc, and to obtain current values up to 1,000 amperes, depending on the type and size of the machine. Although 300 amperes is generally considered sufficient for welding purposes, probably more sat-

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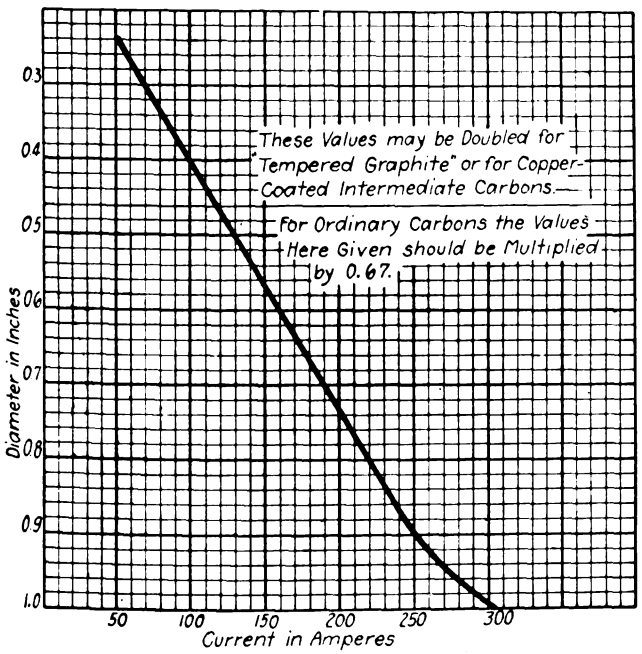
isfactory results can be obtained in heavy cutting work if the current is kept a little higher, say, 400 to 700 amperes. This means an arc length of approximately one-half inch and an arc voltage of about 40.

Several shapes and sizes of welding carbons are made. Cylindrical electrodes with short tapered ends are the ones most commonly used in welding and cutting work. Long tapered electrodes are used for work of a special nature. The cylindrical electrodes may be obtained in sizes varying from 0.25 to 1.5 inches in diameter and in lengths varying from 6 to 24 inches, the 10 and 12-inch lengths being the most common. There are several grades of electrodes available, namely the ordinary welding carbons, the intermediate grade for severer conditions, the copper-coated intermediate carbon design for higher current-carrying capacities than the uncoated intermediate, and the "tempered-graphite" grade or the high-ampere welding quality. In general, the carbons should be hard and solid and in burning away should leave a round end instead of a pencil point.

The accompanying curve shows the carrying capacity in amperes for the different sizes of carbons mentioned above. This curve is for the intermediate grade of carbons; for the common grade multiply the values by the factor 0.67 and for the copper-coated intermediate and tempered-graphite grades the values read from the curve should be multiplied by 2. Either the one-inch-diameter copper-coated intermediate carbon or the one-inch-diameter tempered-graphite carbon would probably be suitable for cutting work in the case at hand. Oftentimes where a narrower cut is desired, such as in cutting beams and rods, a 0.25-inch-diameter tempered-graphite electrode can be used to very good advantage.

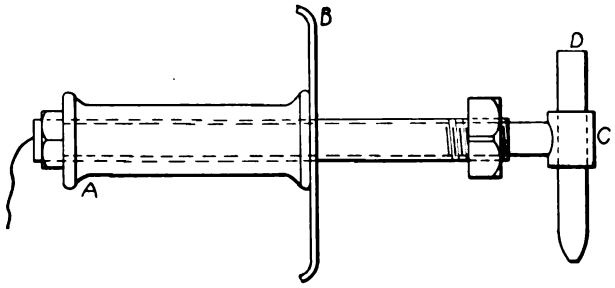
A special holder for welding carbons is shown in Fig. 2. The lead wire is brought to a clamp at the end of the holder through an insulated handle protected by a guard. Some of the electrode holders furnished with the welding sets have a unique push-button control for opening and closing the circuit. In drawing the arc it is simply necessary to touch the carbon



No. 346.—Fig. 1.

to the metal to be cut and withdraw it instantly to a distance of about one or two inches; the arc distance can then be regulated by moving the carbon point nearer or farther from the work, depending upon the heat desired. The short arc is the hottest and also consumes the greatest current. The carbons are generally clamped in the holders about four to six inches from the arc end in order to keep the resistance of the circuit as low as possible.

The following precautions should be taken. Never expose any parts of the body to the arc. Always wear a helmet fitted with a mask and some form of colored glass (a combination of ruby and green glass is good) through which the process can be observed without injury to the eyes. Heavy gloves should be worn to protect the hands from the arc and flying sparks, and a heavy apron to protect the clothing.



No. 346.—Fig. 2.

The metal to be cut should always be connected to the positive side of the line, as about three-quarters of the heat is liberated at the positive end of the arc. It is also very difficult to maintain an arc of appreciable length when the metal is made the negative side, probably because the metal does not become as hot and consequently there is not so much vapor formed to support the arc.

In cutting, provision should be made to allow the molten metal to flow away from the work. If the arc can be worked horizontally underneath the metal this will allow the molten metal to flow out of its own accord. In starting to cut, hold the arc stationary until a hole is melted in one place, then draw the arc along gradually in the direction it is desired to cut the metal.—A. B., Cleveland, O.

No. 347.—Wiring for Polyphase Motors.—(1) There are to be 15 to 20 five-horsepower motors (each 440 volts, three phase) in a manufacturing department supplied from one feeder in conduit. All of these motors are in a space 35 by 24 feet. It is difficult to find space to locate fuse cabinets directly at the point where the branch circuit for each motor is tapped onto the feeder. Would the Code permit locating the motor fuses near to the motors and the use of one or two steel cabinets for terminal boxes where all the branch circuits may be tapped onto the feeder? (2) Where several large motors from 20 to 75 horsepower are supplied from one feeder, can the starting fuses be located near the motor instead of where the branch circuit taps on?—R. B., Jackson, Mich.

(1) According to Rule 23*b* of the National Electrical Code, fuses must be placed at every point where change is made in the size of wire (unless the cutout in the larger wire will protect the smaller). It is therefore evident that, unless special permission is obtained from the inspection department having jurisdiction, the scheme of one or two terminal boxes would not be approved. One way would be to feed the motor branch circuits from two distribution cabinets containing the proper fuses for each motor circuit. Conduit could be installed from these cabinets directly to starting devices of the motors. By properly locating two centers of distribution the branch wiring would be reduced to a minimum and, as the size of the room is small, Rule 8*c* would be complied with. The writer has worked on one large installation where the feeders were run exposed and branch wires were tapped directly onto the feeders and fused only near the starting devices of the motors; motors were located an average distance of 30 feet from the feeder. But as this particular installation did not come under the jurisdiction of any inspection authorities, it is doubtful whether it would be approved elsewhere.

(2) Starting fuses could be mounted near the motor, providing they were installed in an approved manner, but that would require two sets of fuses instead of one, as the change of size of wire at the feeder would require a fuse also. (Rule 23*b*).—J. H. L., North Cambridge, Mass.

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BOOK REVIEWS

"The Telephone and Telephone Exchanges." By J. E. Kingsbury. London: Longmans, Green & Company. Cloth, 558 pages (5¾x8¾ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $4.00.

While not claiming to be a comprehensive history of the subject, this volume traces the development of the telephone and accessories from the early beginning down to the modern exchange system. The author shows great familiarity with his subject, outside of automatic telephony, which receives scant consideration. He has evidently given much study to historical research, and has presented his material in very readable style. His sources of information have been wide, as is illustrated by the fact that he has had access to the unpublished reports of conferences of experts of the Western Electric Company, to whom so much of the development of telephone engineering is due. There is a chapter on long-distance telephony, which recites the various steps leading up to transcontinental telephony in 1915, and the Pupin loading coil is described, but curiously enough no mention is made of other methods of loading, and only the briefest reference to the modern forms of repeaters. An inadequate chapter of 17 pages is devoted to "Instruments." Interesting chapters are added on "The Economics of the Telephone" and "The Telephone and Governments." An appendix gives interesting statistics of the subject.

The entire treatment of the subject is from the Bell standpoint, and except for work in England, developments outside of the Bell organization receive little attention. The names of such European workers as Gati are entirely missing, and the various forms of transmitter design originating in Europe are not mentioned. As a history of the Bell system, however, the volume is one of great interest and value, and brings together a mass of information which has not heretofore been collected in this form. It constitutes a valuable contribution to the literature of the subject.

"Automatic Telephony." By Arthur Bessey Smith and Wilson Lee Campbell. New York: McGraw-Hill Book Company, Incorporated. Cloth, 407 pages (5¾x9 inches), illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $4.00.

Until the appearance of this volume there has been no comprehensive treatise covering the subject of automatic telephone apparatus. The authors of this volume have considered all phases of the subject and the book should fill a real need among students of this subject. The connection of the authors of the Automatic Electric Company has naturally resulted in giving greatest attention to the apparatus manufactured by it, but considerable space is given to the description of other systems and methods, including a chapter on the system of the Western Electric Company. The subject is not treated historically, but present practice is described in relation to each of the American and foreign systems in actual use. One chapter is devoted to long-distance, suburban and rural line equipment. The final chapter is devoted to development studies. The rapid extension of the use of automatic telephone apparatus, especially in foreign countries, has created a world-wide interest in the automatic system, and the descriptions of both instruments and central-station apparatus here given will meet the requirement of a large group of readers.

"Wireless Telegraphy and Telephony: A Handbook of Formulæ, Data and Information." By W. H. Eccles. London: "The Electrician" Printing and Publishing Company, Limited. Three-quarters leather, 418 pages (4¾x8¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $4.50.

The rapid growth of wireless telegraphy and its introduction in all parts of the world has created a need for all of the practical information which can be made available upon this subject. Many of the researches and results of investigations in this line have appeared in the transactions of engineering societies or in the technical journals and there is considerable need of a volume like this which presents a classified collection of information, data, formulæ and tables. The subject matter is presented in rather condensed form, with extensive use of mathematical formulæ and diagrams. Explanatory matter has been introduced where the author considered it necessary, but the treatment is usually made as concise as it can be made without omitting essential matter. The volume will be extremely useful to engineers and others engaged in the work of radiotelegraphy, especially as some of the material is now published for the first time. The book is divided into three sections dealing respectively with tables, formulæ and general information. Under the latter heading are included antennas, power equipment, transmitting and detecting apparatus, the design of high-frequency circuits, and descriptions of the principal systems of wireless telegraphy. A glossary of terms is given at the end. The principles and methods of wireless telephony are described in a chapter of 18 pages, which takes up the different systems which have been proposed and discusses their requirements. The 1915 experiments between Washington and San Francisco are mentioned, but no details given. The omission of the date of publication is a fault which is to be attributed, no doubt, to the publishers rather than to the author, who has done his work well.

"Practical Electric Wiring." By John M. Sharp. New York: D. Appleton & Company. Cloth, 256 pages (4½x6¾ inches), 151 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $1.00.

This excellent little book gives practical instructions for carrying out the simpler kinds of electrical installation work. The author is an instructor in the Bliss Electrical School, and shows his familiarity with presenting the subject to students. The different methods of installing wiring are described in detail and illustrated. Armored cable does not seem to be given as much attention as it deserves. There is a chapter on wiring for motors, one on wiring for bells and annunciators and a third on wiring for telephones. A desirable feature of the book is the addition at the end of most of the chapters of a series of questions, which serve to test the reader's understanding of the subject. An appendix gives useful tables of various kinds. While this book does not take up all of the special problems which would be met by the experienced journeyman, it gives a very good introduction to the subject of wiring for the beginner in this work.

"Electrical Measurements in Direct and Alternating Current." By W. H. Timbie. New York: John Wiley & Sons, Incorporated. Paper, 8x10½ inches, illustrated. Supplied by Electrical Review Publishing Company, Inc. for $0.85.

These papers constitute a loose-leaf laboratory manual, comprising 39 exercises in direct currents and 11 exercises in alternating currents, with others in preparation. A sheet of general instructions for laboratory work is included. The exercises are numbered in groups, and each is complete on one sheet, there being no numbering of pages. The subjects appear to be chosen for their practical significance and value, and many of the stock experiments of the physical laboratory are omitted. The course appears to be designed for students in vocational and industrial schools, such as the Wentworth Institute, of Boston, with which the author is connected. The experiments are not all quantitative, as the title might imply, but include the plotting of magnetic fields, etc. The experiments are well chosen to cover, in a minimum of time, a considerable range of practical applications of electricity. The flexibility of the arrangement of loose leaves will commend this course to instructors wishing to make their own selection of experiments from those given, and with this idea in view, it is to be hoped that subsequent sheets will cover a large range of topics in this field.

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NEW APPLIANCES

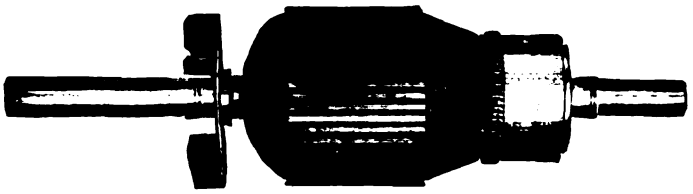
A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Direct-Current Motors of the Smaller Sizes.

To meet the increasing demand for direct-current motors of the smaller horsepowers for direct connection and drive of all kinds of industrial machinery, machine tools and the many motor applications requiring a low-power compact motor, the C & C Electric & Manufacturing Company, Garwood, N. J., has developed a new line of motors specially designed for this class of work.

These new motors, known as the type IB, are of bipolar type with interpoles and can be furnished in ratings up to 10 horsepower, either shunt or compound wound. For a general manufacturer's drives, as machine tools and other industrial machinery, the characteristics of the shunt-wound motor are the most desirable. It is essentially a constant-speed machine having close speed regulation from no load to full load, and is recommended for all purposes where the torque required for starting and accelerating does not greatly exceed full-load torque. The compound-wound motor is desirable for drives where the starting torque is much heavier than the full-load torque. This motor starts at a much heavier load than the shunt-wound motor and any degree of compounding can be furnished to meet conditions. Adjustment of the speed is obtained in both cases by either armature or field control.

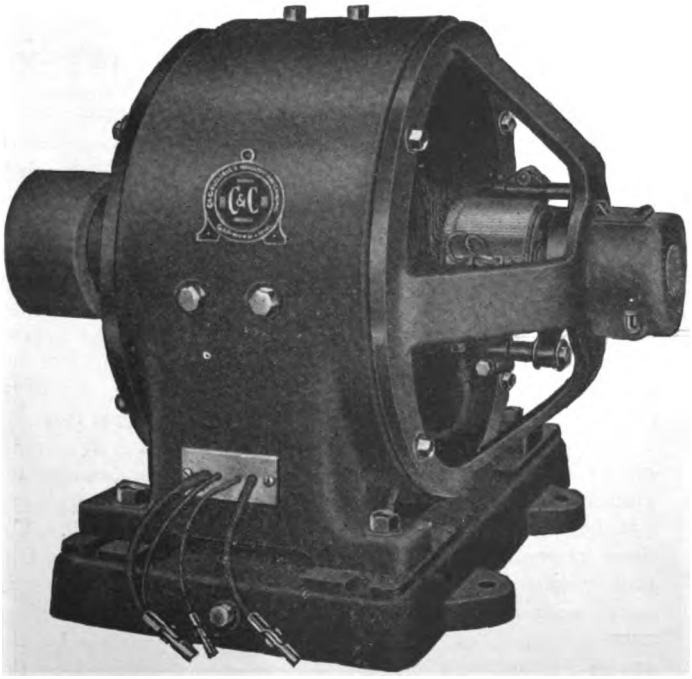
The materials entering into the manufacture of these motors are the best obtainable to permit the closest limits of design, giving a compact machine, sturdy both electrically and mechanically. The main frame is cast integral with supporting feet and the pole pieces are separate. The main pole pieces and pole shoes are laminated and the interpole pieces are separately cast. The coils are all form-wound. The pulley-side bearing bracket is provided with a wide apron to protect the winding from mechanical injury and the bearing is supported by four arms with large openings between them, which makes a rigid open bracket, permitting free and ample ventilation. The commutator-side bearing bracket has four arms, giving a rigid bracket and free access to the commutator and brushes. Both brackets fit in a recess in the main frame, insuring perfect and rigid alinement.



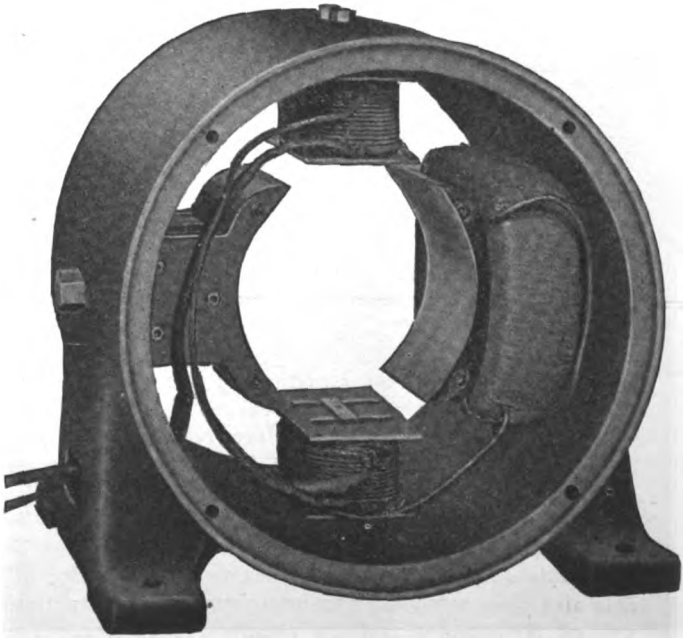
Armature for the Motor.

The armatures are of standard design with laminated core. An air-agitating fan is placed on the pulley side of the shaft, next to the armature winding, to furnish the very high degree of ventilation and cooling necessary in motors of the smaller compact frame and guarantees severe service and heavy overloads. The addition of interior commutating poles completes the perfection and the excellent characteristics of these motors. They are the latest addition to the well known old standard C & C motors and it is said that they uphold the long-established reputation of sturdiness and perfect reliability of the old line. In continuous operation for long periods, they run cool and without attention. The interpoles insure sparkless commutation through the full range of load without changing the brush position.

The new line of motors is furnished in the open type, or with perforated or totally inclosing covers for protection against dust, metal chips, dampness, etc. For belt drive the motors can be furnished with either a universal slide-rail base or a belt-tightener idler pulley.



C & C Type IB Motor with Universal Base.



Main Frame with Field and Commutating Poles.

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Solenoid-Operated and Motor-Operated Switches for Controller Work.

Electrically operated switches for use on control apparatus present an entirely different problem than do similar switches used in central stations and for switchboard work. In the case of the latter switches, operation is not very frequent and therefore the parts are not greatly subjected to wear. In such a case it is therefore possible to use relatively complicated driving mechanism with many parts without decreasing the efficiency of the apparatus. On the other hand, switches used for motor-controller work have to operate very frequently, in some cases as often as once every second, and the wear of the parts during operation becomes very important. The number of the parts of these switches has to be reduced therefore to a minimum and in order to reduce the wear the parts have to be made relatively heavy. This increases the inertia of the moving members and has a tendency to reduce the speed of operation. Speed of operation is of greatest importance, however, where heavy currents are to be handled. The increased inertia of the parts is therefore another reason for the reduction in the number thereof.

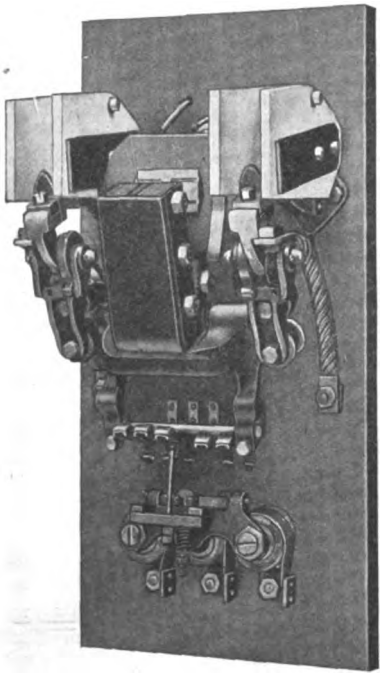

Fig. 1.—Clapper-type Magnetic Switch.

Direct-current switches for low voltages have been successfully built with solenoid operation up to the very large capacity of 10,000 amperes. The energy required by direct-current solenoids is relatively small and in the case of the 10,000-ampere switch, above mentioned, the total watt consumption was only approximately 100. There is practically no limit to the size in which direct-current magnets can be built in a substantial manner and of a sufficient speed for operation of switches of large capacity. However, when we come to the operation of such switches from alternating-current sources of supply, we meet a new problem.

In direct-current magnets the only energy which has to be taken care of is that consumed by the coil of the magnet. In alternating-current magnets, on the other hand, there is not only the current consumption of the coil proper, but also the energy lost in the shape of hysteresis and eddy-current losses in the iron to be taken care of. These losses are of much greater magnitude than the losses in the coil and, in order to keep them within reasonable limits, the iron structure of the magnet has to be laminated. This naturally weakens the magnet structure where very large powers are required. Since the larger the magnet, the smaller is the radiating surface through which the heat due to the losses can be dissipated, therefore there soon is reached a practical limit beyond which alternating-current magnets cannot be built to operate successfully for very severe service. Such magnets also have a tendency to be noisy, due to the pulsating pull of the magnet and the relatively very heavy armature which has to be employed to maintain a certain amount of pull. A relatively high current is taken when in its open position. Although this current is reduced automatically quite materially when the magnet seals, the apparatus employed for controlling the current in the magnet coil has to take care of the very heavy inrush current and is therefore subjected to very great wear.

For all these reasons, large switches for handling alternating currents have not been built with alternating-current magnet operation. Alternating currents of large power and high voltage are most effectively handled under oil and these switches are therefore mostly of the oil-immersed type.

For small currents and low voltages, which can be handled in oil satisfactorily, air-tight switches of the clapper type have been developed and have been in successful use for several years. Fig. 1 shows one of these switches. Small oil-immersed switches for voltages up to 2,200 and relatively low currents may also be handled by alternating-current magnets, such as are shown in Fig. 2.

For large switches, however, the alternating-current solenoid was not found suitable, due to the disadvantages enumerated above, and it was therefore necessary to operate such switches with a direct-current magnet taking power from a direct-current source of supply. Such a switch is shown in Fig. 3, having a capacity of 500 amperes at 6,600 volts.

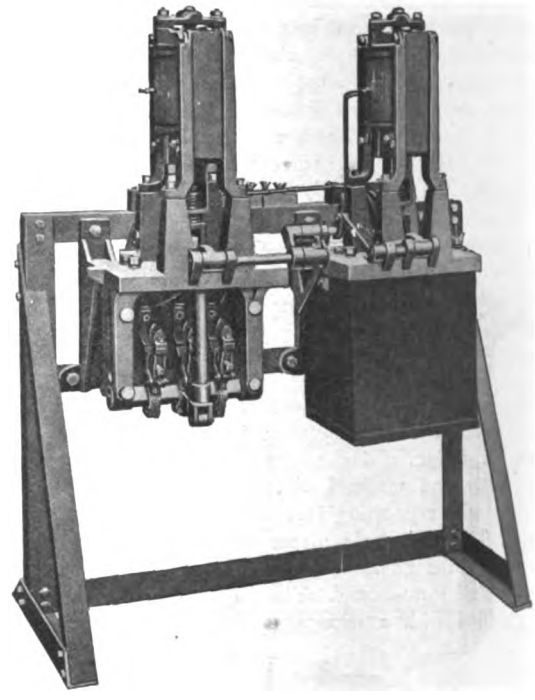

Fig. 2.—Oil Switches Operated by Alternating-Current Magnets.

In many installations where such alternating-current switches are to be employed for controller work no direct-current source of supply is available and it is therefore necessary in all such cases to install a motor-generator set, which is expensive and adds another link to the installation liable to break down. The motor-generator set also requires some attendance, which adds to the operating cost of the installation. The motor-generator set, or even an independent direct-current source of supply, makes the installation somewhat less reliable because the alternating-current circuit controlled from the switch can not be operated if the direct current should fail. For these reasons it seems desirable that the alternating-current switch of large capacity should be operated directly or through a stationary transformer from the alternating-current source of supply. This is made possible by the use of motor-operated switches recently developed by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

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The principle of the motor-operated switch is to connect the motor armature by means of a lever and crank to the operating mechanism of the switch and to have the motor energized during the entire time during which the switch is to be closed, so that the switch operates on "no voltage." Formerly switches with motor operation were developed where the motor circuit was cut out after the switch was closed and a separate tripping mechanism was installed. Such switches, while admirably adapted for central-station work, are not suitable for controller work on account of the great complication which brings with it all the disadvantages enumerated above. Such switches would also be entirely too sluggish in operation for rapid controller work.

To operate the switch directly from the motor armature by means of a crank would require a motor of very large proportions, due to the large torque required. Furthermore, such a motor would consume considerable energy, and in view of the fact that the motor armature stands still during the entire time during which the switch is closed, with the exception of the short interval required for closing, it would be difficult for the motor to dissipate the energy which is developed therein. The simplest type of motor, however, can be used for such an installation, namely, a squirrel-cage motor, which requires nothing but a line connection.

In order to reduce the size of the motor, it is of course possible to gear the armature to the operating mechanism in such a manner that the armature makes several revolutions for the closing of the switch. This reduces greatly the size of the motor and obviates the difficulties stated above. There is, however, one difficulty to overcome. The armature after having made several revolutions attains quite a momentum and when the switch is closed it has to come to a sudden stop. With no provision against this there would be produced a considerable strain on the motor shaft and the gearing which would lead after a relatively short time to destruction of the apparatus. The inertia of the armature must be gradually absorbed outside of the positive stop on the switch without cutting off the power supply from the motor. Similarly, when the motor is cut off the line the armature revolves backwards and it is necessary for the operating mechanism to accelerate the entire armature. This consumes considerable time and when the switch reaches its open position the armature, if coupled tightly with the operating mechanism, produces another shock on the mechanism and gearing when stopped.

The new Cutler-Hammer switches obviate these troubles. The armature is connected with the operating mechanism by means of a pinion and gear sector but, instead of being keyed directly on the shaft of the motor, the pinion is connected with a slip clutch, which is set for a maximum torque slightly in excess to the torque developed by the motor at standstill. When the motor is first energized, the armature is accelerated and in moving it drives the operating mechanism through the slip clutch, closing the switch. When the switch parts reach their ultimate limit, the operating mechanism is stopped in a suitable manner, while the motor armature continues to revolve, causing slippage of the clutch, which absorbs gradually the inertia stored up in the armature, until the latter comes to a standstill and keeps the switch closed. When the circuit to the motor is opened, the switch members, which are under tension, accelerate the armature backwards and when the maximum opening of the switch is reached the switch members are stopped in a suitable manner and the armature is free to rotate through the slip clutch. The latter therefore prevents overstraining of the operating members of the switch.

The motor is designed so that it develops maximum torque at standstill, resulting therefore in the smallest possible motor for the work in question. The motor armature is built as light as possible, so as to reduce the inertia effect and permit of rapid acceleration in either direction so as to produce a rapid closure and opening of

Fig. 3.—Large Alternating-Current Switch Operated by Direct-Current Magnets.

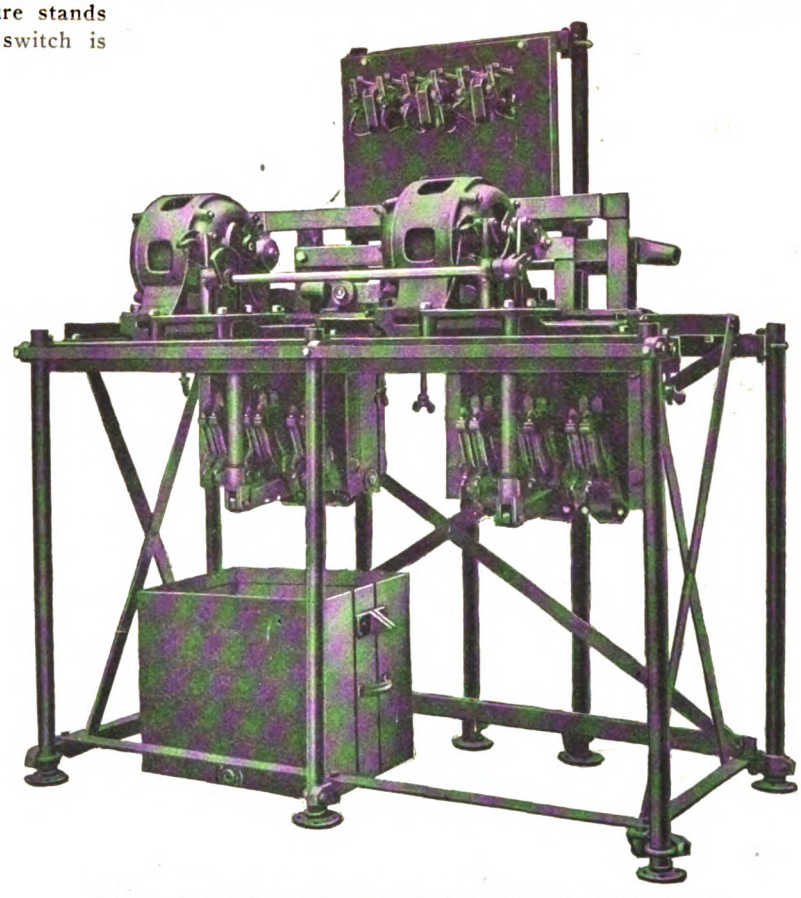

Fig. 4.—Motor-Operated Alternating-Current Oil Switch Group.

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the switch. The armature shaft is supported on ball bearings which require practically no lubrication or attention and all other parts are so rugged that they will stand up under service indefinitely. Particular attention is called to the slip clutch, which is built in a very substantial manner, having an asbestos-lining friction face.

Switches of the type described above may be built in any capacity and they have already been built for handling, in a three-pole type, currents of 1,000 amperes per phase, see Fig. 4. Two of such switches may be combined for reversing the primary of the motor circuit which is to be controlled and in this case they are mechanically interlocked in such a manner that one switch can only close after the other switch is fully opened.

The contact parts of these switches consist of copper-leaf brushes, which are protected by solid metal-block auxiliaries and the contacts are arranged so that they separate in a horizontal plane, producing a horizontal arc. This is easily extinguished by the oil, which being heated by the arc has a tendency to blow upwards or at right angles to the arc; thus the quickest possible elongation of the arc is obtained. The copper-leaf brushes have the advantage that each leaf forms a probable line contact, making it impossible for an oil film to produce a high resistance between the contact plate and the copper-leaf brush.

On the other hand, the heavy metal-block auxiliary contacts have a great cooling effect on the arc, causing it to be rapidly extinguished, and in order to prevent an oil film from producing a high resistance between the auxiliaries, which would cause sparking of the main brushes, the two contact blocks engaging with each other are slotted diagonally the slots on the two blocks crossing at right angles so as to permit the pressure exerted on the blocks to remove the oil film as rapidly and efficiently as possible.

The contacts are inclosed in an oil tank which is easily removable and which is supported from the cast-iron structure that also supports the motor and other operating gear. The leads are brought out through the top of the supporting case in a manner for affording easy wiring.

Noteworthy Church-Lighting Installation at Dedham, Mass.

A remarkable church-lighting installation has been completed in St. Mary's Church, Dedham, Mass., by Edwin C. Lewis., Inc., Boston. The fixtures consist of 14 prismatic glass chandeliers in the main church, and one similar fixture in the vestry. Each is made up of glass units connected by metal fastenings. The extreme length of each fixture is about 4.5 feet, and it terminates in a ball 3 feet in diameter. Within the ball is a 200-watt nitrogen-filled tungsten incandescent lamp, and around the circumference are ranged eight 25-watt tungsten candle lamps.

The fixture supporting the vestibule lamp is of handsome bronze and was imported from France. Around the altar are six large brackets supporting lamps similar to those in the nave, and the basement is lighted by Brascolites manufactured by the Luminous Unit Company, St. Louis, Mo.

View in Press Room of The Cook Pottery Company's Factory.

Practically all the porcelain used in the electrical industry requires great care in its manufacture to insure the electrical and mechanical properties required. Every detail in the process, from the selection and mixing of the raw materials to the shipment of the finished product, requires continual supervision and frequent close inspection. Following out such a policy has given The Cook Pottery Company, of Trenton, N. J., its reputation for turning out goods on a strict quality basis. It prides itself on producing porcelain of a clear white color and of extreme accuracy. The secret of this latter quality lies largely in the careful work done in the press room, a view of which is shown above; the photograph was taken just as the men were about to start their day's work. The company is now operating 69 presses with a daily output of 225,000 pieces of porcelain. There is being turned out at this factory dry-process work of every description and in sizes ranging from the very small, weighing 25 ounces to the 1,000 pieces, to the very large pieces, weighing over 6½ tons per 1,000. In the foreground can be seen an inspector gauging and closely examining a large piece of work that had been pressed up on the preceding day.

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INDUSTRY ACTIVITIES

Palmer Electric & Manufacturing Company, announces the removal on June 15 of its main office and factory from 16 Franklin Street to its new location at 60 K Street, Boston, Mass. The company has obtained a large increase in floor space by the change.

Wirt Company, Germantown, Pa., manufacturers of Dim-a-lites and other electric appliances, announces that the Benjamin Electric Manufacturing Company, 590 Howard Street, San Francisco, Cal., is now acting as its sales representative on the Pacific Coast.

The Spencer Sign & Service Company has been organized at Stevens Point, Wis., by V. S. Prais and S. E. Swancutt, of that city. The company will manufacture electric signs made of punched metal, the openings to be star-shaped. The signs will be composed of changeable letters.

Roller-Smith Company, makers of electrical instruments and circuit-breakers, 233 Broadway, New York City, announces that the Electrical Material Company, 589 Howard Street, San Francisco, Cal., will handle its products in the state of Nevada and in parts of the neighboring states of California, Oregon and Idaho.

The Chain Belt Company, Milwaukee, Wis., has just distributed its folder No. 64 which gives complete data on its traveling water screens. The water screens are designed primarily to remove refuse and foreign material from water before it enters power plants, steel mills or any other industrial plant requiring large quantities of clean water.

The United Battery Corporation, New York, N. Y., announces that owing to its rapidly increasing business it has become necessary to move the general offices from the factory to larger quarters in the Woolworth Building. In addition to the space thus made available at the factory, the company has secured more space and is enlarging its manufacturing facilities.

The Century Electric Company, St. Louis, Mo., is distributing a new folder illustrating various applications of its small motors. Among the applications shown are a motor-driven ventilating fan, organ pump, garage compressor, dough mixer, sign flasher, etc. The company's line includes motors from 0.1 to 30 horsepower in size and its slogan is that standard motors are kept in stock at 33 points in the United States and Canada.

The Bureau of Electric Sign Engineering of Milwaukee, Wis., has filed articles of incorporation with a capital stock of $10,000 and proposes to furnish electric sign data to central stations, electrical contractors and electric sign men; also to manufacture parts of and complete electric signs and electrical advertising specialties. The officers are: J. B. Lindl, president; Joseph Lindl, vice-president; W. G. Garrett, secretary, and W. O. Meilhan, treasurer.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued an attractive booklet entitled "Something in It for You," in order to assist its agents and dealers in marketing the Westinghouse electric range. The booklet describes in a brief manner the advantages of this type of range together with a number of illustrations, and in addition outlines several methods of selling them, and gives some suggestions covering newspaper advertising, window trims, demonstrations, etc. The booklet is being distributed to central stations and dealers. The company has also issued catalog 1-A, entitled "Westinghouse Lightning Arresters," which covers the subject of lightning arresters and the various types designed for particular classes of service. A discussion of lightning and its effects is given, followed by discussion of the application of arresters for protection of various classes of apparatus. Following this is given a general description, accompanied by illustrations of the different types of lightning arresters and accessories manufactured by the company. Copies of the catalog will be sent to those making request.

Hart & Hegeman Manufacturing Company has moved its Chicago offices from the second floor of the Electrical Building, 619 West Jackson Boulevard, to the ground floor of the same building. The constantly increasing demand in the West for this company's product made the change necessary. In the new location the company obtains much better office facilities and unexcelled shipping facilities for "H. & H." and Paiste specialties, the Hart & Hegeman Manufacturing Company being sole selling agent for the H. T. Paiste Company. Haynes Everest, who is so widely and favorably known among the electrical fraternity, is in charge of the Chicago office of the company.

Electrical Publications Syndicate, Inc., New York, N. Y.—A syndicate house organ for central stations known as the *Electralogue,* in which each company maintains its individuality to such an extent that it may be said to be issuing its own house organ, is the product of the Electrical Publications Syndicate, Inc., of New York. The *Electralogue* aggregates, with cover, 40 pages. Twenty-four of these are devoted to syndicated reading matter consisting of articles gathered from every field of the electrical industry and presented in a popular and attractive style. The text is primarily sales stimulating, and presented with the human interest element emphasized. Bound in with these pages are four pages devoted exclusively to reading matter of the subscribing company. Here the central station can conduct its own selling campaigns as it sees fit, or it can tell in detail the news of the local field. Added to this, a separate cover and an inside cover page advertisement is reserved to the subscribing company, completing the individual features of the magazine. The remaining ten pages are devoted to advertising of a general electrical nature.

Canadian Electric Companies Merge.—A consolidation by which the Civic Investment & Industrial Company takes over the Montreal Light, Heat & Power Company has been ratified, thus effecting the organization of one of the most complete electric generating and distributing systems in the world. The Civic Investment & Industrial Company will have an authorized capital of $75,000,000. Of this amount, $65,300,000 will be issued presently to provide for the entire capitalization on the basis of exchange of Montreal Power and Cedar Rapids companies. The balance of the capital will remain in the treasury for future requirements. Under the agreement made the Civic Investment & Industrial Company will operate the Montreal Light, Heat & Power Company and the Cedar Rapids Manufacturing & Power Company, during the period of 98 years, and also guarantees all fixed charges, operating expenses, maintenance, etc., of both companies, and eight-per-cent annual dividends on the stock of the Montreal Light, Heat & Power Company and three-per-cent annual dividends on the stock of the Cedar Rapids Manufacturing & Power Company from August 1, 1916. It is understood that the new company will operate under the style and name of the Montreal Light, Heat & Power Company.

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LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

AUTO-STARTERS.—Fairbanks-Morse Electrical Manufacturing Company, Indianapolis, Ind.

Oil-immersed switch and transformer mounted as a unit in metal case, with and without overload and no-voltage release coils. Used as a means whereby potential impressed upon alternating-current motor terminals may be made less than full line voltage during starting process. In off position transformer and motor windings are disconnected from line. Overload release is inoperative during process of starting motor, and other circuit-breakers or fuses are necessary in motor circuit. Capacity, 200 horsepower or less, 600 volts or less, type CC.

Note.—This manufacturer also furnishes auto-starters for circuits of voltage higher than 600 volts. These will be generally acceptable for use when installed in accordance with requirements of inspection departments having jurisdiction.

Listed April 26, 1916.

ELEVATOR-CONTROL APPLIANCE.—Warner Elevator Manufacturing Company, Cincinnati, O.

Elevator hatchway limit switch, consisting of double-pole series contacts inclosed in metal case with pivot-hinged cover, operated by contact of elevator shoe against cover. One switch installed at top of hatchway and one at bottom, both in main motor circuit. "Warner," 100 amperes, 250 volts.

Listed May 9, 1916.

FITTINGS FOR CONDUIT BOXES, Covers.—E. H. Freeman Electric Company, Trenton, N. J.

Porcelain covers for conduit boxes for use as rosettes. Catalog Nos. 350 and 355.

Listed May 16, 1916.

GROUND CLAMPS.—West End Machinery and Electric Company, 12 Minot Street, Boston, Mass.

Ground clamps for use with rigid conduit. "Wemeco." One-inch conduit or less.

Listed March 31, 1916.

HEATERS, Electric.—Eberbach & Son Company, Inc., Ann Arbor, Mich.

These electric drying ovens consist of a transite asbestos board case provided with a door, electric-heating elements, switches, a pilot lamp and a thermostat. A length of heater cord and a plug are provided on catalog No. 3031 for connection to supply circuit. No plug is provided with catalog No. 3032.

3.5 amperes, 110 volts; 1.75 amperes, 220 volts; alternating or direct current; catalog No. 3031.

9 amperes, 110 volts; 4.5 amperes, 220 volts; alternating or direct current; catalog No. 3032.

Listed April 22, 1916.

INCUBATORS, Electric.—Eberbach & Son Company, Inc., Ann Arbor, Mich.

These surgical incubators consist of a transite asbestos board case provided with a glass and a transite board door, a heating element, a pilot light and a thermostat. A portable cord and plug is provided for attachment to supply circuit.

1.5 amperes, 110 volts; 0.75 amperes, 220 volts; alternating or direct current; catalog No. 4287.

2.5 amperes, 110 volts; 1.25 amperes, 220 volts; alternating or direct current; catalog No. 4288.

4 amperes, 110 volts; 2 amperes, 220 volts; alternating or direct current; catalog No. 4289.

Listed March 16, 1916.

LIGHTNING RODS.—Hollow Cable Manufacturing Company, Hornell, N.Y.

Label service.

Listed April 12, 1916.

MINIATURE MOTION-PICTURE MACHINES.—The DeVry Corporation, 117 North Fifth Avenue, Chicago, Ill.

Portable motion-picture machines of miniature type consisting of asbestos-

Cover for Conduit Box.—E. H. Freeman Electric Company.

lined wood case enclosing projector mechanism, film, incandescent lamp and driving apparatus. Made in three types.

Hand-operated, 100-watt gas-filled lamp, 100-125 volts. "Commercial."

Motor-operated, 200-watt gas-filled lamp, automatic cutout for film breakage 250 watts, 100-125 volts. "Eveready."

Motor-operated, 200-watt gas-filled lamp, automatic cutout for film breakage, alarm clock cutout, 250 watts, 100-125 volts. "Automatic."

Standard only when used with slow-burning film supplied by this manufacturer.

Listed April 10, 1916.

RECEPTACLES, Weatherproof.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. 660 watts, 600 volts, conduit-box type, catalog Nos. 1176-77.

Listed April 12, 1916.

RECTIFIERS.—Chicago Rectifier Manufacturing Company, 6819 South Chicago Avenue, Chicago, Ill.

Mechanical rectifier and panelboard consisting of a synchronous motor driving a commutator which is designed to rectify alternating current at a reduced voltage obtained from an auto-transformer forming a part of equipment. Designed for moving-picture arc lamps. Four kilovolt-amperes, 110 volts, 60 cycles.

Standard when installed in a fireproof compartment separate from the moving-picture booth and in accordance with requirements of inspection departments having jurisdiction.

Listed April 29, 1916.

RHEOSTATS.—Fairbanks-Morse Electrical Manufacturing Company, Indianapolis, Ind.

Type CCR.

Listed April 26, 1916.

RHEOSTATS.—General Electric Company, Schenectady, N. Y.

Motor-starter panels, types CR-2213-16, 2321-26.

Listed May 16, 1916.

SIGNS, Electric.—Federal Electric Company, Lake and Desplaines Streets, Chicago, Ill.

Electric signs shown to be in accordance with requirements of the National Board of Fire Underwriters and examined at factories and passed by Underwriters' Laboratories have labels attached.

Listed April 3, 1916.

SIGNS, Electric.—Kirtland Electric Construction Company, 64 Hamilton Street, Albany, N. Y.

Listed April 15, 1916.

SOCKETS, Standard.—Bryant Electric Company, Bridgeport, Conn.

Bryant or Perkins metal shell. Key, 250 watts, 250 volts, catalog No. 7407. 660 watts, 250 volts, single-pole, quarter turn, catalog No. 4499.

Listed May 3, 1916.

SOCKETS, Standard.—Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

C-H, 660 watts, 250 volts, brass shell, push-button, catalog Nos. 7510, 7512, 7514, 7520, 7522, 7524, 7530, 7532, 7534; keyless, catalog Nos. 7521, 7523, 7525, 7531, 7533, 7535. Candle sockets, push-button, catalog Nos. 7516, 7518, 7526; keyless, catalog Nos. 7509, 7517, 7519, 7527.

Listed May 1, 1916.

SWITCHES, Pendant Snap.—Pass & Seymour, Incorporated, Solvay, N. Y.

P. & S. switches with pull-chain mechanism, 3 amperes, 125 volts; 1 ampere, 250 volts, catalog Nos. 3040, 3041.

Listed April 12, 1916.

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PERSONAL AND BIOGRAPHICAL

MR. GEORGE H. GRAVES, former assistant electrical engineer of the Sanitary District of Chicago, has been appointed head of the department, following the resignation of Edward B. Ellicott.

MR. GEORGE N. ROOKER, manager of the Northern Idaho & Montana Power Company, at Sandpoint, Idaho, has resigned his position with the company, to take effect July 1.

MR. W. W. WHITE has been appointed superintendent of the municipal electric-lighting plant at Bolivar, Tenn., succeeding MR. F. M. SMITH, who has resigned.

MR A. B. ELIAS, general superintendent of the plant of the Southwestern Telegraph & Telephone Company, spoke at the meeting of the Dallas Electric Club—Jovian League on June 9 on the subject of "Safety First."

MR. J. ROBERTS WILSON, formerly sales manager and vice-president of the Crocker-Wheeler Company of Ampere, N. J., has become associated with the Davison Chemical Corporation of Baltimore, Md., as manager of the company's office at 120 Broadway, New York.

MR. W. P. NASER has been appointed by the Trumbull Electric Manufacturing Company, of Plainville, Conn., as manager of its branch office in Chicago, Ill., succeeeding MR. J. S. JACOBSON, who has resigned, as announced in the issue of June 10. Mr. Naser formerly was manager of the company's branch office in San Francisco, Cal.

MR. W. B. WHITEHORN, purchasing agent and assistant to the president of the Omaha Electric Light & Power Company of Omaha, Neb., has resigned to become secretary and manager of the National Oil & Paint Company. Mr. Whitehorn has been with the Omaha company about seventeen years. He will be succeeded as purchasing agent by B. P. Egan, formerly of Nebraska City.

MR. ROY HUSSELMAN, an electrical engineer representing F. W. Ballard of Cleveland, Ohio, has been retained by the board of water commissioners of Dunkirk, N. Y., to make a survey of the local electrical situation with the object of recommending whether or not it would be advisable for the city of Dunkirk to install new generating machinery in the municipal power plant or to buy power from the Niagara & Erie Power Company.

MR. PAUL F. GODLEY presented a paper on "Applications of the Audion," at a meeting of the Radio Club of America held recently at Columbia University, New York City, in which were discussed important considerations in design, construction and operation of apparatus used with the audion as a detector for short or long wave reception, as an amplifier, and as a generator of high-frequency oscillations to be used both in the reception of undamped waves, and as a source of power for radiotelegraphic and radiotelephonic transmission. Complete diagrams, data and specifications were given.

MR. A. L. MARTIN, formerly manager of the Dallas (Ore.) division of the Oregon Power Company, has been appointed superintendent of the Coos Bay (Marshfield) division of the company, succeeding MR. R. M. JENNINGS, who has resigned. MR. R. U. STEELQUIST, formerly manager of the Oregon Power Company at Corvallis, Ore., has been appointed superintendent of the Dallas division, succeeding MR. MARTIN. MR. F. M. HILDRETH, formerly superintendent at Junction City, Ore., has been appointed superintendent at Corvallis to succeed Mr. Steelquist, and MR. RALPH JAMES has been appointed superintendent at Junction City.

MR. G. D. EARLE, who was elected president of the Electrical Dealers and Contractors' Association of Ontario at the annual convention on June 6 to 8, as noted in our last issue, is a native of Peterboro, where he started into electrical work. For about ten years he was employed by the Canadian Pacific Railroad as a traveling electrical man. Five years ago he went to Toronto and for the past two years he has been carrying on a large contracting business, with offices at 72 Nelson Street. Mr. Earle organized the convention and for this work was elected president.

MR. D. S. MILLER, who has been appointed manager of power and lines for the properties of the Reading (Pa.) Transit & Light Company and affiliated companies, was formerly supervisor of power and lines of the electric properties controlled by the New York, New Haven & Hartford Railroad Company, embracing electric railways in Connecticut, Massachusetts, Rhode Island and part of New York State. Mr. Miller was with the New York, New Haven & Hartford Railroad Company about nine and one-half years. He was graduated from the Pennsylvania State College in 1900, and served with the General Electric Company for one year in its testing department and on outside construction work; with the Sprague Electric Company, New York, one and one-half years as erecting engineer, and with the Boston (Mass.) Elevated Railway Company about three years as assistant electrical and mechanical engineer.

OBITUARY.

MRS. JOSEPH ARNOLD, mother of MR. BION J. ARNOLD, consulting engineer, Chicago, Ill., died June 14. She is survived by one daughter and seven sons.

MR. EDWARD N. FOBES, president of the Fobes Supply Company, electrical supplies, Seattle, Wash., and Portland, Ore., was killed at Kent, Cal., June 5 in an automobile accident. Mr. Fobes was 52 years of age and had lived in Seattle 18 years.

MR. GEORGE GILMOUR, a trustee and member of the Executive Committee of the Museum of Safety and head of the inspection department of the Travelers' Insurance Company, died June 15, at his home, 107 Stratford Road, Brooklyn, N. Y., in his fifty-second year. He was an authority on accident prevention and industrial safety, and in 1910 was sent to investigate conditions in Great Britain, France, Holland, Belgium, Germany, Switzerland, and Sweden as a member of the Commission of the state of New York on Employers' Liability, Unemployment, and the Causes and Prevention of Industrial Accidents. His reports had much to do with the enactment of the present laws on those subjects.

DR. SILVANUS P. THOMPSON, noted electrical engineer and physicist and a former president of the Institution of Electrical Engineers, died in London, England, June 13. He was most widely known for his work in the development of dynamo-electric machines. Dr. Thompson was born in York, June 19, 1851, and was educated at the Botham School there, Royal School of Mines, Heidelberg, and other institutions. In 1875 he was graduated as Bachelor of Science from the University of London, and three years later took the degree of Doctor of Science, experimental physics being his special subject. In 1876, Dr. Thompson was appointed professor of experimental physics in the Bristol University College and continued in that capacity until 1895. Ten years before the latter date he was elected principal and professor of physics in the City and Guilds of London Technical College at Finsbury. He was made an LL. D. at Birmingham and an honorary M. D. at Koenigsburg. He was a Fellow of the Royal Society, of the Royal Astronomical Society, a member of the Royal Institution of Great Britain, the Royal Academy of Sciences of Stockholm, the American Philosophical Society, and senator and examiner of London University, in the organization of which he took a prominent part. Dr. Thompson was an honorary member of the American Institute of Electrical Engineers, a past president of the Junior Engineering Society, the Roentgen Society, the Physical Society, the Optical Society, the Southeastern Union of Scientific Societies, Section G of the British Association, the Illuminating Engineering Society and was honorary vice-president of the Electrical Exhibition at Frankfort in 1891 and British delegate to the Electrical Congress in Chicago in 1893. He was a member of the Athenaeum Club and was the founder of the Gilbert Club, being one of its honorary secretaries. Dr. Thompson's writings included biographies of Michael Faraday and Lord Kelvin, in addition to many technical works on dynamo-electric machinery, the electromagnet and optical subjects. His first book published in 1883, "Elementary Lessons in Electricity and Magnetism," reached a circulation of more than 40,000 copies. In 1886 he began the publication of his treatise on "Dynamo-Electric Machinery," which is in its eighth edition. The wide range of subjects covered by Dr. Thompson in his writings won for him several awards from scientific bodies, as also have many of his discoveries. Dr. Thompson was a man of very agreeable personality.

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CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

PORTLAND, ME.—The Public Utilities Commission has been petitioned by the Cumberland County Power & Light Company for permission to issue and sell $350,000 in bonds.

HOLLIS, N. H.—The Hollis Electric Light Company has applied to the Secretary of State for incorporation, with a capital stock of $5,000.

LOWELL, MASS.—The Lowell Electric Light Corporation is constructing a three-phase, 2,000-kilovolt-ampere, 11,000-volt power line from its station to North Chelmsford, about five miles, 2.5 miles being underground conduit. This will provide additional power service to an industrial community that is rapidly growing, a number of the factories being devoted to iron and steel products.

MARLBORO, MASS.—The Boston & Western Street Railway is projected to be built between here and Waltham, about 15 miles, making a direct route from Boston. A committee of the Board of Trade of this city is co-operating with a committee of Waltham citizens to secure the building of the road.

SPRINGFIELD, MASS.—Contracts for the new power plant of the United Electric Light Company, which will be built at the foot of Bliss Street, have been awarded, the general contract being let to the A. E. Stephens Company, of this city. It is estimated that the entire work will cost $750,000.

HARTFORD, CONN.—The Hartford (Conn.) Electric Light Company's directors have voted to recommend to stockholders an increase of $900,000 in capital stock, making a total of $4,500,000. The 9,000 shares would be offered to stockholders of record at par value. The recommendation will be acted upon June 27.

THOMPSONVILLE, CONN.—An improved lighting system consisting of 24 iron posts, each supporting three large incandescent units, is being considered, a special committee having recommended such a system, to cost about $2,800.

EAST SYRACUSE, N. Y.—A modern electric-lighting system will be established here about September 1, work on the new system to begin in a few days. The Syracuse Lighting Company will install the system.

LANCASTER, N. Y.—The Depew and Lancaster Light, Power & Conduit Company, has applied for a franchise to establish an electric-lighting system in Elma, N. Y. It is proposed to give electric service in the towns of Springbrook, Elma Center, East Elma, Blossom and Jamison Road. The company has filed a petition with the Public Service Commission for authority to issue $72,000 of its five-per-cent 40-year gold bonds under an existing mortgage of $1,000,000.

PULASKI, N. Y.—The Pulaski Electric Light Company, of which J. H. Costello is superintendent, is considering plans for the installation of street-lighting systems in Lacona and Sandy Creek, N. Y.

WAVERLY, N. Y.—The Board of Trustees and F. S. Nicholson, manager of the Sayre Electric Company, are considering plans for extensions to the local electric-lighting system.

MADISON, N. J.—Borough Council will install a municipal underground conduit system in Lincoln Place and vicinity.

RIVERDALE, N. J.—Borough officials are negotiating with the Butler Common Council for the extension of the Butler municipal electric system to Riverdale and vicinity.

TRENTON, N. J.—Final plans have been adopted by the City Commission for the installation of a new arc-lamp street-lighting system on State Street, from Clinton Street to State House, on Broad Street, from Greenwood Avenue to Battle Monument, and south on Warren Street to Factory Street. The Public Service Electric Company will make the installation.

CHESTER, PA.—The Beacon Light Company, a subsidiary of the General Electric Company, has acquired a large tract of river-front property, and plans for the erection of a new power plant.

CONNELLSVILLE, PA.—The recent approval by the Public Service Commission of the incorporation of a score or more of power companies in Fayette, Greene and Washington Counties paves the way for the extension of the West Penn Power Company's transmission lines to sections of Southwestern Pennsylvania not now being served. The tapping of the new territory, with its accompanying demand for additional power, will probably revive the project to build the Cheat River power plant, which was abandoned several years ago.

ERIE, PA.—J. B. Brooks and others, of this city, are stockholders in the Sugar Creek Township Power Company, which was recently chartered to supply electrical energy for light and power in Sugar Creek Township. The company is capitalized at $5,000.

HAZELTON, PA.—The Rosell Silk Mill Company will build a large addition to its plant. Steam operation will be supplanted by electric power; individual motors will be installed for all machinery.

HEGINS, PA.—The Public Service Commission has approved of the incorporation of the Hegins Township Electric Company, to install and operate a light and power system.

LANSFORD, PA.—The City Council has passed an ordinance granting the Panther Valley Electric Light Company, of this city, permission to erect high-tension transmission lines through this city to the company's new $45,000 substation.

PHILADELPHIA, PA.—The Hunting Park Improvement Association is negotiating with the City Council for the installation of street lights in the York Road bridge district.

POTTSTOWN, PA.—William M. Rutter will build an electric lighting plant for local service. A site has been selected at the former grist mill.

WEST CHESTER, PA.—The North Coventry Electric Company has been incorporated with a capital of $5,000 by J. C. Murtagh, of this city, to operate in North Coventry Township.

KINSTON, N. C.—Extensions and improvements to the municipal electric-lighting plant, costing approximately $40,000, have just been completed. The capacity of the plant has been quadrupled and considerable reserve power for manufacturing purposes is now available.

COLUMBIA, S. C.—The Carolina Rapid Transit Company has been incorporated with a capital of $50,000 by J. F. Jacobs, W. L. Gray and others. The company proposes to construct an electric railway through Laurens, Spartanburg and Union Counties.

AUGUSTA, GA.—C. A. Wickersham and associates have accepted the conditions of the city ordinance regarding the construction and operation of a terminal railway and have made application for the incorporation of the Savannah River Terminal Company with a capital of $100,000. Considerable electrical construction work will be necessary.

SAVANNAH, GA.—Extensions to the city electric-lighting system are being considered by Chief Engineer E. R. Conant.

PLANT CITY, FLA.—E. V. Capps, representing the Jaudon Engineering Company, has made a report on the survey of the city for a combined municipal electric-lighting and waterworks plant. The total cost is estimated at $91,000.

ST. CLOUD, FLA.—The Central Florida Interurban Railway Company has been incorporated by C. E. Carlton, W. S. Alyea and others. The company proposes to build an electric railway between St. Cloud and Tampa by way of Sanford and Dunnellon; also through Volusia County to a point on the coast, and through Osceola and Brevard Counties.

NORTH CENTRAL STATES.

CINCINNATI, O.—The city service department is working out an estimate of the cost of the proposed boulevard lighting system for the entire downtown business section of the city, the city council having ordered this to be done. Indications are that the system will be constructed.

LONDON, O.—The inadequacy of the city electric plant to the present needs of the city will probably result in improvements being made to enlarge its capacity and extend the distributing system.

SALEM, O.—The Salem Lighting Company, a newly organized concern, has been given authority by the Public Utilities Commission to issue $150,000 in common stock and $150,000 in first-mortgage bonds, the proceeds to be applied to the purchase of the Salem Electric Light & Power Company and the Columbiana Electric Company.

LEROY, ILL.—Plans are being discussed here for the erection of a municipal electric-lighting plant.

OTTAWA, ILL.—The Council is considering ordinances requiring the placing of all electric wires underground in the business district.

PERRY, ILL.—The Perry Light & Power Company has been incorporated with a capital of $5,000 by J. I. Vertrees and others to furnish electric service here.

SPRINGFIELD, ILL.—The city will purchase a new generating unit to be installed at the pumping station. Specifications for a 750-kilovolt-ampere unit have been approved by the City Council and bids will be received June 27. The city budget ordinance contains an appropriation of $20,000 for the unit.

GRAND RAPIDS, MICH.—B. E. Parks & Son, engineers of this city, are preparing plans for rebuilding the power plant of the Eagle-Ottawa Leather Company at White Hall. New boilers will be installed at this plant. They are also preparing plans for increasing the capacity of the same company's pant at Grand Haven. Plans also are being prepared for a power plant for the Cadillac (Mich.) Machine Company.

HANCOCK, MICH.—The Common Council has received estimates for the erection of a municipal electric-lighting plant and has decided to employ an electrical engineer to draw up plans. The preliminary estimate calls for an expenditure of $40,000 for the system.

ELKHORN, WIS.—The Wisconsin Gas & Electric Company has recently installed transmission lines to this city and 24-hour service is now being given. The city is planning to purchase a 40 and a 75-horsepower motor for its pumping plant.

KINGSTON, WIS.—The Ripon (Wis.) Light & Water Company has secured an option on the local electric-lighting plant. It is the intention of the company to connect the two plants and also furnish electrical energy to the towns of Markesan and Dalton.

FERGUS FALLS, MINN.—The Otter Tail Power Company, of this city, is negotiating for the purchase of the municipal electric-lighting plant at Perham, Minn. The company is planning to erect transmission lines to Perham and Deer Creek, through Underwood, Battle Creek, Clitherall and Henning.

CLINTON, IOWA.—Plans are being considered to install ornamental lamps in Fifth Avenue during the summer.

CLINTON, IOWA.—The Albany Lighting Company has been incorporated with a capital of $10,000 by C. E. Peck and others.

DES MOINES, IOWA.—The Southern Iowa Electric Company, with principal offices in Wilmingham, Del., and western offices in Omaha, Neb., has filed notices of incorporation in this state. The company is capitalized at $500,000 and W. B. Roberts is secretary.

BONNE TERRE, MO.—The Public Serv-

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ice Commission has under advisement the purchase of the local electric-lighting system by the Light & Development Company, of St. Louis. If the Commission approves of the transfer the company will enlarge the plant to supply energy to the mining districts in this territory.

ST. JOSEPH, MO.—The Board of Public Works contemplates repairs to the street-lighting system.

ELKHART, KANS.—An issue of $5,000 in bonds has been sold, the proceeds to be used for an electric-lighting system here.

PLYMOUTH, NEB.—A committee has been appointed by the Village Board to investigate the matter of securing an electric-lighting plant for this city.

SHUBERT, NEB.—The City Council is planning ways and means to secure an electric-lighting system here.

VALENTINE, NEB.—Plans are being considered here for improvements to the municipal electric-lighting plant and extensions of the distribution system.

HARTFORD, S. D.—The Northern States Power Company has been granted permission by the County Commissioners to construct and operate for a period of 20 years a transmission line between Sioux Falls and this city.

SOUTH CENTRAL STATES.

GLASGOW, KY.—Basil Richardson, W. L. Porter and R. H. Porter have organized a new telephone company known as the Glasgow Telephone Company, with $100,000 capital and propose to take over the plants of the Glasgow Telephone Company and the Gainsboro Telephone Company, which together operate about 2,200 stations in Glasgow and Barren County, Ky.

HORSE CAVE, KY.—The Horse Cave Light & Ice Company has been incorporated by J. P. Todd, M. G. Todd and W. C. Davis, with $25,000 capital.

LOUISVILLE, KY.—Improvement of the lighting and heating plant of Jefferson County, at Louisville, will be limited this year to an expenditure of $3,000 in the way of repairs, with the probability that a new plant will be provided next year. Brinton B. Davis, architect, will superintend the work.

NEWPORT, KY.—A number of new lamps will be installed and other changes will be made by the city in connection with a rearrangement of the street-lighting system, designed to give more efficient service with the same number of lights now in use. Old lamps will be replaced.

NASHVILLE, TENN.—The City Commission is considering an ordinance which would provide for a bond issue of $1,500,000 with which to erect a municipal electric lighting plant. Commissioners Leo Goodman, Ennis M. Douglas and George C. Love have made an inspection of the municipal plant at Cleveland, O.

BIRMINGHAM, ALA.—At an election held recently the voters authorized the issuance of $500,000 in bonds, the proceeds to pay for extensions in the North Birmingham electric-lighting plant.

BIRMINGHAM, ALA.—The work on the new steam power plant of the Alabama Power Company, which is to be constructed on the Warrior River at a cost of $1,500,000, has been commenced. A. R. Gilchrist is the engineer in charge of the construction of the plant. It is expected that the plant will be ready for operation in about nine months.

HOPE, ARK.—The City Council is planning a number of extensions and improvements to the street-lighting system.

SHERMAN, TEX.—An election will be held this week to vote on the question of issuing $10,000 in bonds for a street-lighting system.

SNYDER, TEX.—Extensions to the city electric-lighting system are being contemplated.

TEXAS CITY, TEX.—Plans and specifications for a proposed street-lighting system have been presented to the City Commission.

WESTERN STATES.

BAINVILLE, MONT.—Plans are being made for the installation of an electric-lighting plant here. S. J. Dorothy, of Williston, N. D., is interested.

GLASGOW, MONT.—The Hinsdale Water & Light Improvement District has been created by the County Commissioners of Valley County, and plans for the installation of an electric lighting plant and distributing system in Hinsdale and unincorporated towns are being prepared. Tentative plans announced for the construction of lighting plant call for poles, lines, transformers, generators, switchboards, engines, etc. A waterworks system is also planned for the town of Hinsdale.

GREAT FALLS, MONT.—The City Council is planning an installation of additional street-lighting units.

LENOX, MONT.—It is reported the Helena Light & Railway Company of Helena plans the extension of its electric-lighting lines to Lenox. W. L. Callaghan is manager.

THOMPSON FALLS, MONT.—It is reported that by September 1, 1916, the Holter plant of the Montana Power Company, near Thompson Falls, Mont., will be furnishing not less than 50,000 horsepower. It is understood the third and fourth units are now being installed and that each of the six units which will comprise the completed plant will furnish 6,250 kilowatts. The work is being rushed at the plant, and plans for the construction of a high-power transmission line up Cow Creek and over the divide to Saltese are being prepared. The line to Saltese will supply current for operation of trains over the line of the Chicago, Milwaukee & St. Paul Railway Company.

PASCO, WASH.—W. S. Bear, local manager of the Pacific States Telephone & Telegraph Company, reports his company will immediately begin installing a new system in Pasco. Present lines will be rebuilt and additional equipment installed at a cost of about $25,000.

SEATTLE, WASH.—The City Council of Seattle recently made a tour of inspection of the Hebb power site on White River, under the personal direction of P. H. Hebb, of Tacoma, owner of the site, who has tried unsuccessfully for several years to sell this site to the city of Seattle for a price approximating $1,000,000. The City Council of 1912, after inspecting the site, decided if same was purchased, it would be only after condemnation proceedings had been instituted. The Hebb site is one of the several sites which J. D. Ross, superintendent of lighting, has under consideration as an adjunct to the present municipal lighting plant, which is considered inadequate to care for constantly increasing business.

SPOKANE, WASH.—City Council has been petitioned for the installation of an ornamental curb-lighting system on Main Avenue, between Division and Monroe Streets and Morton McCartney, city engineer, has been instructed to prepare plans and specifications and estimates of cost for the proposed improvement.

TACOMA, WASH.—The construction of a 250-horsepower electric-lighting plant on Van Trump Creek to serve both Paradise Valley and Glacier camps in the Rainier National Park will begin shortly. The plant will be installed by the Rainier National Park Company of Tacoma, Wash., and will cost $8,000.

TACOMA, WASH.—The application of the Puget Sound Traction, Light & Power Company for a franchise to construct a power line in Pierce County was heard by the Commissioners on June 23.

ASTORIA, ORE.—The construction of a $50,000 central heating plant in Astoria is planned by C. H. Callender, and others of this city.

ARBUCKLE, CAL.—O. H. Guptill, manager in this district for the Northern California Power Company, has been signing up power users in the vicinity of Dunnigan with the intention of extending the company's lines from College City to Dunnigan, a distance of about 10 miles.

BLYTHE, CAL.—Plans are under way for the installation of an electric light plant here as soon as the town is incorporated.

CALEXICO, CAL.—It is stated that the new power plant of the Holton Power Company will be completed within 30 days. In addition to the new plant near Holtville, the company will have its gas and electric reserve plants at El Centro completely renovated and remodeled, greatly improving its equipment and service in the Valley.

FRESNO, CAL.—Announcement has been made by the San Joaquin Light & Power Company that extensions in the Fresno district that will cost approximately $75,000 will be under way in a short time. It is reported that about 65 miles of new lines will be put in, divided as follows: Fresno, 10.3 miles; Selma, Caruthers and Riverdale, 9 miles; Midway, 7.5 miles; Coccoran, 3.75 miles; Bakersfield, 5.2 miles; Madera, 4.8 miles; Dinuba, 2.3 miles; Merced, 3.6 miles; Livingston, 5 miles; Los Banos, 6 miles; Santa Maria, 7 miles.

LOS ANGELES, CAL.—In answer to petitions for better lighting of Monte Vista Park, city officials have instructed the petitioners that it would be necessary to form a lighting district in order to secure the proposed lights.

LOS ANGELES, CAL.—The city council has ordered ornamental lights installed on Washington Street from Main to Vermont Streets.

MARTINEZ, CAL.—The Martinez-Concord Interurban Railroad has been granted a franchise to construct the first unit of its electric railway system which will connect this city with Concord.

MERCED, CAL.—Lighting districts have been established in three unincorporated cities of Merced County by special elections recently; namely, Atwater, Le Grande and Dos Palos.

SAN ANSELMO, CAL.—A petition from property owners to install electroliers along San Anselmo and Dolinas Avenues has been referred to the street committee of the trustees.

SAN FRANCISCO, CAL.—Bids for supplying electric energy to the Board were canvassed and the awards made to the Pacific Gas & Electric Company and the City Electric Company for one year on schedules A and C and to the City Electric Company for three years on schedule B.

SANTA ANA, CAL.—Agitation, which it is thought will sooner or later result in a single telephone system in Santa Ana, Anaheim, Long Beach, San Bernardino and Ventura, has begun. It is understood that petitions will soon be circulated in Long Beach asking the city commissioners for a single system either by merging the two companies now in operation, or providing a municipal system.

CANADA.

PRINCE GEORGE, B. C.—Bids for power-plant equipment to be installed in the municipal plant at Prince George will be received by John A. Turner, city clerk, until 12 o'clock noon, July 8. Specifications and forms of tender may be obtained from city clerk or from Du Cane, Dutcher & Company, Rogers Building, Vancouver, B. C., consulting engineers, who will have charge of the installation.

DATES AHEAD.

American Institute of Electrical Engineers. Annual convention, Hollenden Hotel, Cleveland, O., June 27-30. Secretary, F. L. Hutchinson, 33 West Thirty-ninth Street, New York City.

Public Utilities Association of West Virginia. Annual convention, Parkersburg, W. Va., July 12-14. Secretary, W. C. Davisson, Charleston, W. Va.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 18-21. Secretary, D. L. Gaskill, Greenville, O.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 19-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

International Association of Municipal Electricians. Annual convention, Baltimore, Md., August 22-25. Secretary, C. R. George, Houston, Tex.

Pennsylvania Electric Association. Annual convention, Eagles Mere, Pa., September 5-8. Secretary, H. N. Muller, Duquesne Light Company, Pittsburgh, Pa.

Illuminating Engineering Society. Annual convention, Philadelphia, Pa., September 18-21. Secretary, C. A. Littlefield, Irving Place and Fifteenth Street, New York City.

Association of Iron and Steel Electrical Engineers. Annual convention, Chicago, Ill., September 18-22. Secretary, W. O. Oschmann, Oliver Steel & Foundry Company, Pittsburgh, Pa.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 21,345. ELECTRICAL APPARATUS, ETC.—A firm in Holland wishes to represent in Scandinavian countries American manufacturers and exporters of electrical machinery, electrical novelties, electric fans, valves, gauges, general hardware, and novelties of all kinds. Reference is furnished.

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NO. 21,372. ELECTRIC TRAMWAY.—An American consular officer abroad reports the publication in a foreign trade journal of an announcement relative to the proposed construction of an electric tramway in Bilbao, Spain, connecting the existing system with the Irala-Barri district. The minimum rolling stock required to commence the operation of the line is one motor and one trailer coach for passengers and one motor freight car and two trailer freight cars. Construction work must be commenced within three months and completed within 18 months from the date of the award of the concession. An option on the concession is held by the "Sociedad Tranvia Urbano de Bilbao." Although the bids for this work were to be opened on May 19, 1916, and the contract has no doubt already been awarded, it will nevertheless involve the purchase of some materials from other countries. The Bureau has no further information in regard to this opportunity.

NO. 21,379. ELECTRICAL APPARATUS, ETC.—A firm in Cuba is desirous of representing American manufacturers of electric motors, gasoline motors, electric fans, boats, and electrical supplies.

NO. 21,397. SCIENTIFIC APPARATUS, ETC.—An American consular officer in Spain reports that a firm in his district, which deals in scientific apparatus and materials of all kinds, is desirous of importing small electrical material, incandescent lamps, insulators, electromedical apparatus, apparatus for electric heating and domestic use, electric ventilators and electric motors. Correspondence may be in English. References are furnished.

Proposal

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9,790, Brooklyn, N. Y., 20 radio transmitting sets. Schedule 9,793, Philadelphia, Pa., 20 portable ventilating sets. Schedule 9,796, Norfolk, Va., four turbogenerating sets. Schedule 9,798, Mare Island, Cal., three 0.5-kilowatt motor-generator sets. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

New Incorporations

NEW YORK, N. Y.—Martin Electrical Manufacturing Company. Capital, $50,000. Incorporators: Ralph Martin, 1063 Simpson Street, Bronx, N. Y.; J. J. Murphy and Harvey C. Price, of New York City.

WHEELING, W. VA.—Saylor Electric & Manufacturing Company. Capital, $25,000. Incorporators: F. D. Saylor, W. L. Saylor and others.

ST. LOUIS, MO.—Thomas H. Keffel Manufacturing Company. Capital, $100,000. Manufacture and deal in electrical machines and appliances. Incorporators: Thomas H. Keffel, C. D. Halley, J. M. Smith and others.

REINBECK, IOWA.—Iowa Peerless Electric Sign Company. Capital, $125,000. Manufacture and operate talking electric signs. Incorporators: R. L. Turner, F. W. Webb and S. W. DeWolf.

CLARKSTON, WASH.—Idaho-Washington Water, Light & Power Company, of Boston, Mass., and Clarkston, Wash. Capital, $1,200,000. Incorporators: B. T. Stephenson, L. B. Hardman and E. C. Ulman.

DOLGEVILLE, N. Y.—Dolgeville Electric Supply Company. Capital, $3,000. Incorporators: C. H. Mosher and others.

CEDAR POINT, O.—Cedar Point Utilities Company. Capital, $10,000. Incorporators: E. B. King, R. K. Ramsey, H. A. Dunn and others.

SOUTH BEND, IND.—Kale & Bryan Company. Capital, $10,000. Manufacture electric signs. Incorporators: W. E. Bryan, Fred Kale and J. F. Devine.

CLEVELAND, O.—Cleveland Power Transmission Company. Capital, $10,000. Incorporators: B. V. Selby, E. E. Lenarz, E. H. Krueger, H. J. Nord and A. L. Winsper.

NEW YORK, N. Y.—Artistic Lighting Fixture Corporation. Capital, $25,000. Manufacture electrical fixtures, etc. Incorporators: S. H. Shinsky, M. Shuman and N. W. Coan.

Financial Notes

N. W. Halsey & Company have purchased $4,000,000 first-mortgage 5-per-cent bonds of the Kansas City Railways Company, due 1944. An offering syndicate has been formed and the bonds are being sold at a price of 98 and interest.

Santa Barbara Gas & Electric Company has been authorized by the California Railroad Commission to issue $1,000,000 serial bonds at not less than 91. The proceeds are to be used to retire the company's outstanding $824,500 bonds at 105 and the balance will go to reimburse the treasury for expenditures made from income for capital account.

At the annual meeting of the stockholders of the Westinghouse Electric & Manufacturing Company, retiring directors were reelected for four years. Guy E. Tripp was made chairman of the board. The stockholders confirmed the election of Samuel M. Vauclain, vice-president of the Baldwin Locomotive Works, who was elected to the unexpired term of three years of Charles F. Brooker, retired.

Toronto Electric Light Company has sold to William A. Read & Company and Dominion Securities Company, Ltd., $1,000,000 first-mortgage three-year five-per-cent gold bonds. The issue is for the purpose of retiring a similar amount of bonds maturing July 1. Toronto Electric Light Company does a light and power business in city of Toronto in competition with the Provincial Government's system. The city of Toronto has the option of purchasing the company in 1919 at a price to be fixed by arbitration, failing agreement as to price between the company and the city. The company's gross earnings in 1915 were $1,320,085.

Dividends.

	Term	Rate	Payable
American Cities	S	1.5 %	July 1
American Gas & Elec., com.	Q	2.5 %	July 1
American Gas & Elec., com. (extra)	—	2 %	July 1
American Gas & Elec., pf.	Q	1.5 %	Aug. 1
Ark. Lt. & Pw., pf.	Q	1.75%	July 1
Asheville Pw. & Lt., pf.	Q	1.75%	July 1
Baltimore Elec., pf.	Q	1.25%	July 1
Bell Tel. of Canada	Q	2 %	July 15
Bost. & Worcester El., pf.	S	$1.50	July 1
Carolina Pw. & Lt., pf.	Q	1.75%	July 1
Cleveland Ry.	Q	1.5 %	July 1
Columbus Pw., pf.	Q	1.75%	June 15
Commonwealth Pw., Ry. & Lt., pf.	Q	1.5 %	Aug. 1
Commonwealth Pw., Ry. & Lt., com.	Q	1 %	Aug. 1
Con. Gas, Elec. Light & Pw., com.	Q	1.75%	July 1
Consumers Pw., pf.	Q	1.5 %	July 1
Gas & Elec. Securities, pf.	—	14 %	July 1
Gas & El. Securities, com.	—	12 %	July 1
National Gas, Elec. Lt. & Pw., pf.	Q	1.5 %	July 1
National Gas, Elec. Lt. & Pw., com.	Q	1 %	July 1
New York State Rys., pf.	Q	1.25%	July 1
New York State Rys., com.	Q	1.25%	July 1
Northern Ontario Lt. & Pw., pf.	—	3 %	July 15
Northern States Pw., com.	—	1.5 %	July 20
Northwestern Elec., pf.	Q	1.5 %	July 1
Northwestern Pw., pf.	—	$1.50	July 1
Southern Utilities, pf.	Q	1.75%	July 1
United Gas Improvement	Q	2 %	July 15
Western Pw. Corp., pf.	Q	1 %	July 15
Western Union Telegraph	Q	1.25%	July 15
West Penn Trac., pf., ex.	—	3 %	Aug. 15
West Penn Trac., pf., ex.	—	3 %	Sept. 15

Reports of Earnings.

FEDERAL LIGHT & TRACTION.

Federal Light & Traction Company and subsidiaries report consolidated earnings for April and the four months ended April 30 as follows:

	1916	1915
April gross	$203,175	$190,021
Net after taxes	68,089	63,320
Interest charges	48,723	49,008
Surplus	19,366	14,312
Four months' gross	861,788	822,103
Net after taxes	286,947	289,702
Interest charges	195,396	199,509
Surplus	91,551	90,195

BELL TELEPHONE.

Income account of Bell Telephone System in United States for April, 1916, and four months compares as follows:

April:	1916	1915
Exchange revenue	$15,479,833	$14,003,337
Toll revenue	5,669,166	5,188,990
Miscellaneous revenue	220,456	196,799
Total operating revenue	21,369,455	19,389,126
Operating expenses	13,962,238	12,741,117
Net operating revenue	7,407,217	6,648,009
Net after taxes	6,110,539	5,447,237
Four months:		
Exchange revenue	60,874,924	55,291,277
Toll revenue	22,010,920	19,358,031
Miscellaneous revenue	867,931	747,403
Total operating revenue	83,753,775	75,396,711
Operating expenses	54,685,089	49,868,609
Net operating revenue	29,068,686	25,528,102
Net after taxes	23,859,030	20,682,256
Miles wire owned	18,757,378	17,716,033
Bell stations owned	6,190,383	5,698,887
Bell connected stations	3,215,700	3,105,324
Total stations	9,406,083	8,804,221

MIDDLE WEST UTILITIES.

Middle West Utilities Company reports for the year ended April 30, 1916, compare as follows:

Combined earnings of subsidiaries:	1916	1915
Gross earnings	$8,091,149	$7,634,745
Operating expenses, taxes and rentals	5,205,034	4,877,016
Net earnings	2,886,115	2,757,728
Interest paid outside holders	1,339,412	1,307,629
Amortization	24,642	.....
Dividends paid outside holders, and their proportion of earnings	206,093	310,428
Balance accruing to Middle West Utilities Company	1,315,968	1,139,672
Income of Middle West Utilities Company:		
Interest received and accrued	503,070	437,123
Dividends received and accrued	456,480	364,135
Sundry interest	247,629	276,680
Profit from sale of securities	139,694	332,030
Income in book value securities	54,000	.....
Profit from sale of property to subsidiary companies	100,116	33,956
Securities received for services rendered	119,900	.....
Fees for engineering and other services to subsidiaries	26,796	84,932
Total income	1,642,686	1,528,855
Administration expense, taxes, etc.	190,704	168,855
Interest on collateral notes and bonds	328,576	215,287
Interest on loans, etc.	122,121	163,396
Net income	1,001,286	981,317
Dividends on preferred stock	599,062	598,048
Discount on company's own securities	85,000	80,000
Balance	317,224	303,268
Previous surplus	1,081,132	777,864
Total surplus	1,398,356	1,081,132
Middle West Utilities property, amortization of undivided surplus of subsidiary companies for year	130,730	78,504

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	June 19.	June 12.
American Tel. & Tel. (New York)	130⅝	129½
Commonwealth Edison (Chicago)	141	141
Edison Electric Illuminating (Boston)	238	238
Electric Storage Battery common (Philadelphia)	65¾	64½
Electric Storage Battery preferred (Philadelphia)	65¾	64½
General Electric (New York)	169	169
Kings County Electric (New York)	130	130
Massachusetts Electric common (Boston)	6	6
Massachusetts Electric preferred (Boston)	34½	34
National Carbon common (Chicago)	170	170
National Carbon preferred (Chicago)	123	122
New England Telephone (Boston)	134½	134
Philadelphia Electric (Philadelphia)	27½	27⅞
Postal Telegraph and Cables common (New York)	81	80½
Postal Telegraph and Cables preferred (New York)	68¼	68
Western Union (New York)	94⅛	94⅝
Westinghouse common (New York)	60⅝	61¼
Westinghouse preferred (New York)	70	70

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New Publications

JOURNALISM.—The addresses made at the Fourth Annual Newspaper Institute, held at the University of Washington, Seattle, in January, 1916, have been published in the University *Bulletin* for May under the general title, "Ethical Aspects of Journalism."

FOREIGN TRADE.—The official report of the Third National Foreign Trade Convention, which was held in New Orleans in January, has been issued. It constitutes a bound volume of 530 pages, containing the addresses and discussions in full. The secretary is R. H. Patchin, India House, Hanover Square, New York City.

OSCILLATING-CURRENT CIRCUITS.—An abstract of a thesis on this topic has been published by V. Bush at the Massachusetts Institute of Technology. It is an extension of the theory of generalized angular velocities with applications to the coupled circuit and the artificial transmission line.

MAGNETIC OBSERVATIONS.—The United States Coast and Geodetic Survey has published the results of observations made at the Magnetic Observatory at Sitka, Alaska, 1913 and 1914, by Daniel L. [illegible]. Hourly values of the com- [illegible] of the earth's field are given, with [illegible]aries and with reports of earth- [illegible]kes and magnetic storms.

BUREAU OF STANDARDS.—Scientific papers Nos. 276 and 279 of the Bureau of Standards, Washington, D. C., are entitled respectively "Protected Thermo-Elements," by Arthur W. Gray, and "Distribution of Energy in the Visible Spectrum of an Acetylene Flame," by W. W. Coblentz and W. B. Emerson. The first describes in detail a convenient mounting for protecting laboratory thermo-elements from damage by contamination or by mechanical strains. The second gives the spectral composition of the acetylene flame.

COMMERCIAL REGISTER.—The twenty-fourth annual edition of "Hendricks' Commercial Register" has come to hand. It is devoted especially to the interests of electrical and other engineering industries, architects, contractors, etc. It should prove useful to both buyers and sellers through its lists of producers, dealers, manufacturers and consumers. It is published by S. E. Hendricks Company, Incorporated, 2 West Thirteenth Street, New York, N. Y.

Electrical Patents Issued June 13, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,186,532. Electrical Conduit. C. W. Abbott, assignor to American Conduit Co., Pittsburgh, Pa. Structure of joint.

1,186,541. Time-Recorder. J. W. Bryce, assignor to International Time Recording Co., Endicott, N. Y. Mechanism for operating elapsed-time indicators.

1,186,542. Dynamoelectric Machine. J. W. Burleigh, Rowbarton, Taunton, England. Structure of field with interpoles.

1,186,561. Electromagnet. C. T. Evans, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Single electromagnetic winding with several control circuits.

1,186,563. Automatic Common-Battery Telephone Exchange. E. D. Fales, assignor to First Trust & Savings Bank, Chicago, Ill. Arrangement of connector-switch, relays, etc.

1,186,568. Spark Plug. F. M. Furber, Revere, Mass. Special structure with insulator secured in casing by frictional grip.

1,186,574. Rail Bond. T. Haulton, Wilkinsburg, Pa. Has improved connection with rails.

1,186,585 and 1,186,586. Electric Switch. C. J. Klein, assignor to Cutler-Hammer Mfg.Co. First patent: details of snap switch for sockets. Second patent: two-push-button, snap, flush switch.

1,186,605. Lamp. L. L. Pfeifer, assignor to John W. Brown Mfg. Co., Columbus, O. Structure of headlight casing.

1,186,618. Electric Regulator. L. L. Tatum, assignor to Cutler-Hammer Mfg. Co. Resistance controlled by electromagnets uniformly set but interconnected to produce successive operation.

1,186,629. Method Used in the Manufacture of Paper and Such Like by Machinery Together with an Apparatus for the Purpose. J. H. Wallin and K. Granqvist, Kopmanholmen, Sweden. Method of regulating feed of pulp to machine and electrically indicating thickness of pulp therein.

1,186,636. Switch Lock. G. B. Willcox, Saginaw, Mich. Anti-tampering, locking attachment.

1,186,639. Constant-Speed Integrator. D. R. Yarnall, assignor to Yarnall-Waring Co., Philadelphia, Pa. Mechanism for integrating volume of current flow, driven by electric motor.

1,186,654. Means For Producing Phase-Shifted Oscillations in a Plurality of Independent Oscillation-Circuits. A. Franke, Berlin, Germany. Number of wireless transmitters have currents of different phase supplied to them respectively from generator having frequency a submultiple of antenna frequency, frequency of generator being multiplied to transmitter.

1,186,658. Speed-Control System For Electric Traction Motors. J. E. Haschke, Chicago, Ill. Connections and switching mechanism for sectional-wound field coils.

1,186,701. Spark Plug. H. M. Spencer, Dunmore, Pa. Structural details.

1,186,704. Trolley Guard. C. M. Sweiberg, Yonkers, N. Y. Guard wheels carried by trolley support at sides and above trolley wheel.

1,186,710. Electric Water-Heater. S. Trood, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Thermostatically controlled valve governs liquid flow into electrically heated casing.

1,186,712. Antifriction Bearing Structure For Electric Motors. J. N. Vandegrift, assignor to Railway Roller Bearing Co., Syracuse, N. Y. Arrangement of thrust and journal bearings in frame.

1,186,728. Method of Constructing Terminals. W. M. Austin, assignor to Westinghouse Electric & Mfg. Co. One-piece terminal for receiving number of conductors.

1,186,734. Canopy Insulation. E. E. Bechtold, Chicago, Ill. For fixture canopies.

1,186,746. Telephone Transmitter. C. L. Chisholm, London, Ont., Canada. Arrangement of diaphragm and granule chamber.

1,186,747. High-Potential Rectifier. L. W. Chubb, assignor to Westinghouse Electric & Mfg. Co. Arrangement of electrolytic cells in groups so that uniform, external static field is produced.

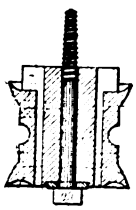
1,186,755. Electric Locomotive. J. L. C. Davis, assignor to Westinghouse Electric & Mfg. Co. Structure of motor having number of symmetrically arranged armatures.

1,186,765. Electrical Measuring Device. C. L. G. Fortescue, assignor to Westinghouse Electric & Mfg. Co. For measuring maximum value of voltage wave.

1,186,766. Target. A. O. Gihre, Christiania, Norway. Rings of target may rock and close indicator circuit.

1,186,767. Electrical Measuring Instrument. W. S. Gorton, assignor to Westinghouse Electric & Mfg. Co. For measuring maximum value of voltage wave; comprises mercury rectifiers supplying to instrument direct current proportional to alternating current through a condenser.

1,186,769. Circuit Closer for Mail-Box Alarms. S. F. Gulley, Lawrence, Kans.



No. 1,186,862.—Insulator.

Details of mechanism for operation by door or lid.

1,186,770. Circuit-Interrupter. F. D. Hallock, assignor to Westinghouse Electric & Mfg. Co. Switch having contacts provided with magnetic members for holding contacts together.

1,186,772. Electric Indicator For Mail Boxes. M. Hammons, LaPorte, Ind. Normally open annunciator circuit can be closed by push button except when article is in box.

1,186,773. Electric Self-Feeding Soldering Iron. H. H. Harris, Oconto, Wis. Relates to details of feeding liquid solder melted electrically in chamber in iron.

1,186,791. Charging System for Electrolytic Lightning Arresters. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Horn gaps in series with arresters and resistor thrown in circuit when gap bridged.

1,186,804. Equalizing Means for Dynamoelectric Machines. B. G. Lamme, assignor to Westinghouse Electric & Mfg. Co. Polyphase windings have number of sections per phase, the terminals of the sections being connected to terminals of corresponding sections of an inductive winding.

1,186,817. Semi-Automatic Telephone System. E. A. Mellinger, assignor to Automatic Electric Co., Chicago, Ill. Arrangement of calling device in cord circuit to be plugged into trunk jacks and line and master switches for selecting an idle trunk.

1,186,818. Regulating System For Electric Machines of the Revolving-Field Type. F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. Distributed field winding having phase divisions and armature with commutator and brushes corresponding to phase divisions, different parts of field winding being made active or inactive at will.

1,186,819. System of Distribution. F. W. Meyer, assignor to Westinghouse Electric & Mfg. Co. Induction motor regulated by gearing to machine as above and having secondary connected to armature of machine by slip rings, and the armature connected through commutation with the motor supply.

1,186,823. Measured-Service Telephone System. F. Newforth, Jr., assignor to Automatic Electric Co., Chicago, Ill. For automatic systems.

1,186,844. Automatic Cab Signaling and Train-Stopping Mechanism. A. P. Sanborn and R. C. Wilson, Ossining, N. Y. Block system having caution and danger signals and electrically controlled air valve.

1,186,851. Synchronizer. M. L. Severy, Arlington Heights, Mass. Current pulsator for vibrating tuned sonorous body, is regulated to constant speed to synchronize pulsations with natural period of body.

1,186,852. Switch For Portable Lamp. G. B. Slocum, assignor to Waterbury Mfg. Co., Waterbury, Conn. Details of flashlight switch.

1,186,857. High-Tension Strain Insulator. L. Steinberger, Brooklyn, N. Y. Has interchangeable parts adapting it for connection in different ways to objects of different shapes.

1,186,859. Battery Box. R. J. Stephenson, assignor to Stephenson Supply Co., Inc., Auburn, N. Y. Details of structure with several battery compartments.

1,186,862. Insulator. O. P. Swartz, Mount Pleasant, Pa. Details of knob with special provision for disposing of moisture. (See cut.)

1,186,881. Manufacture of Paper Board. L. W. Case, Highland Park, Conn. Method of forming insulating board for electrical use.

1,186,886. Electric Clock. J. Cook, Allendale, N. J. Gear train, etc.

1,186,890. Electric Regulation. J. L. Creveling, assignor to Safety Car Heating & Lighting Co., Jersey City, N. J. Resistance regulator for voltage regulation of car-lighting system.

1,186,898. Electrolytic Apparatus. W. E. Greenawalt, Denver, Colo. Has oscillating diaphragm between electrodes.

1,186,901. Ground Clamp. W. H. Higgins, Philadelphia, Pa. For making connection with water pipes, etc.

1,186,906. Web Guiding Means. E. P. Hopkins, assignor to Publishers Utilities Co., New York, N. Y. Motor and controller for shifting web laterally to regulate margin with relation to printing couple of press.

1,186,908. Automatic Selector Switch. C. A. W. Hultman, Stockholm, Sweden. For telephone system: structural details.

1,186,914. Dirigible Lamp. E. E. Krumbein, Womelsdorf, Pa. Housing has lamp, hood, etc., revolvable as unit therein.

1,186,916. Electric Sign. H. G. Lane and H. S. Williams, San Diego, Cal. Details of reflector and sign box.

1,186,921. Method For Synthetic Production of Cyanogen Compounds. A. R. Lindblad, Ludvika, Sweden. Electric furnace process.

1,186,923. Railway Signal. J. F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Co. Controlled by trolley-operated switches.

1,186,929. Coin-Operated Telephone Attachment. E. E. Murray, Shawville, Pa. Details of mechanism.

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1,186,930. Electrical Switch Mechanism. W. J. Newton, assignor to Newton Mfg. Co., Lynbrook, N. Y. Push-button flush switch.

1,186,934. Temperature-Indicating Mechanism. H. Y. Norwood, assignor to Taylor Instrument Companies, Rochester, N. Y. Portable indicator has circuits selectively closed by several thermometers.

1,186,936 and 1,186,937. Electrolytic Apparatus. J. Pfleger and F. Ott, assignors to Roessler & Hasslacher Chemical Co., New York, N. Y. For electrolysis of fused alkali salts.

1,186,941. Electrically Operated Typewriter. P. C. Rawles, assignor to E. Hausberg, Charles City, Iowa. Typebars operated by electromagnets having circuits controlled by keys.

1,186,942. Gong. H. E. Reeve, Brooklyn, N. Y. Structural details of device having magnetically actuated hammer.

1,186,953. Sign Receptacle. J. S. Stewart, assignor to A. Stewart, New York, N. Y. Socket adapted for securing to sign plate.

1,186,959. Circuit-Breaker Relay. A. H. Weiss, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Operated as a buzzer on abnormal current flow.

1,186,961. Electrically Operated Bell For Submarine Signaling. E. C. Wood, assignor to Submarine Signal Co., Waterville, Me. Clapper operated from power accumulator which may be connected with constantly running motor at will.

1,186,986. Incandescent Lamp. G. F. Heustis, Malden, Mass. Cutout spring on stem held open by fusible resistance.

1,186,993. Apparatus For Producing Ultra-Violet Radiation. F. G. Keyes, assignor to Cooper Hewitt Electric Co., Hoboken, N. J. Means for regulating supply of hydrogen to point of use.

1,187,000. Viscoscometer. C. O. Lorenz, Port Arthur, Tex. Fluid heated and circulated by thermostatically controlled electric heater and motor.

1,187,010. Safety Plug. M. R. Rodrigues, Brooklyn, N. Y. For plugging into electric heaters, etc. (See cut.)

1,187,031. Air Compressor. S. D. Black, Baltimore, and A. G. Decker, Orangeville, Md. Mounting and gearing of electric motor.

1,187,035. Telegraphy. A. H. Bumstead, Townsend, and R. W. Bumstead, Brookline, Mass. Apparatus for sending succession of impulses at varying intervals according to code and recording in typographical form.

1,187,038. Safety Lamp and Direction Indicator For Vehicles. A. T. Butkey, Youngstown, O. Electromagnetically operated indicator.

1,187,053. Lock Socket For Electric-Light Bulbs. C. F. Dwyer, Ashland, W. Va. Locking shield thrown into and out of alinement with set screw.

1,187,054. Magnet Meter. R. J. Everest, assignor to Electric Equipment Co., Los Angeles, Cal. Deflection of armature by magnet to be tested moves pointer over scale.

1,187,078. Portable Pole-Platform. S. C. May, Modesto, Cal. For use of linemen.

1,187,083. Thermoelectric Switch. C. R. Murray, San Francisco, Cal. Alarm circuit held open by fuse.

1,187,095. Telephone System. F. N. Reeves, assignor to Western Electric Co., New York, N. Y. Details of automatic switching mechanism.

1,187,103. Casing For Portable Electric Flashlights. C. J. Sagebrecht, assignor to Interstate Electric Novelty Co., New York, N. Y. Structural details.

1,187,104 and 1,187,105. Electric Pocket Flashlight. C. J. Sagebrecht, assignor to Interstate Electric Novelty Co. First patent: Socket and reflector. Second patent: Special structure having connection through reflector.

1,187,111. Apparatus For Starting Internal-Combustion Engines. A. H. Timmerman, E. L. Coolidge and S. Sparrow, assignors to Wagner Electric Mfg. Co., St. Louis, Mo. Motor-dynamo connected to engine by different gearing ratios according to whether driving or driven.

1,187,116. Trolley-Retriever Valve. F. A. Wasson, Milwaukee, Wis. In pneumatically operated device: valve may be relieved to permit hand operation of trolley.

1,187,117. Trolley Base. F. A. Wasson, assignor to Wasson Engineering & Supply Co., Santa Rosa, Cal. Swivel base for trolleys retrieved by air pressure.

1,187,121. Electric Pocket Flashlight. E. Alschuler, assignor to Interstate Novelty Co. Arrangement of switch and lens support.

1,187,123. Combined Socket-Cover and Shade-Holder. L. W. Anderson, Waterbury, Conn. Structural details.

1,187,126. Lightning Arrester. A. E. Beattie, St. Michaels, Torquay, England. For protecting telephone, telegraph and like instruments.

1,187,127. Submarine Signaling Apparatus. C. Bergomer, assignor to Submarine Wireless Co., New York, N. Y. Structure of microphone box on hull below water line.

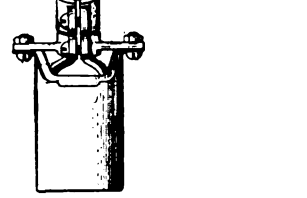
1,187,135. Release Box. J. H. Derby, New York, N. Y. Comprises series of bell-crank levers controlled by magnetic trip.

1,187,157. Apparatus For Aiding the Hearing. J. S. Leach, Brooklyn, N. Y. Device for connecting and locking conductor ends.

1,187,166. Cored Carbon With Arc-Extinguishing Plug. W. R. Mott, [illegible] National Carbon Co., Cleveland, [illegible] of poor arc-supporting material in [illegible] extinguish arc at given point.

1,187,169. Telegraph Circuit. A. Orling, assignor to Orling's Telegraph Instruments Syndicate, London, England. Relates to local receiving circuit.

1,187,178. Indicating Apparatus for the Spark Plugs of Hydrocarbon Engines. O. H. Remmert, Austin, Tex. Finding apparatus for spark plugs.



No. 1,187,010.—Safety Plug.

1,187,180. Means For Improving the Power-Factor of Induction Machines. A. Scherbius, assignor to Aktiengesellschaft Brown, Boveri & Cie, Baden, Switzerland. Special commutator phase-compensating machine having its brushes connected with brushes of induction motor on slip rings of wound rotor.

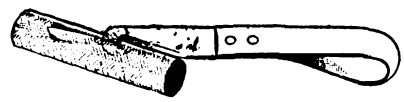
1,187,225. Manufacture of Abrasive Materials. T. B. Allen, assignor to General Abrasive Co., Niagara Falls, N. Y. Comprises fusing bauxite and carbonaceous material by electric heat.

1,187,228. Rheostat. A. J. Asch, New York, N. Y. Details of resistance tube with adjustable contact slider.

1,187,275. Drawing Steel Tubes. M. Derihom, Loncin-lez-Liege, Belgium. In drawing seamless tubes, electric current heats tube at drawing point.

1,187,282. Arc-Lamp Electrode. M. Doetch, assignor to C. Conradty, Nuremberg, Germany. Non-porous carbon has roughened surface to which chemical mixture adheres.

1,187,301. Lamp Grip. G. W. Goodridge, assignor to Bryant Electric Co., Bridgeport, Conn. Receptacle and segmental portions of shell restricted to grip lamp base.



No. 1,187,386.—Insulation Stripper.

1,187,303. Electrical Switch. C. O. Graham, Seattle, Wash. Automatic cutout for oil switch.

1,187,313. Search or Headlight. F. J. Heiberger, Boston, Mass., and M. C. Stuart, Richmond, Va. Pivoted shield at front of lamp body has magnetically controlled latch.

1,187,315. Electric Flasher. G. W. Henry, Jr., Philadelphia, Pa. Details of motor-driven switch mechanism.

1,137,330. Device For Locking Electric Lamp Bulbs in Receptacles. F. Jordan, San Francisco, Cal. Split gripping collar surrounding lamp end of receptacle.

1,187,334. Circuit-Closer. F. C. Keppler, Clifton, Ariz. Thermostatically operated for alarm circuit.

1,187,338. Switch Lock. B. C. Kreiner, Wascott, Wis. Contact-operating bolt operated by key.

1,187,367. Primary Current-Breaker for Magneto-Electric Ignition Devices. F. Munz, assignor to E. Scharrer, Cannstatt, Germany. Structural details.

1,187,368. Trolley Harp and Wheel Therefor. W. W. Neighbour, Sandusky, O. Manner of securing rim and side flanges to central spider.

1,187,372. Electric Brake System. O. E. Nilsen, Fargo, N. D. System having brakes operated from crosshead driven by electric motor.

1,187,377. Electrical Measuring Instrument. A. Onwood, Southfield, London, England. Structure of magnet and suspension of coil in D'Arsonval instrument.

1,187,386. Cable-Insulation Stripper. A. A. Pehrson, New York, N. Y. Blade resembles bill hook and handle connected at an oblique angle to sharpened edge. (See cut.)

1,187,400. Electric-Fan Deflector. R. E. Taylor, Chanute, Kans. Air-current deflector for electric fans.

1,187,404, 1,187,405 and 1,187,407. Electric Welding System. D. H. Wilson, Paterson, N. J. First patent: Arc system has means associated with welding tool for manipulating switchboard rheostat. Second patent: Arc system with variation of arc resistance compensated by automatic variation of potential. Third patent: Modification of 1,187,406.

1,187,406, 1,187,408 and 1,187,409. System of Electric Welding. D. H. Wilson, Paterson, N. J. First patent: Modification of 1,187,405, employing resistance. Second patent: Arc system with special provision for preventing rush of current at striking of arc. Third patent: Arc system has electro-responsive resistance variable to maintain smooth current flow.

1,187,410. Method of Electric Welding. D. H. Wilson. Arc started with maximum potential, current being limited to potential at which there is non-pitting, no slag formation, and no metal spattering.

1,187,411. Alloy for Arc Welding. D. H. Wilson and S. M. Rodgers; said Rodgers assignor to said Wilson. Homogeneous alloy for electrodes of iron, about one per cent manganese and copper.

1,187,412. Alloy for Arc Welding. D. H. Wilson. Iron homogeneously combined with sufficient manganese to give tensile strength and ductility in boiler-plate steel.

1,187,414. Machine for Wrapping Small Articles. J. R. C. August, Sowerby Bridge, England. Electromagnetically operated.

1,187,424. Safety Signal for Automobiles. H. F. Greenup, Pawtucket, R. I. Rear signal lamp controlled by brake rod.

1,187,439. Stabilizer. A. J. Macy, Chicago, Ill. Guiding means for aeroplane controlled by electric contact subject to close by freely movable ball elements as machine tilts.

1,187,473. Railway Signaling System. H. A. Wagner, Short Hills, N. J. Has conductively continuous track rails.

Reissue 14,151. System of Distribution. T. W. Varley, assignor to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Original No. 1,175,320, dated March 14, 1916. Special connections of three sets of transformer windings for phase transformation.

PATENTS EXPIRED.

The following United States electrical patents expired on June 20, 1916:

627,105. Apparatus for Lighting Car Lamps. H. C. Farquharson, New York, N. Y.

627,106. Apparatus for Electrically Lighting Lamps. H. C. Farquharson, New York, N. Y.

627,133. Electric Vehicle. W. M. McDougall, East Orange, N. J.

627,134. Secondary Battery. W. M. McDougall, East Orange, N. J.

627,144. Electric Transformer. G. A. Scheffer, Peoria, Ill.

627,155. Electrostatic Measuring Instrument. E. Thomson, Swampscott, Mass.

627,172. Telephone Toll Apparatus. J. T. Belanger, Detroit, Mich.

627,242. Electric Relay. H. B. Taylor, Newark, N. J.

627,243. Railway Signal. H. B. Taylor, Newark, N. J.

627,245. Railway Signal. J. Wayland, Newark, N. J.

627,246. Generating Electricity for Cars, Etc. J. Wayland, Newark, N. J.

627,252. Means for Lubricating Electric Motors. N. A. Christensen, Milwaukee, Wis.

627,266. Process of Producing Acid Chromate of Lead. C. Luckow, Cologne-Deutz, Germany.

627,267. Process of Producing Basic Phosphate of Copper by Means of Electrolysis. C. Luckow, Cologne-Deutz, Germany.

627,291. Driving Mechanism for Dynamos on Car Trucks. W. L. Bliss, New York, N. Y.

627,322. Thermostatic Instrument. C. Burgher, Winthrop, Mass.

627,326. Electric Lighting System for Cars. J. L. Creveling, New York, N. Y.

627,345. Generating Electric Waves for Vibrations. D. M. Moore, Newark, N. J.

627,366. Insulator for Fastening Electric Wires. J. Treleaven, Vancouver, Canada.

627,376. Controller. T. von Zweigbergk, Cleveland, O.

627,417. Electric Motor. A. Hinman, Forest City, Mo.

627,442. Process of Electrolytically Treating Ores. L. Pelatan, Paris, France.

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